Green Intraprenurial Flexibility towards Sustaining Competitive Advantage: A Case of South Asian Context -

4 authors:

Dinesh Samarasinghe
University of Moratuwa
68 PUBLICATIONS **195** CITATIONS

SEE PROFILE

Ananda Wickramasinghe
University of Wollongong
42 PUBLICATIONS **210** CITATIONS

SEE PROFILE

Helan R. Gamage
James Cook University Singapore
22 PUBLICATIONS **57** CITATIONS

SEE PROFILE

Nalin Abeysekera
The Open University of Sri Lanka
184 PUBLICATIONS **295** CITATIONS

SEE PROFILE

A. T.
Business Management Review

This edition is published on December 16th,2015

GENERAL INFORMATION

An enterprises' operation and management technique have been subject to strong impact and challenge, with a new type of multinational trade forming. This is due to the Internet and information's continuous development, and also simultaneously facing the internationalization and polarization evolution in community environments. In the previous thirty years, our institute has at all times, adhered to the following missions at all times: We always pay great attention to the continuous growth of our enterprise and management community. The journal published by our institute has been conceived to improve research and promote academic environment. This is in order to satisfy the internationalized pluralistic society and the E-age's requirements. It is expected that the academic consultant community and the strict review system provided by our institute can create higher quality and a more competitive academic environment for communities.

To hold academic Conference and Journal publishing. Conferences will be regularly held once or twice a year,and the academic journal will regularly call for papers three times a year.Issue is arranged for April, August, and IDecember. Papers relevant to the following fields are welcome: Enterprise Resource Planning (ERP), Enterprise Strategies, Marketing Management, Production Management, Logistics Management, Financial Management, Tourism Management, (Business Administration), Service Quality Management, and Case Discussion, etc. Please check the website www.jtiba.com

JOURNAL PUBLICATION FEES

The author of accepted paper must pay the journal/conference publication fee of $295 to publish his/her paper in Taiwan Institute of Business Administration, Cambridge. The journal/conference publication fee for papers with two authors will be $395 and the journal publication fee for papers with three authors will be $495. The publication fee must be received in seven days after the paper is accepted. Paying the publication fee entitles authors to publish the paper in the journal and to receive a copy of the publication. There is a shipping and handling fee for foreign addresses (other than Canada). When the paper is accepted, each author must pay the registration fee. Only money orders and personal checks are accepted. There is a $250 cancellation fee on cancellations received prior to publication deadline. There will be no refunds on cancellations received after the dead line.

Subscription rates for TIBA: in U.S., Mexico, and Canada, $150 for one year. Rates for overseas $250 for one year.

One Author	US$295
Two Authors	US$395
Three Authors	US$495
Four Authors	US$595
Cancellations Received Prior To Publication Deadline	US$250
Subscription Rates , U.S., Mexico, and Canada, One year	US$150
Subscription Rates , Rates for overseas, One year	US$250

Taiwan Institute of Business Administration,
The Journal No.6, Aly. 17, Ln. 1224, Zhongzheng Rd., Wufeng Dist.,
Taichung City 41350, Taiwan (R.O.C.)
Tel-886-921-362250
* Email: kent@jtiba.com * Web: www.jtiba.com
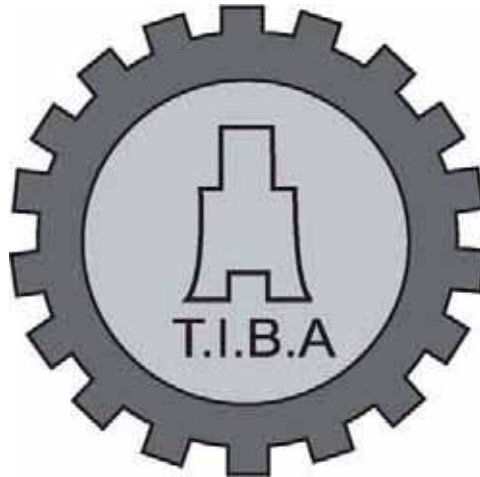
Academy of Taiwan Business Management Review
Volume 11* Number 3* December 2015
ISSN 1813-0534

The journal is listed in Cabell's, Ulrich's, and the Journal Rank List of Australia Research Concil with ERA ID 40538. It is ranked "B" by ABDC (Australian Business Deans Concil)

BOARD MEMBERS

EDITORIAL ADVISORY BOARD

Chinese Economy And Central Asia

Celal Bayari
The University of Sydney.
Australia

ABSTRACT

Chinese economic growth has accompanied the rise and development of the Chinese economic model with its own types of multinational enterprises, and state owned enterprises. Major stock market plunges in 2015 have taken away the focus from the model and the manufacturing base that upholds it. Analyses of the system of the Chinese state, its enterprises and the private sector need to continue to understand the future of this economy and its implications for the rest of the world. Central Asian energy markets, which China has entered a decade ago, are important in this context, as their future behaviour will have consequences for the EU, North American and Australian markets. The Chinese state is the owner of the largest banks and sovereign wealth funds in the world. When China lost its energy independence in 1993, it began to rely on Central Asian energy markets and increasingly placed more emphasis on the region as a hub for its economic expansion, and as a strategic location and export market. The region, neighboring Xinjiang Uyghur Autonomous Region, is one of the foci of organizations such as the Shanghai Cooperation Organisation (SCO), and projects such as the Silk Road Economic Belt (SREB). Chinese trade and foreign direct investment (FDI) in the region involve plans to build economic and other links from Xinjiang Uyghur Autonomous Region across Central Asia. This paper argues that Central Asia faces some challenges due to its landlocked status, and industrial structure and markets, despite its energy and mineral resources, some of which is yet to be developed.

Keywords: China, Central Asia, natural gas, crude oil, trade and FDI

INTRODUCTION

Contemporary international trade and FDI order is primarily reliant upon the co-operation of individual participants, or their coalitions, and the existence of stabilizing hegemonic powers in international politics, as per numerous theoretic constructions (Ikenberry et al., 1988; Kindleberger, 1973; McKeown, 1983; Snidal, 1985). International trade and FDI environment is built on international economic power structures that are not always stable (Lake, 1988; Waltz, 1979). There is divergence of opinion on whether the co-operation of individual countries or their conflicts shape the international order (Grieco, 1993; Keohane, 1984; Krasner, 1991). John H. Dunning's 'eclectic paradigm' of 'ownership, locational, internalization, [OLI] advantages' has been instrumental in defining and evaluating trade and FDI activities of multinational enterprises (MNEs) (Dunning, 1988, 1993, 1995, 1997, 2006). According to Dunning, the 'international trade' perspectives (such as Aliber, 1993; Kojima, 1982) that are inspired by neo-classical framework downplay the significance of the advantages that MNEs possess and utilize (Dunning, 2000). Such perspectives implicitly assume that in trade all good are exchanged between independent buyers and sellers across national borders while in fact, as theories that simultaneously cover international trade and international production (i.e. the 'eclectic paradigm') explicitly postulate, the transfer of immediate products is undertaken within the same MNEs (Dunning, 1998, p. 2). A contemporary example of this is visible in the operations of Chinese corporations, MNEs, and state owned enterprises (SOEs)] that invest and trade in overseas energy and mineral markets, and also export overseas. Overall, international trade and FDI are the two complementary domains of MNEs and SOEs. The post-Second World War international order originates from the global expansion of Western market institutions that themselves had emerged in Europe over a period of several centuries. Capitalist models in Korea, Japan and China are built on non-Western institutional frameworks (Dunning, 1995, p. 461). Prior to the rise of China, the Japanese model represented the East Asian capitalism (Park, 2011, pp. 248-250). The post-Second World War reconstruction of the Japanese economy was simultaneous with the Japanese model getting co-opted, as an ally of the US, into the new order (Bayari, 2012, p. 160). Chinese state-guided capitalism is a much later entrant to the contemporary trade and investment order (Hsu et al., 2011; Urio, 2012). Models such as the Chinese and Japanese exist in context of the international order but with their own respective institutions. The post-Second World War growth period was the best era that the Japanese economy has ever had (Cumings, 1997, pp. 152; Schaller, 1985, p. 239; Tsuru, 1993, pp. 83-84). In later decades, it was the accession of China to the WTO that allowed its market model to participate in the world of trade and FDI agreements (Dunning, 2003, p. 1). Thus, the post-Second World War trade and FDI order includes the "constructers" of the order, and the countries that became "co-opted." Japan and China's growth would not have come about if they had not been allowed access to Western markets of consumers, resources, technology and education (Dunning and Lundan, 2008, p. 755). MNE trade and FDI activities have always included lobbying foreign countries for friendly economic

policies (Dunning, 1995, pp. 464, 483). Since the early 1980s, the relationships between MNEs and governments have become increasingly co-operative, within the process of globalization (Dunning, 1998, p. 282). The Chinese capitalist market reforms of the early 1980s and the subsequent expansion of Chinese SOEs coincided with this new international business environment. China's capitalist market take off has been characterized by simultaneous search for markets and natural resources (Dunning, 2008, p. 8). The Chinese model began as a national, and yet an internationalizing model, that is, its viability as a national economic system has always been dependent on its cross-border success, which also expanded into the Central Asian crude oil and natural gas industries. Dunning's 'investment development path model' proposes that as a country develops, there is a change in the configuration of the 'OLI advantages' that its corporations enjoy overseas (Dunning et al, 2001). The Chinese state, SOEs, and MNEs have long been aware that expansion in the domestic market is not disassociated from expansion of Chinese business activity overseas. The Chinese state's 'go out [zou chu qu]' strategy, backed by its foreign currency reserves, has been the main impetus behind the start of the Chinese corporations' overseas expansion to find markets and resources (Alon et al., 2010, p. 4; Chen, 2011, p. 1; Sauvant, 2005, p.676). The Chinese foreign currency reserves were US$4 trillion as of October 2014 government figures, which are the largest in the world, and more than the total of the next nine largest reserves held by governments (State Administration of Foreign Exchange, 2014). Chinese SOEs' international character derives from their securing of critical raw materials and energy via mergers and acquisitions internationally (Athreye and Kapur, 2009, p. 211). Japan was in the same situation in the late 19th and early 20th centuries as it needed to export industrial output and secure raw materials simultaneously that required the overseas networking of its general trading companies [sogo shosha] (Dunning and Lundan, 2008, p. 157). Chinese SOEs are enterprising hallmarks of Chinese capitalism. The term "state capitalism" is not highly relevant in this context as the boundary between private capital and state capital in China has not yet been clearly defined. Trade and investment activities originating from China are subsidized by the state through direct and indirect contributions, and by channeling these activities through SOEs (Haley and Haley, 2013, pp. 3-14). Chinese SOEs have 96 per cent share of the top ten corporations in the country, excluding unlisted entities such as public utilities and services (Büge, 2013; Wooldridge, 2012; Szamosszegi and Cole Kyle, 2011). Chinese capitalism has enabled growth without destabilizing the existing power structure, and ensured the continued dominance of Communist Party while improving the allocation of resources (Acemoglu and Robinson, 2012). SOEs may change organizational character but are unlikely to ever assume a role that goes against the interests of the Chinese state that has always provided support for them. China Petroleum and Chemical Corporation (Sinopec Ltd), the world's largest corporation by revenue level, China National Petroleum Corporation (the world's third largest corporation by revenue level), and State Grid Corporation of China (the world's eighth largest corporation by revenue level) are all SOEs. The Chinese state also owns the largest sovereign wealth funds (SWFs) in the world, which sets the pace for others (Xing and Shaw, 2013; Xu and Bahgat, 2011). Thus, the state leadership has characterized the indigenous institutional organization of the Chinese model, and the clearest contemporary evidence of the state creation and sponsorship of markets is visible in the Chinese electronics and telecommunications manufacturing sector that includes Huawei, which is the largest global corporation in its sector. Huawei, ZTE, Haier and Lenovo (all major exporters to Central Asia and elsewhere) are all either creations of the Chinese state, or upheld by its financial support (Hawes, 2012). The largest and founding shareholder of Lenovo is a form of a state think-thank, and Haier, after its inception as a SOE, has long identified itself as a privately owned collective, which is also what Huawei presents itself as (McGregor, 2012, pp. 201-204). What they all arguably have in common is the state assistance. (Dalton, 2011; Montlake, 2012; Muncaster, 2012; Schmidt et al., 2012). The success of Chinese manufacturers and their internalization of foreign markets have progressed in conjunction with the increase in the Chinese corporate mergers and acquisitions overseas. In Dunning's 'eclectic paradigm', 'locational advantages' of the host market and 'ownership advantages' of the investor determine the type of investment. Overall, the Chinese FDI displays a pattern in which the type of investment is highly dependent on the type of host market, i.e. 'developed countries' and 'developing countries' (Cheung and Qian, 2009, p. 336).

WHAT IS BEIJING CONSENSUS?

The term of Beijing Consensus, first coined in 2004, has arguably come to symbolize the Chinese economic model. Some have argued this be relevant, as an alternative economic growth model, to some developing nations that did not benefit from the distribution of FDI and trade in the last so many decades of globalization. The Beijing Consensus' interaction with such countries is in direct proportion to the fiscal powers and aims of Beijing. The Beijing Consensus is argued by some to be an alternative (to the Washington Consensus) global organization, and a model that answers to the particular needs of Chinese society (Dirlik, 2006, p. 7). There is also the held notion that the

Beijing Consensus recognizes the co-existence of commonality and difference (Rebol, 2010, p. 7). It is also argued that the 'consensus' is Beijing's way to manage China's globalization, the eventual outcome of which may lead to a complex network of inter-state relationships (Abad, 2010, pp. 14-15). The notion of such a consensus does not make strong claims about, for example, an equitable distribution of resources, wealth, services, or products but rather refers to a policy of open door to discussions of a variety of topics. It is imbued with the idea that it is a model of a co-opting process with a difference. This paper does not probe the validity of this argument, which would require more space, and which is highly problematic. Chinese economy's mixed character is most intriguing, as the country has evolved sets of institutions, which are dissimilar to those of the countries in the West, and the Chinese institutions have created high rates of growth, which nevertheless may present eventual drawbacks, as per the Nobel laureate Douglass C. North (North, 2013, p. 18). The 'China model' has one overwhelming priority, which is to keep functioning within the global economy, while masking over domestic issues (Dirlik and Prazniak, 2012, p. 287). 'Chinese globalization' is a process that has been partially shaped by the global economy. The 2008 global financial crisis reduced Chinese investment in export related expansion and increased domestic investment in infrastructure, welfare, housing and health (Abad, 2010, p. 58). In short, when business overseas proved unprofitable, there was an increased investment in the vast domestic market. Overall, the notion of Beijing Consensus is not an officially professed policy and is a rather broad definition of the Chinese state's methods of simultaneously dealing with its domestic politics, economic growth [in its varying rates across the regions in China], and the global economy through Chinese SOEs and MNEs (Xing and Shaw, 2013, pp. 88-89). Both SOE and MNE overseas activities are supported by the Chinese SWFs. In the case of China, the private investment and government investment are synchronized because of the political system, which creates a competitive advantage against other major economies. Chinese corporations' overseas construction and other types of project proposals are priced at low profit margins and/or backed by loans from domestic institutions such as the China's Export-Import Bank (Goh, 2014; Bradsher, 2014). Thus, one of the aims of this neo-mercantilism, defined as a form of economic nationalism, is to reject efficiency and short-term-profit-driven market calculations in favor of those seen to be advancing national power (Ziegler and Menon, 2014, p. 19). Chinese foreign currency reserves provide further advantages in this respect. China has several economic tools at its disposal. The largest foreign currency reserves, growing investments overseas, the world's largest consumer market, and a centrally driven economy with state guided or state owned gigantic corporations.

CHINESE TRADE AND FDI IN CENTRAL ASIA

The paper will now discuss the Chinese trade and FDI in Central Asia in reference to economic structuring in the region. When the Soviet Union disintegrated, five new countries emerged in Central Asia, and at that time many presumed that the region would inevitably come under Iranian influence but instead there developed a complex international rivalry, bringing to mind the 19th century 'Great Game' paradigm of the British and Russia imperialist aims, to influence and control Central Asia's destiny, trade, and oil, gas and mineral resources (Blank, 1995, p. 187). Discussions on the region include Azerbaijan due to its high volume energy exports, its membership of the Turkic heritage and the geographical proximity between Turkey, Azerbaijan Turkmenistan and Kazakhstan (Çagatay, 2006; Frye, 1996; Johanson and Csató, 1998; Prazniak, 2013). Iran is also home to Azerbaijani and other Turkic minorities (Souleimanov et al., 2013). After the collapse of the Soviet Union, Russia remained keen to maintain its near monopoly over the transport of natural gas and crude oil resources of Kazakhstan, Turkmenistan and Azerbaijan, and worked with Iran to prevent the split of the Caspian Sea into five sovereign sectors, and thus making the construction of new non-Russian territorial pipelines out of Central Asia construction difficult (Ruseckas, 1998, pp. 52, 55, 58, 60). Turkmenistan was thus unable to build pipelines to Azerbaijan to export energy to the EU via Georgia and Turkey. Moreover, Russian, and Iranian, support for Armenia and its occupation of Azerbaijani territory limited the possibilities of new pipelines. Presently, Azerbaijan-Turkey links have to detour via Georgia, another country that has long suffered post-Soviet era territorial crisis. However, the most significant change that affected the region's economy came from elsewhere. In 1993, as its oil consumption exceeded its production levels China lost its energy independence (Mathews, 2008, p. 60). This intensified its focus on Central Asia as the location of nearest foreign reserves, and its investment levels in the region are now fast surpassing those that are from Russia (Nichol, 2014, pp. 16-17). China has become a major global investor and trader of Asian, African and Latin American commodities. Its fiscal status is the main factor in this context. Of twelve global banks with over a trillion US$ in assets, four are from China and each one of them is valued over US$2.4 trillion, as per Table 1.

Table 1. World's Top Banks

Rank	Bank name	Total assets (US$ Billion)
1	Industrial & Commercial Bank of China (ICBC)	3,181.88
2	HSBC Holdings	2,758.45
3	China Construction Bank Corporation	2,602.54
4	BNP Paribas	2,589.19
5	Mitsubishi UFJ Financial Group	2,508.84
6	JPMorgan Chase & Co	2,476.99
7	Agricultural Bank of China	2,470.43
8	Bank of China	2,435.49
9	Credit Agricole Group	2,346.56
10	Barclays PLC	2,266.82
11	Deutsche Bank	2,250.64
12	Bank of America	2,149.85
13	Japan Post Bank	1,968.27

Source: http://www.relbanks.com/worlds-top-banks/assets, March 31 2014 balance
sheets and exchange rates.

While China has become both the dominant investor and trader in Central Asia, Russia, by contrast, has remained dependent on continuous FDI to explore, extract, and export its energy reserves, which are its primary revenue sources (Coburn, 2010b, p. 24).

CENTRAL ASIA AND THE SIGNIFICANCE OF XINJIANG UYGHUR AUTONOMOUS REGION FOR CHINESE FDI

China is the largest trading partner of Central Asia. Turkmenistan enjoys a massive surplus from China trade, followed by Kazakhstan. The other three Central Asian countries run deficits of which Kyrgyzstan is the worst case with a deficit that is close US$5 billion, as per 2012 figures (Table 2).

Table 2. Central Asia-China Trade in US$ Billions

	Imports from China	Exports to China	Balance of Trade
Kazakhstan	11.001	14.675	3.674
Kyrgyzstan	5.073	0.088	-4.985
Tajikistan	1.747	0.010	-1.737
Turkmenistan	1.699	8.673	6.974
Uzbekistan	1.783	1.091	-0.692

Source: Mariani, 2013, p. 10.

Chinese energy imports from Kazakhstan and Turkmenistan, and exports to Central Asia form the bulk of the Chinese economic activity there (Nichol, 2014, p. 14). Further, China has long recognized that in order to stabilize and strengthen its economic growth it needs to further economically expand into Central Asia, and become the major player, thus guaranteeing stability in Xinjiang Uyghur Autonomous Region, home to another nation with the Turkic heritage (McMillan, 2004, pp. 3-5). China aims to transform this region into a regional hub for its trade with Central Asia, Russia, and the EU, that will involve the project named the 'Silk Road Economic Belt' (SREB). China's strategy in Xinjiang Uyghur Autonomous Region and Central Asia is defined by the endeavor to achieve a "double integration" of Xinjiang Uyghur Autonomous Region with China proper and Central Asia by extending modern infrastructure throughout Xinjiang Uyghur Autonomous Region and connecting them to neighboring Central Asian countries to reach their oil and natural gas resources, all of which have been underwritten by the Shanghai Cooperation Organisation (SCO), and bilateral political, economic and military relations (Clarke, 2008, pp. 107-111). Kyrgyzstan and Tajikistan are both economically challenged and politically fragile countries bordering China's Xinjiang Uyghur Autonomous Region, and will play a growing role in the transit of energy (Rickleton, 2014b). Kyrgyzstan and Tajikistan (the parts of the former Soviet border) and Xinjiang Uyghur Autonomous Region form a zone of what appears to be relative impoverishment and underdevelopment between China's industrialized, densely populated and wealthy east, and Central Asian countries of Kazakhstan and Turkmenistan which are the region's two biggest energy exporters. Turkmenistan, especially, is in a strong position as it has a relatively small population. The lack of industrialization in parts of Central Asia is, in part, a residual effect of the Soviet era, especially its last decades. China's 'Great Western Development' campaign, managed from Xinjiang Uyghur Autonomous Region, serves, among other functions, as a post-Soviet collapse stabilization remedy, to develop and better control Xinjiang Uyghur Autonomous Region in order to secure access to Central

Asia, and increase the Chinese influence, as per one view (Clarke, 2013, pp. 7-9). It is, in conjunction with the SREB, an attempt to replicate the Soviet economic policy over the region, but from the opposite direction. As was the case with the Soviet era, the success of this current process depends on the fiscal and political stability of the 'centre' and the amounts it is willing to invest. Central Asia is an important zone of the Beijing Consensus. As such that, after building the SCO, the first multilateral group that China started on its own, and enlarging it to include discussions of trade, economics and energy, China had the SCO run a joint military exercise in the Xinjiang Uyghur Autonomous Region in 2003 (Cooper Ramo, 2004, pp. 47, 52, 53). China was subjugated by Western and Japanese capitalism in the nineteenth century, its development was blocked and it became their 'periphery', as Moulder argued in her application of Immanuel Wallerstein's 'core-periphery' dichotomy of the 'modern world system' (Moulder, 1977). In the late and early 20th centuries Japanese ownership levels in China were so high that the nation, colonized by several foreign powers at the time, hosted 77.5 per cent of the total Japanese FDI, spread through key sectors such as coal mining, iron works, shipping, cotton industries and banking (Dunning and Lundan, 2008, p. 157). Central Asia became Russia's periphery in the tsarist and the Soviet eras. It now occupies a peripheral place in relation to the Chinese economic expansion (Sutter, 2008, p. 263). The topic of Central Asia's current political relations with Russia is important but beyond the scope of this discussion. China has developed a dependence on commodities exports from Central Asia. Overall, China has many peripheries but they are not locked in a similarly crucial and close proximity relationship (Stares et al., 2011). One analysis argues that Central Asians are unsure whether Chinese trade and FDI will benefit the economic development of Central Asia and whether China is engaged in economic imperialism as virtually all of China's imports from Central Asia are raw materials, and its exports to the region are cheap manufactured goods which prompt some Central Asians to conclude that China is dumping its goods in the region while looting their raw materials (Scobell et al., 2014, p. 42). Yet, in the future, some of the Chinese electronics and automotive manufacturing MNEs may move into the region, and transfer their technology and production systems for high value added goods manufacturing. After the 2008 global financial crisis, Chinese economic expansion continued with domestic demand growth, but it moved from the orbit of the OECD nations' economic cycles and increased its trade and FDI relationships with developing nations (Barcena et al., 2011, pp. 7, 29). China's development of a niche in frugal engineering enables them to manufacture low cost versions of goods for mass markets (Athreye and Kapur, 2009, p. 214). This has provided them with 'ownership advantages' that other nations' manufacturing MNEs lack. When the proximity of Central Asia as a ready-market for their manufactures, and their energy market relations with the region are taken into account, Chinese MNEs also possess a 'locational advantage' that other nations' MNEs can never develop as they are not bordering Central Asia. Essentially, there is no other country in the world that can replicate the price levels of Chinese manufactured consumer goods in Central Asian markets. This means that presently Central Asian markets appear to be in an asymmetrical reciprocal relationship with the Chinese market. The lack of strength of the Central Asian economies in comparison is apparent in the emergence of the SCO, the Collective Security Treaty Organization (CSTO), and the now-defunct post-Soviet formations (i.e. EurAsEc) all of which can be seen as attempts maintain the region's status quo, which is limited by its geography, and its underdeveloped institutions of manufacturing, trade and investment. International trade has long been characterized by fragmentation of production which parts and components manufacturing are outsourced, predominantly from China (Kierzkowski and Chen, 2010, pp. 67-69). Central Asia, instead of remaining an export market ground for low cost Chinese consumer goods, can negotiate itself, possibly as a type of regional trade bloc, into the Chinese manufacturing chains and produce parts and components as a condition of bi-lateral trade. This would significantly reduce the present asymmetrical reciprocity. However, this discussion is a mere conjecture of the present moment. China may never shift production outside its borders. Prior Asian waves of electronics exports to the EU and the US markets occurred without shifting production to those markets (Dunning and Lundan, 2008, p. 534). China may follow precedent, and given its still large rural population that it wants to urbanize, it may be even less willing to shift any production out of the country.

CENTRAL ASIAN NATURAL GAS AND CRUDE OIL EXPORTS

Central Asia has been an energy producer since period of the occupation by the Russian Empire. Azerbaijan became a major crude oil exporter in the middle of the 19th century, followed by Kazakhstan, and after the Second World War Turkmenistan and Uzbekistan became major natural gas and crude oil producers (Feddersen and Zuccatto, 2013, p. 160). Diversification of Central Asian crude oil routes out of the region started in the mid-1990s, and in the late 2000s natural gas exports began to be exported to markets other than Russia, which undermined the latter's aims to maintain control over them (Coburn, 2010b, p. 21). Central Asia's detachment from the Soviet Union made a big impact on the Chinese economy.

Table 3. Crude Oil Reserves, Production, Consumption, and Production/Consumption Ratio (2013)

	R (Thousand M. tonnes)	P (M. tonnes)	C (M. Tonnes)	P/C Ratio (%)
Azerbaijan	1.0	43.4	4.6	10.6
Kazakhstan	3.9	83.8	13.8	16.5
Uzbekistan	0.1	2.9	3.3	113.8
Turkmenistan	0.1	11.4	6.3	55.3
Russia	12.7	531.4	153.1	28.8

Source: British Petroleum, 2014b, pp. 6,10, 11.

Table 4. Natural Gas Reserves (excl. LPG), Production, Consumption, and Production/Consumption Ratio (2013)

	R (Trillion cu. ft.)	P (Billion cu. ft.)	C (Billion cu. ft.)	P/C Ratio (%)
Azerbaijan	31.0	16.2	8.6	53.1
Kazakhstan	53.9	18.5	11.4	61.6
Uzbekistan	38.3	55.2	45.2	81.9
Turkmenistan	617.3	62.3	22.3	35.8
Russia	1103.6	604.8	413.5	68.4

Source: British Petroleum, 2014a, pp. 20, 22, 23.

Table 5. Kazakh and Turkmen Natural Gas (excl. LPG) Export Markets (%) (2013)

	Russia	China	Iran	Other	Total
Kazakhstan	97.5	0.8		1.7	100
Turkmenistan	24.7	60.9	11.7	2.7	100

Source: British Petroleum, 2014a, p. 28.

In 2010, China's first international natural gas pipeline connection, the Central Asian Gas Pipeline (CAGP) connected its demand with the Central Asian supply, and began to transport natural gas from Turkmenistan, through Uzbekistan, and Kazakhstan to Xinjiang Uyghur Autonomous Region (Energy Information Administration, 2014a, p. 24). The intricacy of this path, determined by geography, is a representation of the Chinese reach to Central Asia. The CAGP is not to be confused with Central Asia-Center Gas Pipeline of Gazprom, which runs from Turkmenistan, Uzbekistan and Kazakhstan into Russia. As per China's crude oil imports from Central Asia, the Kazakhstan-China pipeline has been transporting Russian and Kazakh oil since 2006, and in 2011, the Russian-China crude oil pipeline began operations (Energy Information Administration, 2014a, p. 13). Crude Oil and natural gas pipelines form a new type of new Silk Road that connects Central Asia as well as Russia to all the importers and contribute to this century's energy politics (Coburn, 2010a, p. 19). However, this path of a possible reconstruction of the Silk Road stopped at Central Asia-Iran border. Turkmenistan has also been exporting natural gas to Iran through two pipelines since 1997. This trade relationship, despite its potential, has not progressed well, due to the disagreement over price. Iran is reportedly unwilling to continue to purchase the Turkmen natural gas that can eventually push up the share of the Chinese market beyond the current 70 per cent, making Turkmenistan solely reliant on exports to China (Pannier, 2014; Rickleton 2014a). Iran's history of relations with the West, which has made it hard for Central Asian energy exports to pass through Turkey, and then onto to the EU, has strengthened the Russian position at first. Then, this situation became increasingly less relevant with the rise of the China as the dominant consumer and importer of the natural gas and crude oil from Turkmenistan and Kazakhstan, through pipelines and infrastructures built and paid for by the Chinese. The possession of 'asset-exploiting type of FDI' is necessary to extract resources, augment markets, create new ones, and co-ordinate, and integrate existing cross-border operations (Dunning et al. 2008, p. 9). Chinese SOEs' FDI, underwritten by the nation's foreign currency reserves, has established Chinese-Central Asian energy relations. The centre of the issue of Central Asian energy exports has thus long shifted to China. This will be the part of the region's status quo until such time when new export pipelines to Europe can be established. Central Asian energy exports will continue to grow. In terms of the volume of natural gas exports, reliability of demand, and a trade deal free of past political dimensions, the Turkmen economy first broke its isolation by opening to the outside world via the Chinese energy demand, which has kept growing. The Turkmen natural gas is transported to China through three pipelines (between 2009 and 2014 Line A, B, and C started operating with D being presently built) via central Uzbekistan, southern Kazakhstan, and northwest Xinjiang Uyghur Autonomous Region. Until 2009, Turkmenistan used to sell most of its natural gas to Russia's Gazprom, which has drastically reduced its purchase volumes, and China became the major buyer and investor in the pipelines, and fields (Ziegler and Menon, 2014, p. 24). China's 2014 deal with Turkmenistan will be boosting annual gas deliveries to China to about 65 billion cubic meters by 2020. Turkmenistan, unlike the other Central Asian countries, is not a member, observer, or dialogue partner, of the SCO of which the largest forces are Russia and China. China does not have border with

Turkmenistan, but is a neighbour of Kazakhstan, which offers a secure and reliable replication of the volumes of oil it currently imports from East Africa, and the Persian Gulf (Du, 2011, p. 7). China began to invest US$5 billion in Kazakhstan's Kashagan oil field in 2013, as part of a US$30 billion deal (Lelyveld, 2013). Information on its crude oil reserves is presented above (British Petroleum, 2014b, pp. 6, 10, 11). The only transnational Turkmen crude oil pipeline goes to Kazakhstan via Uzbekistan, and Turkmenistan also exports crude oil via foreign oil companies that operate in the country, by transporting it across the Caspian Sea (Energy Information Administration, 2014b). Its crude oil production, refining and export industries have massive growth potential but this is unlikely to occur in the near future, due to a lack of sufficient FDI, poor infrastructure and the status of the Caspian Sea, which was raised above. In order to meet its needs, Turkmenistan plans to utilize new technologies to produce gasoline from natural gas (Oil and Gas Journal 2014). Uzbekistan, by contrast, has sufficient reserves to be a major exporter (Feddersen and Zuccatto, 2013, p. 175). The present natural gas production volume in Uzbekistan is more than the combined volume of Azerbaijan and Kazakhstan production, and is close to that of Turkmenistan, but it is primarily consumed domestically (British Petroleum, 2014a, pp. 20, 22, 23). Uzbekistan was a major producer, during the Soviet era, in the 1960s and 1970s, which depleted most of the existing fields. New investment is needed for extraction and infrastructure as its present production is mostly for domestic consumption (80 per cent) and the rest is exported, via Central Asia-Center Gas Pipeline, to Russia, Kazakhstan, Kyrgyzstan and Tajikistan, but China is also projected to be an export market following the loans provided by the Export Import Bank of China (Energy Information Administration, 2012, pp. 5-7). Among the few energy MNEs that invested in Uzbekistan, the US MNE, Tethys Petroleum, Korea National Oil Corporation, and the Malaysian SOE Petronas have withdrawn in 2013-2014 (Kim, 2014). In the long term, due to the close proximity to the region and its energy consumption levels, China may well be the largest source of new investment in the Uzbek oil and gas exploration and extraction industries, and consequently it is possible that Chinese FDI may internalize these markets, and construct and manage their export routes across China to the Pacific seaboard to supply new buyers in Asia.

CENTRAL ASIAN ECONOMIES

The energy exports from Central Asia have been feeding the Chinese economic growth for the past decade. This trade expansion accompanied Chinese FDI in energy export related infrastructure. Central Asia, in return, increased its imports of Chinese manufactures. Overall, Central Asia has become a destination predominantly for the Chinese FDI.

Table 6. GDP and population in Central Asia, Eurasia and Asia Pacific

	GDP (US$ millions)	Population (millions)
Kazakhstan	231,876	16.4 million
Uzbekistan	56,805	29 million
Turkmenistan	40,826	5.2 million
Tajikistan	8,497	8.2 million
Kyrgyzstan	7,225	5.5 million
Azerbaijan	73,537	9.4 million
Turkey	819,990	75 million
Iran	367,098	77.4 million
Mongolia	11,516	2.8 million
Russia	2,096,774	142.8 million
China	9,469,124	1.4 billion
India	1,876,811	1.3 billion
Japan	4,898,530	127.1 million
Korea	1,304,468	49.3 million

Source: UN, World Population 2012, Department of Economic
and Social Affairs, Population Division, 2014.

Table 7. Distribution of global FDI inward stock in Asia, the EU and North America (1995-2013)

	1995	2013	% Change
The EU	34.81	33.70	-3.19
N. America	32.81	21.91	-33.20
Japan	0.97	0.67	-31.11
China	2.94	3.76	27.89
Korea	0.53	0.66	24.12
Mongolia	0.00	0.06	5451.34

	1995	2013	% Change
Iran	0.07	0.16	141.90
Turkey	0.43	0.57	31.64
Azerbaijan	0.01	0.05	462.90
Kazakhstan	0.08	0.51	504.68
Kyrgyzstan	0.00	0.01	225.28
Russia	0.16	2.26	1288.85
Tajikistan	0.00	0.01	448.86
Turkmenistan	0.01	0.09	649.54
Uzbekistan	0.00	0.03	985.11

Source: UNCTAD FDI/TNC database, 2014.

From a global perspective, Central Asia's share of net global FDI inflows are low and concentrated in mining, natural gas and crude oil extraction industries that involve relatively low skill jobs (OECD 2013: 15-17). In 2013, FDI inward stock in Central Asia was 0.65 of the global total. This appears to be rather a poor distribution of global FDI inward stock given the predictions made about the region's future as an energy exporter but there were large percentage increases from 1995 to 2013 (Table 7) during which the totality of the global FDI inward stock increased by 640 per cent. In the area surrounding Central Asia, global FDI inward stock shares of China, Russia, Turkey and Kazakhstan were the highest in 2013 (Table 7). Kazakhstan holds the largest stock of FDI in Central Asia, and is by far the largest economy (over four times the size of Uzbekistan economy). Central Asian countries, Russia and Azerbaijan, among others, all belong to the United Nations Conference on Trade and Development classification of 'transitional economies'. As an investor, Kazakhstan is the largest foreign direct investing Central Asian country, followed by Azerbaijan (UNCTAD, 2014b, pp. 7, 72, 89). All Central Asian countries are in the group of 'land locked countries', which combined with their development status, and past political geography have made their prospects somewhat limited without construction of new infrastructure and sound market policies (Feigenbaum, 2011, p. 62). Turkmenistan and Uzbekistan are frequently urged to reduce the subsidies for household energy consumption, with a view to increase the share of private capital (IMF, 2014b, p. 56). This, however, may prove to be a recipe for civil discontent. Energy consumption subsidies are income supplements. They are a form of non-market income or welfare measure for the population that relies on them for above subsistence level living. Overall, Central Asia, as a region, compares poorly to other developing regions. It has some of the lowest 'employment-to-population' ratios in the world, and its unemployment rates, particularly among the youth, exceed the rates for other developing regions (IMF, 2014b, p. 86). The region also has developed reliance on consumption driven by a large consumer-lending sector (IMF, 2014b, p. 57).

Table 8. Share of manufacturing value added in GDP (%) in Central Asia and Asia Pacific

	2006	2011
Kazakhstan	11.74	11.03
Uzbekistan	no data	
Turkmenistan	no data	
Tajikistan	26.88	20.47
Kyrgyzstan	10.7	11.41
Azerbaijan	5.26	3.41
Turkey	17.51	18.07
Iran	10.9	10.37
Mongolia	5.96	5.97
Russia	15.45	13.71
China	32.62	34.15
India	14.78	14.89
Japan	21.8	20.53
Korea	25.37	27.74

Source: UNIDO, 2014, p. 196-203.

As displayed in Table 9, 'share of manufacturing value added' in GDP in percentage terms is not a major factor in Central Asian economies, nor is the 'share of world manufacturing value added'. The same situation applies to Azerbaijan, Mongolia and Russia as well, presenting a weakness in their economic connections to the rest of the world. None of them are significant participants in the value added manufacturing activities of the industrialised world. In their immediate neighborhood, only Turkey recorded a modest improvement from 2006 to 2011. Economically and politically, Kazakhstan, and Turkmenistan to a lesser extent, are the most stable Central Asian countries, while Tajikistan,

Kyrgyzstan and Uzbekistan have all experienced lower economic performance, law and order problems, including civil violence, and suffered from rising crime rates (Feigenbaum, 2011, pp. 60-63).

Table 9. Share of world manufacturing value added in GDP (%) in Central Asia and Asia Pacific

	2006	2011
Kazakhstan	0.09	0.11
Uzbekistan	no data	
Turkmenistan	no data	
Tajikistan	0.01	0.01
Kyrgyzstan	0	0
Azerbaijan	0.01	0.01
Turkey	1.14	1.27
Iran	0.28	0.28
Mongolia	0	0
Russia	1.61	1.49
China	10.44	16.42
India	1.7	2.25
Japan	12.74	10.7
Korea	2.84	3.36

Source: UNIDO, 2014, pp. 196-203.

The types of insurgencies that troubled Kyrgyzstan, Uzbekistan and Tajikistan in the post-Soviet years have not been witnessed in Turkmenistan (Cornell and Jonsson, 2014, pp. 19-20). Kazakhstan, however, has experienced some troubles in 2011-2014 (Nichol, 2014, pp. 22-24). As per Table 10, Azerbaijan and Kazakhstan are the largest recipients, in Central Asia, of the OECD aid for development. However, the overall aid share of Central Asia in comparison to other developing regions is not high.

Table 10. Central Asia Share of the OECD Development Aid

	2006	2007	2008	2009	2010	2011	2012
Azerbaijan	0.078	0.000	0.000	0.223	0.269	0.431	0.509
Kazakhstan	0.395	0.941	0.625	0.593	1.352	0.813	0.407
Kyrgyzstan	0.285	0.219	0.242	0.183	0.234	0.331	0.274
Tajikistan	0.236	0.183	0.205	0.245	0.259	0.205	0.245
Turkmenistan	0.000	0.015	0.008	0.021	0.024	0.074	0.079
Uzbekistan	0.137	0.177	0.140	0.152	0.133	0.103	0.290

Source: OECD, 2014.

Russia and China have undeniable influence on the future of Central Asian resource and energy exports and the pertaining logistical problems (Feddersen and Zuccatto, 2013, pp. 165, 167, 169; Starr et al., 2014, p. 40). Central Asian energy exports are affected by demand, and price and the lack of diversified export markets simultaneously (IMF, 2014a, p.60). Logistical problems also trouble Central Asia's massive and primarily untapped mineral reserves. Kazakhstan has the most developed mining and processing industries that contribute to its economic growth, Uzbekistan and Kyrgyzstan possess two of the largest gold, and other important ore reserves in the world, and Tajikistan, despite its difficult terrain, has growth potential as is the case with Turkmenistan's underdeveloped mineral mining sector (Asian Development Bank, 2010, pp. 63-66). Tajikistan also possesses large aluminum reserves and is one of the biggest aluminum processors in the world (Nichol, 2014, p. 42). However, as in the case of Australia, resource rich countries can have problems developing value added manufacturing, especially if they are far from major markets (Bayari, 2012). Mining and natural gas and oil extraction define FDI in Central Asia. Kazakhstan is the second largest recipient of FDI, followed by Turkmenistan, Azerbaijan, and Uzbekistan, Kyrgyzstan, and Tajikistan respectively (UNCTAD, 2014c, pp. 70-72). The EU is the largest investor, while North America is a minor one, in the region due to dual European needs of energy imports and access to export markets. The EU has also been the destination of FDI from the Russian Federation and Kazakhstan in 2005-2013 that has been dominated by investments in petroleum and natural gas companies but has also included purchases of rail transport companies, department stores, banks, and steel manufacturers (UNCTAD, 2014c, pp. 72, 75). This trend appears to represent a conciliation of Russian and Kazakh foreign interests overseas to smooth out their export market expansion. Overall, FDI has contributed to economic growth in Kazakhstan (especially in 2006-2008), Azerbaijan, Turkmenistan, and Mongolia, and the last two have been the largest recipients in the past five years (UNCTAD, 2014c, pp. 90, 91).

CONCLUSION

Chinese economy has built a solid relationship with Central Asian economies and the intensity of this connection will increase with further rises in Chinese energy imports and Central Asian consumption of Chinese manufactured products. China-Central Asia economic relations, via the presence of Xinjiang Uyghur Autonomous Region in the equation, are likely to expand further in the next several decades. One issue that has not been covered here is Central Asia's reliance on agricultural exports and its rapidly intensifying water shortages. Chinese foreign currency reserves play a major role in purchase and stockpiling, and thus price control, of agricultural exports, which accentuate the nature of economic relationship in between. Water is becoming an expensive commodity in Central Asia. The region is in fact exporting its precious water supplies when it exports cotton to China. The region's oil and gas industries are also major users of water. Overall, every export-related economic activity exacerbates the region's water trouble. Another major issue that needs to be discussed elsewhere is the security arrangements that involve Central Asia, such as the CSTO, and the SCO as well as the oft-quoted Silk Road Economic Belt project. These topics are crucial for the future of Central Asia. The discussion herein has defined the roles that Russia and China have had in Central Asia in the last so many decades and the impact of the Chinese economic growth on the region. Central Asia has immense natural resources, and needs to connect to new markets and augment its current market relations while dealing with the shortcomings in its industrial structures that readily make it an easy market for foreign consumer goods. Central Asia is not a major development aid receiver, and while its inward FDI stocks have increased since the fall of the Soviet Union, its energy sector is the primary recipient. Economic diversification, especially in manufacturing, appears to be the obvious answer that will require the development of domestically constituted market policies.

REFERENCES

Abad, Gracia, T*he Beijing Consensus in the Shadow of the Global Financial Crisis. UNISCI Discussion Papers*, (no. 24 2010).

Acemoglu, Daron and James A. Robinson, "State Capitalism Winning?" *The Clash of Capitalisms*, 31 December (2012).

Aliber, Robert, "A Theory of Direct Foreign Investment," pp. 127-140 in John H. Dunning (ed), *The Theory of Transnational Corporations*, London: Routledge, 1993.

Alon, Titan and Galina Hale and Joao Santos, "What is China's Capital Seeking in a Global Environment?" *FRBSF Economic Letter*, 22 March (2010).

Athreye, Suma and Sandeep Kapur, "Introduction: The internalization of Chinese and Indian firms-trends, motivations and strategy". *Industrial and Corporate Change*, vol. 18, no. 2 (2009), pp. 209-221.

Barcena, Alicia, Antonio Prado, Osvaldo Rosales and Ricardo Pérez. *People's Republic of China and Latin America and the Caribbean*. Economic Commission for Latin America and the Caribbean, Santiago: United Nations, 2011.

Bayari, Celal. "Australian Trade and FDI Relations with Japan: Reflecting on the Past Seven Decades." *International Language and Culture*, no. 16 (2012a), pp. 145-188.

Bayari, Celal. *Australian Economy and Neo-Liberalism: Manufacturing, Trade and Bilateral Links with Japan in the Post-Keynesian Age*. Zurich: LIT Verlag, 2012b.

Blank, Stephen. "Russian Policy and Central Asian Energy, Economics and Security." *Demokratizatsiya*, (1995), pp. 187-208.

Bradsher, Keith. Chinese Interests Look to Malaysia." (19 November 2014), *The New York Times*, p.1.

British Petroleum. *BP Statistical Review of World Energy. Natural Gas*. June 2014a.

British Petroleum. *BP Statistical Review of World Energy. Oil*. June 2014b.

Büge, Max, Matias Egeland, Przemyslaw Kowalski, Monika Sztajerowska. "State owned enterprises in the global economy: Reason for concern?" *VOX CEPR's Policy Portal*, 2 May (2013).

Çagatay, Ergün (ed). *The Turkic Speaking World. 2000 Years of Art and Culture from Inner Asia to the Balkans*. Munich: Prestel Verlag, 2006.

Chari, Anusha and Nandini Gupta. "Incumbents and Protectionism: The Political Economy of Foreign Entry Liberalization." *Journal of Financial Economics*, vol. 88 (2008), pp. 633-656.

Chen, James. "The Emergence of China in the Middle East." *Strategic Forum*, (December 2011).

Cheung, Yin-Wong and Xing Wang Qian. "Empirics of China's Outward Direct Investment." *Pacific Economic Review*, vol. 14, no.3 (2009), pp. 312-341.

Clarke, Michael. "China's Integration of Xinjiang with Central Asia: Securing a "Silk Road" to Great Power Status?" *China and Eurasia Forum Quarterly*, vol. 6, no. 2 (2008), pp. 89-111.

Clarke, Michael. "China's Strategy in "Greater Central Asia": Is Afghanistan the Missing Link." *Asian Affairs: An American Review*, vol. 40, no.1 (2013), pp. 1-19.

Coburn, Leonard L. "Russian Oil. A Long Term View." *International Association for Energy Economics*, (Third Quarter 2010a), pp. 23-24.

Coburn, Leonard L. "Central Asia: Pipelines Are the New Silk Road." *International Association for Energy Economics*, (Fourth Quarter, 2010b), pp. 19-21.

Cornell, Svante E. and Michael Jonsson. "The Nexus of Crime and Conflict," pp. 1-22 in Cornell, Svante E. and Michael Jonsson (eds) *The Political Economy of Conflict in Eurasia Organized Crime and Armed Conflict in the Postcommunist World*. Philadelphia: University of Pennsylvania Press, 2014.

Cumings, Bruce. "Japan and Northeast Asia in the Twenty-first Century', pp. 136-168 in Peter J. Katzenstein and Takashi Shiraishi (eds) *Network Power, Japan and Asia*. Ithaca and London: Cornell University Press, 1997.

Dalton, Matthew. "EU Finds China Gives Aid to Huawei, ZTE." *The Wall Street Journal*, (3 February 2011).

Dirlik, Arif. "Beijing Consensus: Beijing "Gongshi." Who Recognizes Whom and to What End?" University of Oregon Position Paper, 2006.

Dirlik, Arif and Roxann Prazniak. "Social Justice, Democracy and the Politics of Development: The People's Republic of China in Global Perspective." International Journal of China Studies, vol. 3, no.3 (2012), pp. 285-313.

Du, Ruoxi. *Central Asian Energy: A Point of Contention or Collaboration in Russia China Relations*. The Foreign Military Studies Office and The Center for Russian, East European & Eurasian Studies: The University of Kansas, 2011.

Dunning, John. H. *Explaining International Production*. London: Unwin Hyman, 1988.

Dunning, John H. *The Globalization of Business*. London: Routledge, 1993.

Dunning, John H. "Reappraising the Eclectic Paradigm in an Age of Alliance Capitalism." *Journal of International Business Studies*, Third Quarter (1995), pp. 461: 491.

Dunning, John H. *Alliance Capitalism and Global Business*. London: Routledge, 1997.

Dunning, John H. "Transnational corporations: an overview of relations with national governments." *New Political Economy*, vol. 3 (1998), pp. 280-284.

Dunning, John H. "The eclectic paradigm as an envelope for economic and business theories of MNEs activity." *International Business Review*, vol. 9 (2000), pp. 163-190.

Dunning, John H. "Towards a new paradigm of development: implications for the determinant of international business." *Transnational Corporations*, vol. 15, no. 1 (2006), pp. 173-227.

Dunning, John H., Kim Chang-Su and Jyh-Der Lin. "Incorporating trade into the investment development path." *Oxford Development Studies*, vol. 29, no.2 (2001), pp. 45-54.

Dunning, John H., C. Kim and D. Park. "Old Wine in New Bottles." *Oxford University SLPTMD Working Paper Series*. no. 11 (2008), pp. 1-33.

Dunning, John. H. and Sarianna M. Lundan. *Multinational Enterprises and the Global Economy*. Cheltenham: Edward Elgar, 2008.

Energy Information Administration. *China*. (Washington DC: February 2014a).

Energy Information Administration. *Turkmenistan*. July. (Washington DC: July 2014b).

Energy Information Administration. *Uzbekistan*. (Washington DC: January 2012).

Feddersen, Gustavo H. and Giovana E. Zuccatto, "Infrastructure in Central Asia. Energy and Transportation Controversies," UFRGS *United Nations Journal*, vol. 1 (2013), pp. 159-181.

Feigenbaum, Evan A. "Central Asian Contingencies", pp. 60-70 in Paul B. Stares, Scott A. Snyder, Joshua Kurlantzick, Daniel Markey, and Evan A. Feigenbaum. *Managing Instability on China's Periphery* (New York: Council on Foreign Relations, 2011).

Frye, Richard Nelson. *The Heritage of Central Asia from Antiquity to the Turkish Expansion*. Princeton: Marcus Wiener Publishers, 1996.

Goh, Brenda. "After building China's railways, giant CRCC flexes muscles abroad." *Reuters*, 4 December 2014.

Gorman, Siobhan. "China Firms Under Fire Lawmakers Press Huawei, ZTE Amid Probe About Possible Threats to Security." *The Wall Street Journal*, (12 June 2012).

Gowa, Joanne. "Rational hegemons, excludable goods, and small groups." *World Politics*, vol. 41, no. 3, 1989, pp. 307-324.

Grieco, Joseph. "Understanding the Problem of International Cooperation: The Limits of Neoliberal Institutionalism, and the Future of Realist Theory", pp. 301-338 in David A. Baldwin (ed) *Neorealism and Neoliberalism*, New York: Columbia University Press, 1993.

Haley, Usha C. V. and George T. Haley. *Subsidies to Chinese Industry: State Capitalism, Business Strategy, and Trade Policy*. Oxford: Oxford University Press, 2013.

Hawes, Colin. *The Chinese Transformation of Corporate Culture*. London: Routledge, 2012.

Hsu, S. Philip, Yu-shan Wu, and Suisheng Zhao. *In Search of China's Development Model: Beyond the Beijing Consensus*. London: Routledge, 2011.

Ikenberry, G, John, David A. Lake and Michael Mastanduno. "Introduction: approaches to explaining American foreign economic policy' International Organisation, vol. 42, no.1 (1988), pp. 1-14.

IMF. *World Economic Outlook. Legacies, Clouds, Uncertainties*. Washington DC, October 2014a.

IMF. *Regional Economic Outlook. Middle East and Central Asia*. Washington DC, October 2014b.

Keohane, Robert O. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton; NJ: Princeton University Press, 1984.

Kierzkowski, Henry and Lurong Chen. "Outsourcing and Trade Imbalances: The United States-China Case." *Pacific Economic Review*, vol. 15, no. 1(2010), pp. 56-70.

Kim, Alexander. "Political Scandal in Uzbekistan Harms Investment Climate." *Eurasia Daily Monitor Volume*, vol. 11, no. 21 (February 3 2014).

Kindleberger, Charles P. *The World in Depression*. Berkeley: University of California Press, 1973.

Kojima, Kiyoshi. "Macroeconomic versus international business approach to foreign direct investment." *Hitotsubashi Journal of Economics*, vol. 23 (1982), pp. 1-19.

Krasner, Stephen D. "Global Communications and National Power: Life on the Pareto Frontier." *World Politics*, vol. 43 (1991), pp. 336-366.

Lake, David A. *Power, Protection, and Free Trade*. Ithaca: Cornell University Press, 1988.

Lelyveld, Michael. "Russia-China Rivalry in Energy-Rich Central Asia Denied." *Radio Free Asia*, (30 September 2013).

Mariani, Bernardo. *China's Role and Interests in Central Asia*. (London: Saferworld, 2013), p. 10.

Mathews, John A. "Energizing industrial development." Transnational Corporations, vol. 17, no. 3 (2008), pp. 59-83.

McGregor, Richard. *The Party*. New York: Harper Perennial, 2012.

McKeown, Timothy. "Hegemonic stability theory and the 19th century tariffs in Europe." *International Organization*, vol. 37, no.1 (1983), pp. 73-91.

McMillan, Ann. "Effects of interdependency in the Xinjiang-Central Asian region." Griffith University, Mimeo, 2004, pp. 1-11.

Montlake, Simon. "Crossed Lines: ZTE Gets Tangled In U.S.-China Telecom-Gear "Cold War." *Forbes*, 29 December (2012).

Moulder, Frances. *Japan, China and the Modern World Economy: Toward a Reinterpretation of East Asian Development ca. 1600 to ca. 1918*. New York: Cambridge University Press, 1977.

Muncaster, Phil. "State handout won't play well abroad as SEC clamps down on Chinese firms." *The Register*, 5 December (2012).

Nichol, Jim. *Central Asia: Regional Developments and Implications for U.S. Interests*. Washington

DC, Congressional Research Service, (March 2014).

North, Douglass C. *Understanding the Process of Economic Change*. Forum Series on the Role of Institutions in Promoting Economic Growth, Washington DC: Mercatus Center at George Mason University, 2003.

OECD. "Total Official Development Flows by Country and Region (ODF)." Paris, 2014.

Oil and Gas Journal. "Turkmen plant to yield gasoline from gas." (August 26 2014).

Pannier, Bruce. "Is Turkmenistan Losing Iran As A Gas Customer?" *Radio Free Europe*. (14 August 2014).

Park, Gene. *Spending Without Taxation: FILP and the Politics of Public Finance in Japan*. Stanford: Stanford University Press, 2011.

Prazniak, Roxann. "Tabriz on the Silk Roads: Thirteenth Century Eurasian Cultural Connections." *Asian Review of World Histories*, vol. 1, no. 2 (2013), pp. 169-188.

Ramo, Joshua Cooper. *Beijing Consensus*. London: The Foreign Policy Centre, 2004.

Rebol, Max. "Why the Beijing Consensus is a Non Consensus: Implications for Contemporary China Africa Relations." *Culture Mandala: Bulletin of the Centre for East West Cultural & Economic Studies*, vol. 9, no.1 (2010), pp. 7-20.

Pannier, Bruce. "Is Turkmenistan Losing Iran As A Gas Customer?" *Radio Free Europe*. 14 August 2014.

Rickleton, Chris. "Is Turkmenistan's Gas Flowing Toward a One-Country Policy?" *Eurasianet.org*, (18 August 2014a).

Rickleton, Chris "China's energy footprint in Central Asia." *China Dialogue*, (27 July 2014b).

Ruseckas, Laurent. "State of the Field Report. Energy and Politics in Central Asia and the Caucasus," Access Asia Review, vol. 1, no. 2. (1998), pp. 41-84.

Sauvant, Karl P. "New Sources of FDI: The BRICS." *Journal of World Investment and Trade*, vol 6., no. 5 (2005), pp. 639-709.

Schaller, Michael. *American Occupation of Japan*. New York: Oxford University Press, 1985.

Schmidt, Michael S., Keith Bradsher and Christine Hauser. "U.S. Panel Cites Risks in Chinese Equipment." *The New York Times*, (8 October 2012).

Scobell, Andrew, Ely Ratner and Michael Beckley. *China's Strategy Toward South and Central Asia*. Santa Monica: Rand Corporation, 2014.

Snidal, Duncan. "The limits of hegemonic stability theory." *International Organization*, vol. 39, no. 4 (1985), pp. 579-614.

Souleimanov, Emil, Kamil Pikal and Josef Kraus. "The Rise of Nationalism among Iranian Azerbaijanis," *Meria*, (March 20 2013).

Stares, Paul B., Scott A. Snyder, Joshua Kurlantzick, Daniel Markey, and Evan A. Feigenbaum. *Managing Instability on China's Periphery*. New York: Council on Foreign Relations, 2011.

Starr, S. Frederick, Bulat Sultanov, S. Enders Wimbush, Fatima Kukeyeva, Svante E. Cornell, Askar Nursha. *Looking Forward: Kazakhstan and the United States*. (Central Asia-Caucasus Institute and Silk Road Studies Program, Johns Hopkins University, 2014.

State Administration of Foreign Exchange. "The Time-Series Data of China's Foreign Exchange Reserves." (20 October 2014).

Sutter, Robert G. *Chinese Foreign Relations: Power and Policy since the Cold War*. Lanham, MD: Rowman & Littlefield, 2008.

Szamosszegi, Andrew and Cole Kyle. *An Analysis of State owned Enterprises and State Capitalism in China*, Washington DC: U.S.-China Economic and Security Review Commission, (26 October 2011).

Tsuru, Shigeru. *Japan's Capitalism*. Cambridge: Cambridge University Press, 1993.

UN. *World Population 2012*, Department of Economic and Social Affairs, Population Division, New York: United Nations: 2014.

UNCTAD. "Recent Trends in the World Economy', pp. 1-14 in *Trade and Development Report 2014*. (New York and Geneva: United Nations, 2014a).

UNCTAD. "Global Investment Trends," pp. 2-34 in *World Investment Report 2014*. (New York and

Geneva: United Nations, 2014b).

UNCTAD. "Regional Investment Trends', pp. 36-104 in *World Investment Report 2014*. (New York and Geneva: United Nations, 2014c).

UNCTAD FDI/TNC database. "Web table 3 FDI inward stock, by region and economy 1990-2013". www.unctad.org/fdistatistics. (2014).

UNIDO. Industrial Development Report 2013. Sustaining Employment Growth: The Role of Manufacturing and Structural Change. (Vienna: United Nations Industrial Development Organization, 2014).

Urio, Paolo. China, the West and the Myth of New Public Management: Neoliberalism and its Discontents. London: Routledge, 2012.

Waltz, Kenneth. *Theory of International Politics*. Reading, MA: Addison-Wesley, 1979.

Wooldridge, Adrian. "The visible hand." The Economist. (21 January 2012).

Xing, Li and Timothy M. Shaw. "The Political Economy of Chinese State Capitalism." *The Journal of China and International Relations*, vol. 1, no. 1 (2013), p. 88-113.

Xu, Yi-chong and Gawdat Bahgat. *The Political Economy of Sovereign Wealth Funds*. New York: Palgrave Macmillan, 2011.

Ziegler, Charles E. and Rajan Menon. "Russia, China, and the United States are Neomercantilism and Great-Power Energy Competition in Central Asia and the Caspian." *Strategic Studies Quarterly*, (Summer 2014), pp. 17-41.

Financial Characteristics of Top Green Companies in USA: An Empirical Investigation

Dr. William J. Jones ,Dr. Srinivasan Ragothaman
University of South Dakota, Vermillion, SD
USA

ABSTRACT

Newsweek magazine published in early 2014, an environmental performance ranking of the largest 500 publicly-traded companies in the USA. It is one of the foremost corporate green rankings and is based on eight key environmental performance indicators. We examine using COMPUSTAT data whether the Top 100 Green companies (TG) differ from a control group of firms [Bottom 100 companies (BG) in the Newsweek List], in underlying aspects such as beta, firm size, liquidity, profitability, growth prospects, etc. by studying key financial ratios. We develop a logistic regression model to examine the relative explanatory power of selected independent variables. The statistical results indicate that liquidity, Tobin's q, risk, and size measures are significantly different between the two groups. When compared to control (BG) firms, TG firms are larger, tend to be less risky as measured by beta, have higher current ratios, and lower Tobin's q ratios. Profitability as measured by cash flow ratios, the governance measure and capital intensity were not significantly different between the two groups.

INTRODUCTION

Increasingly, the effects of climate change are being addressed in moral terms by global leaders. This represents a new cultural reality in the debate over global climate change and contrasts with the firm-specific view of undue cost burdens. President Obama in his 2014 State of Union address stated that "The shift to a cleaner energy economy won't happen overnight, and it will require tough choices along the way. But the debate is settled. Climate change is a fact. And when our children's children look us in the eye and ask if we did all we could to leave them a safer, more stable world, with new sources of energy, I want us to be able to say yes, we did." In addition to political leaders, climate change is increasingly being brought to the forefront by global religious leaders such as Pope Francis (2015) who wrote a papal encyclical on climate change urging believers to "forcefully reject the notion that our being created in God's image and given dominion over the earth justifies absolute domination over other creatures" (p. 49).

Historically, firms engaged in defensive or reactive approaches to environmental sustainability (Buysse & Verbeke, 2003). Increasingly, firms seek proactive approaches to environmental sustainability grounded in the total quality movement (Harrington, Khanna, & Deltas, 2008). Hart and Ahuja (1996) take this view and find that green initiatives benefit firms' financial performance at two years out of implementing emission reductions due to cost savings related to increased efficiency. Nevertheless, Hart and Ahuja's results were tempered in that gains for firms at very low pollution levels are offset by rising capital and technological investments. Clemens and Douglas (2006), on the other hand, describe the role of coercive, institutional forces in achieving green initiatives via abatement costs and their historical high costs. The emphasis of their study, however, highlights the apposition of the historical cost-burden versus the voluntary adoption of green initiatives. Clemens' (2006) other work on this topic, which appears a full ten years after Hart and Ahuja (1996), demonstrates the value of green initiatives even among small firms. The next section summarizes prior research and the variables used in our model. The third section describes the data and the Logit methodology while the fourth section enumerates the results. The final section provides a brief conclusion.

PRIOR RESEARCH AND VARIABLES USED

Although the way in which we now frame corporate environmental policy is sociopolitical, this has not always been the case. Michael Porter is largely responsible for thrusting the issue into the public consciousness while addressing strategic considerations. In his now seminal piece, Porter and Farmer (2006) argued that corporate social responsibility should be firm-specific rather than purely idealistic. Moreover, Porter contends that firms should seek to deliver shared value to society in what he refers to as corporate social integration. Today, CSR-based strategic planning is largely taken for granted in major business textbooks as the modern equivalent of the strategic status quo (e.g., Lamb, Hair, & McDaniel, 2015). Nevertheless, the debate now rages on among academics who consider the direction of causality of superior financial performance in light of environmentally friendly policies. That is, are firms made more profitable because of environmental friendliness or are profitable firms those that can afford to invest in environmental friendliness (King and Lennox, 2001)?

In this paper, we consider differences in measures of financial performance for the Top 100

Green companies (TGC) as ranked by Newsweek's 2014 Greenest Companies ratings relative to a control group of firms. These rankings, which are based on eight key performance indicators, assess the largest 500 publicly-traded companies in the USA and are one of the foremost corporate green rankings. Previous academic research has considered the role of the Newsweek rankings and its impact on firm performance. Specific financial measures and the purported effect of the rankings on these measures are described below.

▌ Beta

Beta is a measure of the unpredictability or systematic risk of a stock relative to the market at large. Beta is calculated through regression as part of the capital asset pricing model or CAPM. The price of a security with a beta of 1 moves in tandem with the market. A security with a beta less than 1 evidences its price will be more stable than the market. When beta is greater than 1, a security's price will be more unpredictable or volatile. By way of comparison, utilities are typically small beta stocks whereas small technology stocks have higher betas. A few studies have considered beta explicitly within the context of a firm's green actions. Other studies have considered factors related to firms' systemic risk. Sharfman and Fernando (2008), for example, discuss dual perspectives on the relationship between a firm's green performance and overall economic performance, which includes gains from better resource utilization compared to decreases in firms' total cost of capital. Clemens (2006) makes the enhanced resource utilization case arguing that even for small firms environmental improvements might have "spin-off" benefits for other aspects of their operations. For cost of capital savings, Sharfman and Fernando (2008) find that firms incur cost of capital reductions when they develop a strategy to improve their risk management through improved environmental performance. Ragothaman, Cornelsen and VanSloten (2011) argue that corporate social responsibility and corporate financial performance are related.

▌ Dividend Payout (DIVPO)

The dividend payout ratio is the proportion of net income a firm pays in dividends to its shareholders. Yamashita, Sen, and Roberts (1999) conducted an event study of the stock price reactions to the announcement of environmental conscientiousness (EC) scores as published in Fortune magazine in 1993. The authors attempted to assess if the announcement of a better EC score positively impacts short-term stock returns. Overall, Yamashita, Sen, and Roberts (1999) find that the public release of a firm's environmental conscientiousness record has an insignificant, but positive relationship with financial performance. With respect to present purposes, dividend yield was significantly and negatively related to EC scores whereas dividend growth was significantly related to EC scores in a positive direction. These effects were in spite of earnings growth, debt/asset ratio, company size and beta having no significant relationships with EC scores.

▌ Current Ratio (CR)

The current ratio is expressed as current assets divided by current liabilities. The current ratio measures a firm's ability to pay off its short-term liabilities with its current assets, thus indicating a firm's liquidity and efficiency position (Current Ratio, 2015). As short-term liabilities are due within the next year, the current ratio is a vital measure of liquidity. In their study of the financial performance of green companies, Blazovich, Smith, and Smith (2013) examined the current ratio as a liquidity measure under the premise that green companies would be less risky. However, their results showed no significant difference between high and low green score companies. Instead, Blazovich, Smith, and Smith found that the debt to assets ratio of high green score companies is significantly lower. Thus, high green score firms may be less leveraged than their lower score counterparts.

▌ Logarithm of Employees (LNEMP)

Smaller firms may be poorly equipped to engage in environmentally conscientious practices. Historically, smaller firms tended to be without management information systems to track environmental information and lacked resources to acquire information on environmental practices (Holt, Anthony, & Viney, 2000). Due to inherent structural reasons, smaller firms' environmental information may be concentrated in key personnel and this information may not be widely distributed to top executives. Past researchers have considered firm size within the context of environmental practices. In their study of environmental legitimacy, Berrone, Gelabert, and Fosfuri (2009) explored whether firm size, as measured by the natural logarithm of employees, would be related to the positive versus negative news coverage that firms receive relative to their environmental management practices. Firm size, Berrone, Gelabert, and Fosfuri (2009) contend, should lead to "more contractual and social ties and also endorsements from actors from their environments" (p. 11). Notwithstanding, Berrone, Gelabert, and Fosfuri find that firm size positively predicts environmental reputation except when modeled via OLS with fixed effects, which they attribute to little variation in the number of employees for firms within the analysis. This suggests that firm size might be overall predictive with regard to variables related to firms'

environmental practices, but should be considered against the backdrop of analytical designs.

▌ **Tobin's q**

A firm's total market value divided by its asset value, also known as Tobin's *q*, provides an indication of a firms' valuation as a function of its replacement costs (Q Ratio '(Tobin's Q ratio)', 2015). A *q* greater than 1 implies an overvalued stock; a *q* less than 1 implies an undervalued stock. A firm with a *q* of 1 is equal to its market value, which means that its replacement costs equal its market value. In their event study of firms ranked in the top 100 of Newsweek's Greenest Companies, Lyon and Shimshack (2011) found evidence that Tobin's *q* interacts with top-100 ranking for an event-window lasting 4 days in the prediction of abnormal returns. Lyon and Shimshack (2011) interpret high Tobin's *q* as a proxy for the intangible value derived from powerful brands. When construed this way, the effect on Tobin's *q* may be related to susceptibility of companies with powerful brands to regulation. In other words, public penalties assessed on high visibility brands may create broad-based political pressure on other firms.

▌ **Cash flow to Sales Ratio (CFSALES)**

The cash flow to sales ratio is a measure of firm profitability. Firms not engaging in environmentally sustainable business practices may be at risk of incurring costs associated with mandated environmental cleanup such as Superfund liability. The US government, through the Environmental Protection Agency, imposes Superfund liability on firms due to the presence of hazardous substances at a site. A liable party may be held responsible for government cleanup costs, damages to natural resources (e.g., a fishery), costs of certain health assessments, and injunctive relief (i.e., performing a cleanup) where a site may present an imminent and substantial endangerment (www2.epa.gov, 2015). Koehler (2006) describes environmental effects regarding firms as "cash flow news". From her perspective, announcements such as Newsweek's Green Companies report may affect a firm's stock price in the short term, but this effect will largely be short lived as investors that are more unconcerned with environmental issues per se acquire a firm's stock at lower prices.

DATA AND MULTIVARIATE TESTS – THE LOGIT MODEL

Newsweek magazine published in early 2014, an environmental performance ranking of the largest 500 publicly-traded companies in the USA. It is one of the foremost corporate green rankings and is based on eight key environmental performance indicators for the year 2012. Financial data for sample companies (both TG and BG firms) were obtained from the COMPUSTAT (Research Insight) database for the year 2012. The dataset used in this study consists of several attributes for each firm for the year 2012. These attributes are: Beta, Dividend Payout ratio, Current Ratio, Logarithm of employees, Tobin's Q ratio, Cash Flow to Sales Ratio, Capital Intensity, and Auditor opinion. Support for using these specific variables is found in prior research described earlier. The dependent variable Y is a dichotomous (0, 1) variable representing the two groups, TG company (Y=1) and BG company (Y=0).

If independent variables are correlated, univariate tests may not produce robust results. However, using the independent variables in a multivariate context facilitates the examination of their relative explanatory power and can lead to better predictions since the information contained in the cross-correlations among variables is utilized. A primary objective of many multivariate statistical techniques is to classify entries correctly into mutually exclusive groups. Multiple discriminant analysis, logistic regression (logit), and PROBIT represent such multivariate models.

In this study, the following logistic regression (LOGIT) model is proposed:

$$Pr(Y=1|X) = F (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_K x_K)$$

The dependent variable Y is a dichotomous (0, 1) variable representing the two groups, TG group (Y=1) and BG (Y=0) group. The independent variables X_1, X_2, ... X_K include beta (a risk measure), dividend payout ratio, current ratio (a liquidity measure), logarithm of employees (a size measure), Tobin's q (a valuation and growth proxy), cash flow to sales ratio (a profitability measure), auditor opinion (a governance variable), and capital expenditure intensity. Specifically these explanatory variables are:

BETA = Market Beta
DIVPO = Dividend Payout ratio
CR = Current ratio
LNEMP = Natural logarithm of number of employees
TOBIN'S q = TOBIN'S q
CFSALES = Cash flow to sales ratio
CAPINT = Capital expenditure to PPE ratio
AUOP = Auditor opinion

It is assumed that no exact linear dependencies exist among X's across k, and that the

relationship between Y's and X's are non-linear or logistic (i.e., $P(Y=1|X) = \exp(\Sigma \beta_K X_K) / [1 + \exp(\Sigma \beta_K X_K)]$.). The null hypotheses would be: $H_0: \beta_k = 0$, where k = 1,...6;

STATISTICAL ANALYSES AND RESULTS

Table 1. Descriptive Statistics

Variables	Firm Code	N	Mean	Std. Deviation	T-statistic
BETA	1	94	0.914	2.133	-1.15
	0	96	3.292	19.951	
DIVPO	1	99	79.837	334.92	1.03
	0	99	44.235	82.651	
CR	1	82	2.247	1.811	1.66 [b]
	0	82	1.844	1.248	
LNEMP	1	99	2.885	1.682	1.60
	0	99	2.522	1.498	
TOBIN'S q	1	100	1.930	1.333	-1.66 [b]
	0	100	2.329	1.999	
CFSALES	1	100	0.164	0.155	0.09
	0	100	0.161	0.180	
CAPINT	1	89	0.114	0.108	-0.63
	0	90	0.122	0.062	
AUOP	1	100	1.600	1.206	1.33
	0	100	1.390	1.014	

Firm code: 1 = TG firms   0 = BG firms

[a] two-tailed significance at < 0.05 level
[b] two-tailed significance at < 0.10 level

BETA   = Market Beta
DIVPO   = Dividend Payout ratio
CR   = Current ratio
LNEMP   = Natural logarithm of number of employees
TOBIN'S q   =   TOBIN'S q
CFSALES   = Cash flow to sales ratio
CAPINT   = Capital expenditure to PPE ratio
AUOP   = Auditor opinion

A summary of descriptive statistics is provided in Table 1.   The beta measure has a mean of 0.914 for TG firms and a mean of 3.292 for control firms.   The TG firms appear to be less risky as measured by beta.   The current ratio measure has an average of 2.247 for TG firms and a mean of 1.844 for control firms.   TG firms are more liquid than the control firms and difference is statistically significant at the 10 percent level.   TG firms are larger and the size variable averaged 2.885 for TG firms and 2.522 for control firms. The average Tobin's q ratio was 1.930 for TG firms and 2.329 for control firms.   This is somewhat unexpected in that BG firms appear to have higher valuation and growth measures.   The differences in average cash flow to sales ratio, auditor opinion, and capital intensity measures are all statistically insignificant.

Table 2. Pearson Correlations

	BETA	DIVPO	CR	LNEMP	Tobin's q	CFSALES
BETA	1.000					
DIVPO	-0.042	1.000				
CR	-0.094	-0.073	1.000			
LNEMP	0.009	0.080	-0.208	1.000		
Tobin's q	-0.035	-0.087	0.259	-0.278	1.000	
CFSALES	0.005	0.039	0.230	-0.390	0.013	1.000

We provide a summary of Pearson correlation coefficients for the variables in Table 2.   There are a few strong correlations among the explanatory variables.   Current ratio is positively correlated with Tobin's q, and cash flow to sales ratio. Firm size and beta are negatively correlated with current

ratio. Cash flow to sales ratio is also negatively correlated the size measure. There is a negative relationship between Tobin's q and the size variable. There is a positive association between cash flow ratio and current ratio. Even though some of these relationships are significant at conventional levels, none of the correlations are greater than 0.390. Only one correlation (out of 15) is greater than 0.3. According to Judge, Griffiths, Hill and Lee (1980), multicollinearity problems arise only when the correlations among explanatory variables are higher than 0.8. Hence, the degree of collinearity present among explanatory variables appears to be too small to invalidate estimation results. The highest VIF value is only 1.305 and this again indicates the absence of multicollinearity concerns.

The statistical results of the logistic regression (logit) models appear in Table 3. Null hypothesis 1 (H_1) suggests that there is no statistically significant difference in the beta measure between TG firms and control (BG) firms. The coefficient estimate for beta is -0.537 and is statistically significant at the 0.10 level in model I. This suggests that beta is marginally different between the two groups. The TG group had, on average, lower beta than the control group. This suggests that the TG group is less risky than the BG group.

H_2 (null) suggests that there is no statistically significant difference in dividend payout ratios between TG firms and control firms. The coefficient estimate for the dividend payout ratio variable is 0.0001 and is statistically not significant at the conventional levels models. This suggests that the dividend payout measure is not significantly different between the two groups. H_3 (null) suggests there is no statistically significant difference current ratios between TG firms and control firms. The coefficient estimate for the current ratio is 0.317 and it is statistically significant at the 5 percent level. TG firms are more liquid than the control firms and have higher current ratios. This is an indication that better environmental performance is associated with better liquidity measures.

TABLE 3: LOGIT ANALYSIS RESULTS TO TEST FOR DIFFERENCES IN FINANCIAL ATTRIBUTES OF TG FIRMS VS CONTROL (BG) FIRMS

$$P(Y=1|X) = \beta_0 + \beta_1\, BETA_i + \beta_2\, DIVPO_i + \beta_3\, CR_i + \beta_4\, LNEMP_i + \beta_5\, TOBIN'S\ q_i + \beta_6\, CFSALES_i$$

VARIABLE	MODEL I COEFFICIENT (CHI-SQUARE)	MODEL II (CHI-SQUARE)
INTER	-0.348 (0.197)	-0.405 (0.642)
BETA	-0.537 (3.209) [b]	-0.512 (2.919) [b]
DIVPO	0.000 (0.003)	-------
CR	0.317 (4.886) [a]	0.302 (4.329) [a]
LNEMP	0.255 (3.346) [b]	0.232 (2.721) [b]
TOBIN'S q	-0.290 (4.114) [a]	-0.249 (2.978) [b]
CFSALES	1.136 (0.660)	1.404 (0.973)
CAPINT	-------	-3.601 (1.434)
AUOP	--------	0.287 (2.466)

[a] two-tailed significance at < 0.05 level
[b] two-tailed significance at < 0.10 level

NAGELKERKE R SQUARE = 0.146 and 0.173
MODEL LOG LIKELIHOOD = 198.23 and 194.62

BETA	= Market Beta
DIVPO	= Dividend Payout ratio
CR	= Current ratio
LNEMP	= Natural logarithm of number of employees
TOBIN'S q =	TOBIN'S q
CFSALES	= Cash flow to sales ratio
CAPINT	= Capital expenditure to PPE ratio
AUOP	= Auditor opinion

H$_4$ (null) suggests that there is no statistically significant difference in size (natural logarithm of number of employees) between TG firms and control firms. The coefficient estimate for this ratio is 0.355 and is statistically significant at the 10 percent level. TG firms with are marginally larger, on average, as measured by the number of employees than the BG group. However, the weak support for the size hypothesis should be interpreted cautiously. Size could be proxying for other omitted variables that are correlated with the natural logarithm of number of employees. H$_5$ (null) suggests there is no statistically significant difference in the Tobin's q measure between TG firms and control firms. The coefficient estimate for the Tobin's q variable is -0.290 and it is statistically significant at the 5 percent level. Hence, the null hypothesis is rejected. Tobin's q ratio is used in prior research as a measure of whether the management is adding value for shareholders. Tobin's q is also used as a proxy for growth prospects of the firm. TGC firms have lower Tobin's q ratios than the control firms. The market could be viewing environmental stewardship as hindering growth prospects.

H$_6$ (null) suggests that there is no statistically significant difference in the cash flow to sales ratio between TG firms and control firms. The coefficient estimate for the intangible assets to total assets ratio is 1.136 and is not statistically significant. This suggests that the cash flow to sales ratio is not different between the two groups. Interestingly, TG firms, on average, have marginally higher cash flow to sales ratio than the control firms.

We performed robustness tests by adding two explanatory variable in model II: capital expenditure to property, plant and equipment ratio and audit opinion and dropping the dividend payout ratio. The model I results are confirmed and the same four variables as in model I are statistically significant in model II. The coefficient estimate for the AUOP variable is 0.287 and is statistically insignificant. This suggests that audit opinion is not different between the two groups. Audit opinion is a proxy for the corporate governance mechanism. The coefficient estimate for the capital expenditure to property, plant and equipment ratio variable is -3.601 and is statistically insignificant. This suggests that capital intensity is not different between the two groups.

CONCLUSION

We addressed some of the limitations of prior studies, by using more holistic measures of green rankings. We deliberately chose a non-linear model to examine the relationships between environmental ranking and financial performance. We used a holistic measure (Newsweek magazine 2014 green ranking) in order to capture environmental dimensions. We built a non-linear, multivariate logistic regression (logit) model to examine the relationship between firm characteristics and environmental performance. Our independent variables (accounting and financial performance measures) were also multi-dimensional. Our results are interesting and provide support to some prior studies.

As noted in the paper earlier, TG firms tend to be less risky, are bigger, have higher current ratios, and lower Tobin's q ratios. Because TG firms have lower betas, they may have better resource utilization, cost of capital reductions, or both. Our findings further support the notion that firm size is related to environmental performance variables (see Berrone, Gelabert, and Fosfuri, 2009). Nevertheless, our findings challenge past research that finds no relationship between current ratio and TG firms. Thus, our current research suggests that TG firms have higher liquidity. Future research should seek to resolve why the analysis in the present study departs from the earlier study conducted by Blazovich, Smith, and Smith (2013) on an earlier time frame. Finally, TG firms evidenced lower Tobin's q, which might partially be explained by increased brand equity. Future research should investigate characteristics of TG firms with respect to their brand values. Since the sample size used in this research is small, caution is warranted in generalizing the results.

REFERENCES

Berrone, P., Gelabert, L., & Fosfuri, A. (2009). The impact of symbolic and substantive actions on environmental legitimacy. Retrieved from http://www.iese.edu/research/pdfs/DI-0778-E.pdf

Blazovich, J. L., Smith, K. T., & Smith, M. (2013). An examination of financial performance and risk of environmentally friendly 'green' companies. *Journal of Legal, Ethical and Regulatory Issues*, 16

(1), 121-134.

Buysse, K., & Verbeke, A. (2003). Proactive environmental strategies: a stakeholder management perspective. *Strategic Management Journal*, 24(5), 453-470.

Clemens, B. (2006). Economic incentives and small firms: does it pay to be green? *Journal of Business Research*, 59(4), 492-500.

Clemens, B., & Douglas, T. J. (2006). Does coercion drive firms to adopt 'voluntary' green initiatives? Relationships among coercion, superior firm resources, and voluntary green initiatives. *Journal of Business Research*, 59(4), 483-491.

Current Ratio (n.d.). Retrieved October 28, 2015, from http://www.myaccountingcourse.com/financial-ratios/current-ratio

Francis, Pope (2015). *Encyclical on climate change and inequality: On care for our common home.* New York, NY: Melville Press.

Harrington, D. R., Khanna, M., & Deltas, G. (2008). Striving to be green: The adoption of total quality environmental management. *Applied Economics*, 40(23), 2995-3007.

Hart, S. L., & Ahuja, G. (1996). Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. *Business Strategy and the Environment*, 5(1), 30-37.

Holt, D., Anthony, S., & Howard, V. (2000). Supporting environmental improvements in small and medium-sized enterprises in the UK. *Greener Management International*, 2000(30), 29-49.

Judge, G., Griffiths, W.E., Hill, R.C., Lutkepohl, H., & Lee, T. (1985). *The Theory and Practice of Econometrics*. New York, NY: Wiley.

King, A. A., & Lenox, M. J. (2001). Does it really pay to be green? An empirical study of firm environmental and financial performance: An empirical study of firm environmental and financial performance. *Journal of Industrial Ecology*, 5(1), 105-116.

Koehler, D. A. (2006). Capital markets and corporate environmental performance research in the United States. In Schaltegger, S. & M. Wagner (Eds.), *Managing the business case for sustainability* (211-231). Sheffield: Greenleaf Publishing.\

Lamb, C. W., Hair, J. F., & McDaniel, C. (2015). *MKTG 9* (9th ed.). Boston, MA: Cengage Learning.

Lyon, T. P., & Shimshack, J. P. (2012). Environmental disclosure: Evidence from Newsweek's green companies rankings. Business & Society, 54(5), 632-675.

Newsweek (2014). Newsweek's Green Rankings, 2014. June 5, 2014.

Porter, M. E., & Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78-92.

Q Ratio '(Tobin's Q ratio)' (n.d.). Retrieved October 28, 2015, from http://www.investopedia.com

Ragothaman, S., Cornelsen, E., & VanSloten, P. (2011). Good Corporate Governance and Firm Characteristics: An Empirical Analysis. *A.T. Business Management Review, 7*(3), 41-47.

Sharfman, M., & Fernando, C. S. (2008). Environmental risk management and the cost of capital. *Strategic Management Journal*, 29(6), 569-592.

Yamashita, M., Sen, S., & Roberts, M. C. (1999). The rewards for environmental conscientiousness in the US capital markets. *Journal of Financial and Strategic Decisions*, 12(1), 73-82.

Taking Advantage of Time Zone Differences between Global Stock Markets to Deliver Improved Return

Fatollah Salimian, Kashi Khazehr
Franklin P. Perdue School of Business,
Salisbury University,USA
Robert C. Winder, Professor
Department of Economics
Christopher Newport University,USA

ABSTRACT

The increasing integration of the world's capital markets, the proliferation of stock market indexes and funds in developed and developing economies around the world, and vast technological advances have created new opportunities for individual and institutional investors.   In the context of this new financial environment, this study demonstrates how investors can achieve improved returns by taking advantage of asset price correlations in equity markets trading in different time zones. Using daily data for the period 2000-2014, this study finds that moving funds from a domestic (U.S.) growth fund to a global equities fund on days when the growth fund achieves a pre-determined percentage gain, and then back again the next day, results in improved investment performance.   This is true not only for the full 15-year period, it holds also for all sub-periods.   These findings, and the broader application of this strategy, should provide insight and direction for investors seeking to optimize returns in this new financial environment.

INTRODUCTION

The search for higher investment returns is a constant and continuing theme for investors around the world.   This is true for all types of investors and across all asset categories.   As new information becomes available, or as expectations regarding future cash flows change, individuals and institutions are motivated to adjust their portfolios in search of higher rates of return and/or lower risk.   As a result of these actions, asset prices change and the balance sheets and financial prospects of market participants may be significantly impacted, for better or worse.

While the drive for higher yields has not fundamentally changed over the years, the economic, financial and institutional environment does evolve and change.   These changes impact investor attitudes and investment strategies in various ways.   For example, the overheating of the housing market, and the subsequent housing crash, left many investors skittish about the future prospects for the housing market.   Beyond this, in response to the financial crisis of 2008 and the subsequent recession, the Federal Reserve System continues to pursue a policy of extraordinary monetary ease which has resulted in interest rates being "zero lower bound." But this unprecedented interest rate environment has damped investor enthusiasm for treasury and other fixed income securities.   In part, the Fed's strategy to stimulate economic activity included a deliberate attempt to induce investors to seek higher yields by investing in the equity market.   From a longer term perspective, the inexorable move from defined benefit pension plans to defined contribution plans, along with perceived vulnerabilities in the Social Security System, have both focused attention on the need for individuals to take responsibility for their own financial well-being.

Moreover, in recent years, the equity market itself has evolved and changed in ways that impact investment strategies.   For example, the ongoing globalization (integration) of the world's money and capital markets has connected the economies and financial markets of different nations to an unprecedented extent.   Today, economic or financial events in one nation can significantly impact the economies and financial markets in other nations anywhere in the world.   In addition, advances in information technology and the proliferation of investment funds and equity market indexes have made it possible for individuals to adopt investment strategies not previously available.   For example, it is possible today for an individual investor to move money between various stock market funds or stock indexes, including funds or indexes with different exposures to companies based in different time zones around the world, very quickly and with little or no transactions costs.

One specific investment strategy now available to individual investors, as well as to institutions, is to attempt to take advantage of time zone differences in stock price movements. A number of studies have attempted to determine if the performance of a particular stock exchange on a given day has a significant influence on the performance of another stock exchange when these stock exchanges are operational in different time zones.   This paper attempts to identify and measure the possible gains from a strategy designed to take advantage of these relationships.

REVIEW OF LITERATURE

There is an extensive body of literature studying co-movements between different stock markets, including both the level of stock prices and volatility indexes, in different countries. The motivation for many of these studies relates to maximizing investment returns or minimizing risk through international diversification based on standard portfolio theory. It is not a surprise that many of these studies have found stronger correlations between the world's equity markets over time as national economies and their capital markets have become increasingly integrated, thereby reducing the potential benefits of international diversification and, simultaneously, raising the potential of "contagions" moving across worldwide equity markets. At the same time, however, this finding of stronger correlations may create opportunities for investors and traders, both individual and institutions, to achieve higher returns by adroitly taking advantage of the specific lead and lag relationships.

The article by Lyocsa and Baumohl (2014) studied the co-movements in the stock markets of several emerging markets in Central and Eastern Europe (CEE) and concluded that despite the positive relationships between stock price movements, benefits from international diversification "may still exist." Dragota and Ilica (2014) also studied price co-movements and market efficiency among twenty stock markets in Central Eastern Europe. The article by Islam (2014) evaluated volatility spillover and the possibility of a contagion for a number of Asian stock markets. Worthington and Higgs (2004) also studied price and volatility spillovers in Asian equity markets, focusing largely on differences between the developed and emerging markets. The article by Goh, Wong and Kok (2005) focused on contemporaneous stock price co-movements among Asian markets, with a particular emphasis on periods of financial crisis. Huang and Bacon (2009) studied the specific relationship between the U.S and Asian stock markets from 2000-2007.

Similar articles examining stock price co-movements around the world include Chittedi (2014), Mollah and Mobarek (2009), Lee, Tsong and Lee (2014), and Huang (2014), Sakthivel, Bodkhe and Kamaiah (2012), Saleem and Fedorova (2014), and Peng and Ng (2012). The article by Cai, Faff, Hillier and McKenzie (2006) evaluated the relationships between individual (i.e., country) stock indexes and "general measures of global or world stock market volatility." Allali and Oueslati (2011) employed partial directed coherence (PDC) models to determine the exact sources of co-movements for ten major, world stock markets.

Other articles have adopted a more short-term, or "trading" perspective, focusing largely on the "timing" of stock price co-movements rather than the diversification or portfolio effects. Meric, Lentz, Smeltz and Meric (2012) employed principal components analysis and Granger causality tests to determine the specific "lead/lag linkages" between the U.S., European and Australian equity markets. They found the U.S. stock market has "substantial influence" on both the European and Australian markets. Using intra-day data, Egert and Kocenda (2011) found a significant degree of synchronization between equity markets in the "old EU" but less between the old EU markets and the Central and Eastern European (CEE) markets.

Koopman and Uspensky (2002) studied "the inter-temporal relationship between stock index returns and their volatility" for the U.K, the U.S and Japan. Adrangi, Chatrath and Raffiee (2014) studied the "daily volatility spillovers" between the S&P 500 stock index and stock indexes in Brazil, Argentina and Mexico for the years 2007-2012. They found "nonlinear dependencies" and "bi-directional spillovers." An early, but important article by Hamao, Masulis and Ng (1990) found stock price spillovers from U.S stocks to Japanese stocks and from U.K stocks to Japanese stocks. Floros (2005) examined both the short and long-run connections between the U.S., U.K and Japanese equity markets using daily observations for the 1988-2003 period. Liu and Pan (1997) found evidence of spillover effects from both the U.S. and Japanese equity markets to four Asian stock markets.

Additional studies have focused primarily, or in part, on how stock investors (or traders) might take advantage of stock price co-movements between stock markets in different parts of the world to increase day-to-day gains. For example, the study by Ingyu Chiou (2011) used intraday data to determine the lead-lag relationships between major stock markets in New York, London and Tokyo and found these markets to be "significantly interdependent," particularly the link between New York and London. As a practical implication, Chiou observed that "there may exist profitable investment strategies in one market by observing the performance of another market that was just closed." (p.1) An earlier article by Kahya (1997) studied the effects of "non-overlapping trading hours" on price co-movements for the U.S., U.K. and Japanese stock markets. Kahya found that "daily stock market innovations in the U.S. are rapidly transmitted to the rest of the world." Lin, Engle and Ito (1994) studied the correlations between the Japanese and U.S. equity market using intraday data. They found that "the trading hours of one market [have] a global impact on the returns of the other market." (p.1)

The present article uses daily data for the most recent 15-year period to explicitly and directly test the potential for increasing investment returns by taking advantage of the co-movements of stock prices for stock indexes (or stock funds) which are operational across different time zones.

DATA AND METHODOLOGY

Using data for the Teachers Insurance and Annuity Association - College Retirement Equities Fund's (TIAA-CREF) Growth fund and its Global Equities fund for the period January 1, 2000 through December 31, 2014, this study evaluated investment options to achieve an improved rate of return (ROR) by taking advantage of inter-temporal correlations.[1] Unit values for these two variable annuity accounts, as well as for TIAA-CREF's Equity Index fund, were downloaded from the TIAA-CREF website. This total period represents 5,479 days spanning 15 years and includes 3,803 days with reported unit values. For the 3,803 days with reported data, stock values increased in 2005 of these days and decreased in 1,780 days. For the remaining 18 days stock values did not change.

The 1-year, 3-year, 5-year, 10-year and 15-year average annual returns to each of the three indexes are shown in Figure 1, below.[2]

Figure 1. (January 2000 - December 2014)
TIAA-CREF Growth, Equity Index, and Global Equities Annual Returns
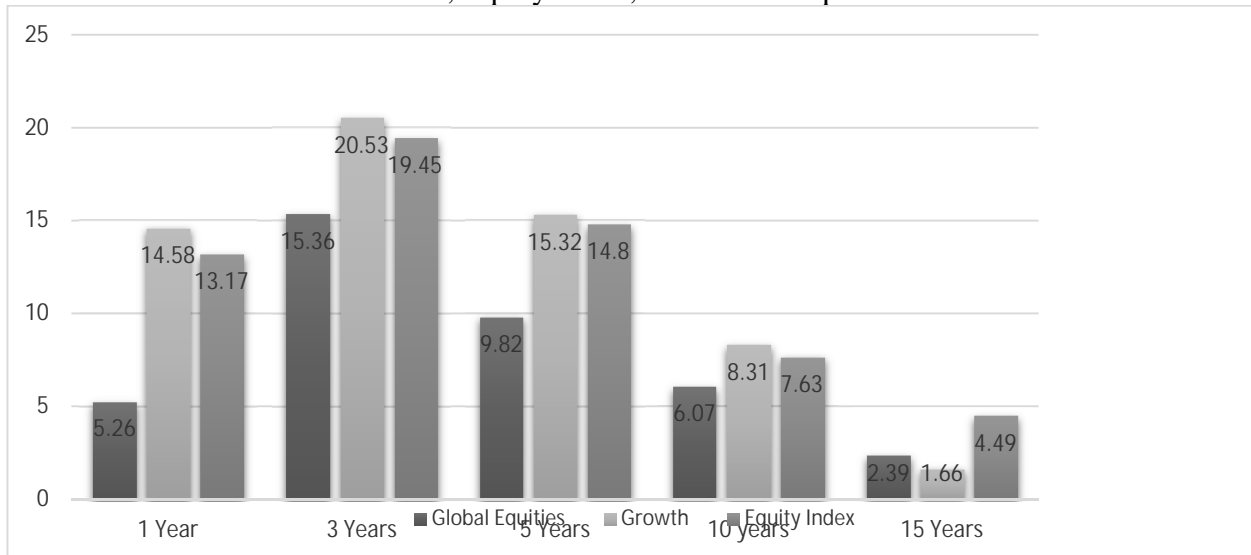
As can be seen from casual observation, the returns form these three funds tend to move together from year to year; that is, higher (lower) returns in one fund tend to be associated with higher (lower) returns in the other funds. Interestingly, over the entire 15-year period, the Equity Index fund outperformed both of the two "managed" funds.

Additionally, the inter-temporal correlation coefficients between the daily returns on the Growth fund, the Global Equities fund, and the Equity Index fund were computed and evaluated. It was found that on days when the value of the Growth fund increased significantly, the daily returns on the next day's Global Equities fund were positively influenced. By contrast, for days when the Growth fund declined significantly in value, the (next day) daily returns to the Global Equity fund were not significantly impacted. The correlation coefficients among the three CREF accounts are shown in Table 1, below.[3] In particular, note the small, but statistically significant, positive correlation coefficient (i.e., 0.0317) between the Growth fund and the (next day) Global Equities fund.

---

[1] TIAA-CREF is a private financial services company headquartered in New York City. In 2014, the company employed over 10,000 people and generated revenues of almost $34 billion. It is ranked 95th in the Fortune 500.

[2] Total Annual Returns for each Index were computed based on:
ROR = ((Index Value$_{(n)}$ /Index Value$_{(0)}$)^t -1) * 100
where:
n = the present period or December 31 , 2014 for this analysis;
0 = the initial period.
t = the number of years.

[3] The Pearson Product Moment correlation coefficient for the growth fund and the (next-day) global equities fund was highly significant with a p-value of 0.02214.

Table 1. Correlation between CREF Fund Unit Values (January 2000 - December 2014)

Correlation Coefficient	Equity Index	Growth	GE Next Day
Equity Index	1		
Growth	0.9629	1	
Global Equities next Day	0.00847	0.0317	1

To add greater context, the inter-temporal daily correlation coefficients between the Growth fund and the Global Equities fund, sorted by year, are shown in Figure 2, below.

Figure 2. (January 2000 - December 2014)

Daily Correlation Coefficients between the Growth Index and Global Equities Funds with a Lag of One
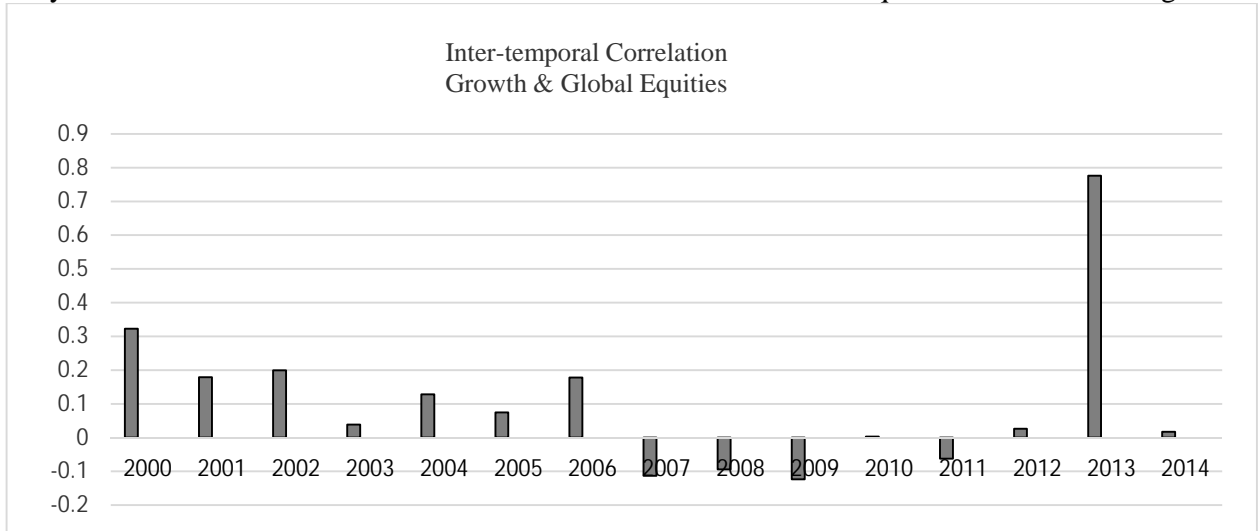
EMPIRICAL TESTS AND DISCUSSIONS

To demonstrate how an investor might take advantage of these inter-temporal relationships, this study considered an initial investment of $1000 beginning January 1, 2000. The ending balances, based on three specific scenarios, were then determined for a variety of holding periods. In the first scenario, the initial balance of $1,000 was invested in, and kept in, the TIAA-CREF Growth fund. Under the second scenario, the initial balance of $1,000 was invested in, and kept in, the TIAA-CREF Global Equities fund. In the third and final scenario, the $1,000 was invested in the Growth fund beginning January 1, 2000, and, on each day the Growth fund was on its way to gain "n" percent in value, the entire balance was transferred to the Global Equities fund before the market closed on that day. Upon investing in the Global Equities fund for exactly one day, the entire balance was transferred back to the Growth fund. Allowing "n" to assume integer values from 1 to 12, the resulting balances for each of the three investment strategies and for each holding period were determined. Table 2, below, shows the results for each investment strategy for each time period, for the case where "n" equals to 2 percent.

Table 2. (January 2000 - December 2014)

$1000 Invested in Growth Equities and Global Equities (Option n=2)

Fund Name	Jan. 1 2000	After 1 year	After 3 years	After 5 years	After 10 years	Dec. 31 2014
Growth	$1,000	$792.85	$427.50	$580.28	$619.45	$1,281.42
Global Equities	$1,000	$833.83	$525.29	$796.27	$877.65	$1,427.17
Growth & Global	$1,000	$960.29	$618.64	$858.95	$951.43	$1,943.04

As indicated in Table 2, Scenario 3 resulted in an improved investment performance for every time period considered (i.e., 1-year, 3-year 5-year 10-year, and 15-year periods) compared to Scenarios 1 and 2. That is, the strategy of transferring money from the Growth fund to the Global

Equities fund (and then back again, one day later) when the Growth fund gained two percent or more resulted in a significantly higher closing balance in every case. For example, for the 15-year investment period, the closing balance for Scenario 3 was $1,943.04, compared to just $1,281.42 and $1,427.17 for Scenarios 1 and 2, respectively. Because the third investment strategy delivered superior performance for all time periods, taking advantage of inter-temporal relationships between equity markets operational in different time zones should be attractive to intermediate-term investors as well as to longer-term buy-and-hold investors.

The actual rates of return for the above three scenarios, as opposed to the dollar values, are shown in Table 3, below. As indicated, for the full 15-year period, Scenario 3 generated an average annual rate of return of 2.64 percent, compared to 1.66 percent and 2.39 percent for Scenarios 1 and 2, respectively.

Table 3. (January 2000 - December 2014)
Average Annual Performance of TIAA-CREF Investment Options (Option n=2)

Fund Name	1 Year	3 Years	5 Years	10 years	15 Years
Growth	14.58	20.53	15.32	8.31	1.66
Global Equities	5.26	15.36	9.82	6.07	2.39
Growth & Global	14.58	20.53	14.95	8.46	2.64

The findings described above illustrate the special case when the money is transferred from the Growth fund to the Global Equities fund when the Growth fund was on its way to gain 2 percent (i.e., when n = 2). However, the more frequently the transfers are made, the greater the reward for this switching strategy. This effect is illustrated by Table 4, below, which shows the dollar outcomes for a $1,000 investment when n varies from a 13 percent gain in the Growth fund all the way to 1 percent gain (in the Growth fund). As indicated, as "n" declines (i.e., indicating that transfers from the Growth fund to the Global Equities fund are made in response to smaller and smaller percentage increases in the Growth fund), the end balance continually rises. In the limiting case, when "n" equals 1, the 15-year ending balance was $3,244.87. Interestingly, the largest increment (in both absolute amount and in percent) results from the move from "n" equals 2 to ""n" equals 1. This, of course, relates to the rather large increase in the "possible number of transfers" from 207 (when n = 2 percent) to 649 (when n = 1 percent).

Table 4. (January 2000 - December 2014)
$1000 Invested in TIAA-CREF Investment Options

Percent Gain	Possible # of Transfers	Balance
1	649	$3,244.87
2	207	$1,943.04
3	87	$1,479.97
4	38	$1,415.68
5	21	$1,396.73
6	11	$1,350.27
7	5	$1,386.40
8	3	$1,335.41
9	3	$1,335.41
10	2	$1,317.82
11	1	$1,309.34
12	1	$1,309.34
13	0	$1,281.42

CONCLUSIONS AND FUTURE RESEARCH

This study clearly illustrates that it is possible to exploit time zone differences to deliver improved investment returns. For the 15-year period covered by this analysis, the strategy of transferring funds from TIAA-CREF's Growth fund to its Global Equities fund on days when the former gained two percent or more, and then transferring the money back to the Growth fund one day later, yielded superior investment returns compared to simply holding either the Growth fund or the Global Equities fund. This was true for not only the full, 15-year period, it was also true for the 1-year, 3-year, 5-year and 10-year time horizons. Moreover, the more frequently the transfers are made (e.g., when the Growth fund gains just one percent, as opposed to two percent), the greater the investment returns.

Of course, there are competing investment strategies, including the possibility of "market timing." While timing the market may seem attractive to many investors, the successful application of this approach is not at all easy, and a caveat is in order. According to Nobel Laureate William Sharpe, market timers must be right 82-percent of the time just to match the returns realized by buy-and-hold investors. If market timers missed the ten best daily performances in the equity market over the 15-year period considered in this study, their average annual return would have been cut in half (i.e., it would have declined from a 12.03 percent average annual return to a 6.09 percent average annual return). Accordingly, it would seem that the strategy described in this paper, that is, taking advantage of time zone differences and predictable stock price correlations between funds operational in different time zones, might provide a better approach to long-term wealth maximization.

The scope of this paper was limited to the interplay of two equity funds offered by TIAA-CREF. The first fund (CREF Growth) is purely a U.S.-based fund while the second one (CREF Global Equity) is a global fund composed of Asian, European, and American equities. Almost fifty percent of the equity composition of CREF Global Equity fund is U.S. stocks; accordingly, future research might explore switching (i.e., time zone) strategies involving stock funds from completely different exchanges with no common composition. Additionally, future research might investigate the impact of global indexes on each other with, or without, time lags. For example, one could consider the closing prices of S&P 500 and see if it has any significant influences on opening prices of CAC40, DAX, or FTSE 100. While some these relationships have, to an extent, been explored, there remain significant opportunities to analyze data for specific exchanges and specific holding periods to provide up-to-data and actionable information for the individual and institutional investors who might consider exploiting these correlations and/or time zone differences.

Finally, another possible line of future research is to determine if the return on a portfolio can be amplified by substituting regular funds with Power share ETF's. Worthy of note is the fact that while this study concentrated on exploiting time zone differences to optimize equity market returns, similar strategies might be implemented in other financial markets such as bond markets or commodities markets.

REFERENCES

Adrangi, B., Chatrath, A. and Raffiee, K., "Volatility Spillovers across Major Equity Markets of Americas," International Journal of Business, Vol. 19, No. 3, 2014, pp. 255-274.

Allai, A. and Oueslati, A., "Detection of Information Flow in Major International Financial Markets by Interactivity Network Analysis," Asia-Pacific Markets, Vol. 18, 2011, pp. 319-344.

Cai, C., Faff, R., Hillier, D., and McKensie, M., "Modelling Return and Conditional Volatility Exposures in Global Stock Markets," Review of Quantitative Finance and Accounting, Vol. 27, pp. 125-142.

Chiou, I., "The Volatility Transmission of Stock Returns across Asia, Europe, and North America," Managerial Finance, Vol. 37, No. 5, 2011, pp. 442-450.

Chittedi, K., "Global Financial Crisis and Contagion: Evidence for the BRIC Economies," The Journal of Developing Areas, Vol. 48, No. 4, 2014, pp. 243-252.

Dragota, V. and Ilica, E. V., "Market Efficiency and the Post-Communist European Stock Markets," Central European Journal of Operations Research, Vol. 22, No. 2, 2014, pp. 307-337.

Egert, B. and Kocenda, E., "Time-Varying Synchronization of European Stock Markets," Empirical Economics, Vol. 40, 2011, pp. 393-407.

Floros, C., "Price Linkages between the U.S., Japan and U.K. Stock Markets," Financial Markets and Portfolio Management, Vol. 19, No. 2, 2005, pp. 169-178.

Goh, K., Wong, Y. and Kok, K., "Financial Crisis and Intertemporal Linkages across ASEAN-5 Stock Markets," Review of Quantitative Finance and Accounting, Vo. 24, 2005, pp. 359-377.

Hamao, R., Masulis, R. and Ng, V., "Correlations in Price Changes and Volatility across International Stock Markets," The Review of Financial Studies, Vol. 3, No. 2, 1990, pp. 281-307.

Huang, C., "Influence of External Factors on the Taiwan Stock Exchange," The International Journal of Business and Finance Research, Vol. 8, No. 4, 2014, pp. 109-120.

Huang, Y. and Bacon, F., "Can the U.S. Stock Market Be Shanghaied?: Evidence of the Impact of China's Emerging Stock Market," Management Research News, Vol. 32. No. 5, pp. 469-476.

Islam, R., "Comparing Financial Contagion and Volatility Spill Over and Structural Break within Major Asian Economies Pre and Post Global Recession to That of Asian Crisis," The Journal of Applied Business and Economics, Vol. 16, No. 4, 2014, pp. 92-111.

Kahya, E., "Correlation of Returns in Non-Contemporaneous Markets," Multinational Finance Journal, Vol. 1, No. 2, 1997, pp. 123-135.

Koopman, S. J. and Uspensky, E. H., "The Stochastic Volatility in Mean Model: Empirical Evidence from International Stock Markets," Journal of Applied Econometrics, Vol 17, No. 6, 2002, pp. 667-689.

Lee, C., Tsong, C. and Lee, C., "Testing for the Efficient Market Hypothesis in Stock Prices: International Evidence from Nonlinear Heterogeneous Panels," Macroeconomic Dynamics, Vol. 18, No. 4, 2014, pp. 943-958.

Linn, W., Engle, R. and Ito, T., "Do Bulls and Bears Move across Borders? International Transmission of Stock Returns and Volatility," The Review of Financial Studies, Vol. 7, No. 3, 1994, pp. 507-538.

Liu, Y. and Pan, M., "Mean and Volatility Spillover Effects in the U.S. and Pacific-Basin Stock Markets," Multinational Finance Journal, Vol. 1, No. 1, 1997, pp. 47-62.

Lyosca, S. and Baumohl, E., "Risk-Return Convergence in CEE Stock Markets: Structural Breaks and Market Volatility," Journal of Economics and Finance, Vol. 64, No. 5, 2014, pp. 352-356.

Meric, G., Lentz, C., Smeltz, W. and Meric, I., "International Evidence on Market Linkages after the 2008 Stock Market Crash," The International Journal of Business and Finance Research, Vo. 6, No. 4, 2012, pp. 45-57.

Mollah, S. and Mobarek, A., "Market Volatility across Countries – Evidence from International Markets," Studies in Economics and Finance, Vol. 26, No. 4, 2009, pp. 257-274.

Peng, Y. and Ng, W., "Analyzing financial Contagion and Asymmetric Market Dependence with Volatility Indices via Copulas," Ann Finance, Vol. 8, 2012, pp. 49-74.

Sakthivel, P., Bodkhe, N. and Kamaiah, B., "Correlation and Volatility Transmission across International Stock Markets: A Bivariate Garch Analysis," International Journal of Economics and Finance, Vol 4, No. 3, 2012, pp. 253-264.

Saleem, K. and Fedorova, E., "Transfer of Risk in Emerging European Stock Markets: A Sectoral Perspective," International Business Research, Vol. 7, No. 8, 2014, pp. 134-138.

Worthington, A. and Higgs, H., "Transmission of Equity Returns and Volatility in Asian Developed and Emerging Markets: A Multivariate GARCH Analysis," International Journal of Finance and Economics, Vol. 9, No. 1, 2004, pp. 71-80.

Risk-Sharing in Conventional And Islamic Finance: Convergent and Divergent Views

Md. Shameem Jawed*, Research Scholar (Finance & Accounting),
Indian Institute of Management Indore, India.
Santosh Kumar Tiwari, Research Scholar (Strategic Management),
Indian Institute of Management Indore, India.
Amol Dhaigude, Research Scholar (OM&QT), Indian Institute of Management Indore, India.
Archit Tapar, Research Scholar (Marketing Management),
Indian Institute of Management Indore, India.

ABSTRACT

This paper attempts to identify and discuss the origins of the risk sharing concept in Islamic finance and the conventional finance. Drawing from the literature on historical developments of the modern Islamic and conventional financial system, the paper attempts to explore the convergence/ divergence views of the two schools of thought. The paper identifies that on the risk-sharing concept there exist a convergence between the ideal-conventional and Islamic financial schools of thought. However, conventional (practiced) financial thought diverges with Islamic finance on risk sharing.

Keywords – Islamic finance, conventional finance, risk-sharing, Shariah, convergent/divergent school of thought, literature review

INTRODUCTION

Islamic finance, in the past few decades, has grown to a sizable mass in the global financial systems (Uppal and Mangla, 2014). According to an estimate by Ernst & Young (2012), over the past two decades, the Islamic financial assets have risen by close to 15–20 percent, year on year, and exceeded $1.3 trillion in 2012. Till date Islamic finance has spread to only a few Muslim dominated geographies like Malaysia, Iran, Indonesia, Egypt, Saudi Arabia, UAE, Qatar, Pakistan, and few European countries like UK, France, Germany (Venardos, 2012). Given the growth potential and the rate with which Islamic finance has expanded in the past few decades, it could attract many finance scholars' and organizations' interest towards it.

The ideal-conventional financial system (envisioned by Adam Smith and partially followed by researchers, like Arrow and Debreu, 1954; Arrow and Hahn, 1971) was based on the assumption of optimal risk sharing strategy in a decentralized economy, which is governed by moral-ethical values, complete market and contracts. But as the literature progressed some of these original principals and ideas of ideal-conventional financial system got diluted in the assumptions and interpretations, creating a relatively different financial system, which we will refer as the conventional/practiced financial system, which prevails in today's world.

Islamic financial system is not limited to banking, but has spread to cover a gamut of risk-sharing financial instruments and intermediary services in capital markets, capital formation, project finance, microfinance, insurance, etc. Appearing in the late 1970s in the mainstream financial literature, the term *Islamic Financial System* is relatively nascent. Literature suggest that the *interest-free* and *Islamic banking* were two such trade and basic financial terms which were used in the financial literature, registering a case of some maturity of the Islamic economic thought over a period of time (Siddiqi, 2006).

The prohibition of payment and acceptance of interest is known to be the central theme of the early literature in Islamic finance. The Islamic economic thought is much more than prohibition of payment and acceptance of interest, and includes practices like, risk sharing (Ul-Haque and Mirakhor, 1986; Pryor, 1985; Chapra, 1998; El-Gamal, 2000), trust (Siddiqi, 1983; Pryor, 1985), sanctity of the contracts and property rights (Siddiqi, 1983; Chapra, 1998), and social justice (Khan, 1985; Ariff, 1988). The Islamic economic system is formulated and guided by the rules based on Muslim laws, known as *Shariah.* These laws do not only constitute the regulative and constitutive rules of the holy Quran, but also the prophet Mohammed's sayings and actions (*Hadith*). Islamic finance is guided by five pillars: (i) prohibition of interest (*Riba*), (ii) refraining from speculative behavior (*Maysir*), (iii) handling of uncertainty in the contract (*Gharar*) (iv) refraining from investing in certain prohibited business (*Haram*), (v) and investment with asset backing and profit and loss distribution (Peillex and Ureche-Rangau 2013). Islamic financial system does not solely focus on the economic and transactional side, but broader aspects like religious ethics, morality and socialism – to achieve a greater good of society as a whole by improving parity and fairness for all (Iqbal and Mirakhor, 2011).

Last six to seven years saw a quantum jump in the interest and attention of the financial community towards the merit of this Islamic financial system– thanks to its robustness, which not only weathered the financial crisis but eventually outperformed the conventional counterparts in the

financial intermediation domain (Chapra, 2008; Ahmed, 2010; Askari and Krichene, 2014). Since then the literary community witnessed a plethora of work on comparative study of risk in the conventional and Islamic financial systems, on different aspects like efficiency (Iqbal and Molyneux, 2005; Rosman and Wahab, 2014), profitability (Bashir, 1999; Hassan and Bashir, 2003; Beck et al., 2013), and stability (Cihak and Hesse, 2010; Askari & Krichene, 2014; Morrison, 2015). However, there are very few studies (Khan, 1997; Mirakhor and Smolo, 2012), which have actually raised questions on the genesis of the two systems and how and why they are different in conception or implementation. The present study addresses this gap by systematically reviewing the literature of these two financial systems.

Remaining paper compares and contrasts the roots of the risk-sharing concept in the ideal-conventional, conventional and Islamic financial literature. While discussing this, the paper examines the historical development of these financial systems through the lenses of convergent/divergent school of thought.

HISTORY OF ISLAMIC FINANCE

We may broadly classify the history of Islamic financial systems into three main phases - foundation, establishment, and modern Islamic finance.

Foundation Phase

In the early 19th century, the Arab world was suffering from many socio-economic issues and the western cultural influence was on rise. At the same time Islamic scholars started to see merit in the western techno-intellectual shift (Khan and Mirakhor, 1990). In this backdrop, the Islamic scholars felt a need of rebuilding the society based on holistic growth and development. However the main vexing problems were - how to change the property structure to enhance the productivity of the society; how to improve the educational system to impart innovative skills needed for the development of the society? On the other hand, Islamic scholars feared that these reforms would inject a capitalistic mindset into their economic system. Therefore, in this phase, reforms aimed at incorporating western technologies while leaving the inherent capitalistic ideological underpinning. In sum, the first phase marked the formulation of new mental models and vocabulary to develop the traditional Islamic society, while warding off the materialistic couture of the west.

Establishment Phase

Two major events marked the end of the 19th century: the wave of decolonization and the rise of capitalism. This encouraged the Islamic scholars to imagine an Islamic society as an alternative to the western culture. They envisioned state as a change agent, which will promote values like cooperation and welfare while promoting development. But they feared that the rising influence of materialistic capitalism would rupture the moral fabric of Islamic society. Thus, scholars propounded the concept of Islamic socialism, balancing capitalism and communism, as a solution where people will find their places based on brotherhood and cooperation, following the teaching of Prophet Mohammed (Khan and Mirakhor, 1990). Thus, this phase marked the break off from the old social order to start creating a new welfare state and society, which would confer to the Islamic values. It was believed that only a strong state, with welfare orientation, could bring the much-needed change in property rights and education system to liberate the Islamic world from the western influence.

Modern Islamic Finance Phase

Third and the most defining phase of the modern Islamic economy started in early 1970s. By the end of second phase it was clear that the concept of welfare state could not live up to the expected growth and development. Islamic scholars had realized that centralized states on nationalist ideology did not give them the needed level of growth and development to catch up with the west. In fact, Islamic society was trapped into a system filled with inefficiencies, unemployment and poor technological progress. Furthermore, defeat of the Arabs in the hands of newly formed Israel revealed the overall weakness of the Islamic world (Moisseron et al., 2014).

In view of these events and state of affairs, a new Islamic economic thought emerged which embraced the idea to develop a socialist state with individualistic entrepreneurship and property rights. The new vocabulary developed was of an ideal "Islamic business-man"; a model of success in both material and spiritual life (Chachi, 2005). However, such focus on individualism by means of entrepreneurship needed to be in consonance with rules of *Shariah* leading to a sudden surge in the interest in studying, defining, and refining the traditional laws of finance, property rights, trade, etc. The central idea of the Islamic intellectuals was to check the human nature of acquisitiveness, while promoting the distribution of economic welfare. And this phase saw the genesis of the term "*Shariah compliant*" - making of money in light of Islamic law.

The original ideology of Adam Smith was strongly criticized in Europe at his time; even Islamic economists criticized Smith's ideology for a fairly long time before realizing and correcting it. Eventually, the Islamic intellectuals agreed to the ideology of Adam Smith, which said that -

material private interests were the driving force of human behavior. Such ideology proved to be a turning point in Islamic economy in the 70s and some Arab nations became economically comparable with the west very soon, thanks to the sudden boom in the oil prices and increased production due to the acquired technology (Chachi, 2005; Mohanty et al., 2011; Moisseron et al., 2014). But the sudden surge in economic growth of many Arab nations fuelled a need for an organized banking system, and lead to the emergence of the Islamic Banking and Finance as a leading subject in the Islamic finance for the decades to come.

Based on the prohibition of interest in financial dealings, and the rising requirement of a robust banking system to support the rapid growth in the economy, the Islamic banking took the route of financial contracts, which were based on equity participation – *mudaraba* products. Such a system of profit-loss sharing in financial contracts not only helped long term equity financing to the growth of entrepreneurship. It also helped *Shariah* abiding people to deposit their money in banks and earned profit or shared the loss, based on the bank's performance (Chapra, 1992; Siddiqi, 1983). And subsequent to this all the other instruments in Islamic finance followed the trend where they developed financial products based on the profit-loss sharing concept which allowed them to keep away from the ex-ante interest payments (*Ribah).*

ISLAMIC FINANCIAL SYSTEM AND RISK-SHARING CONCEPT

Evolution of Islamic finance should be seen not only as a means of following religions scriptures but also as struggles of intellectuals to propose an alternative to the western capitalism. By mid of twentieth century, Islamic scholars accepted that the private material gain was a guiding force of human behavior. The entrepreneurial activities of the individuals, not the state, became the vehicle of wealth creation, which would trickle down to society at large. The Islamic financial thought did acknowledge the importance of capital for wealth generation, but not at the cost of large financial disparity in the society, emanating individual wealth accumulation.   The Islamic economic scholars and thought leaders had understood that the western model was more of a risk delegation that keeps borrowers at a disadvantageous position. The Islamic scholars were looking for a model that will not only generate wealth but also promote equality and ward off the over influence of the western culture; while falling in the ambit of *Shariah* (Islamic laws and teachings). And this effort helped shaping the present day Islamic finance, which is *Shariah Complaint*.

According to *Shariah*, the organizing principle of Islamic finance lies in the teachings of holy Quran. One shall refer verses 275, 276, 278, and 279 of chapter 2, which directly touches upon the concept of risk sharing. According to these verses, all financial transactions should be done by means of contracts of exchange (*al-Bay*) and should refrain from contracts, which are based on debt (*Riba*). The interpretation is clear – Islam discourages the believers of *Shariah* to engage in contracts, which are interest based, as in such contracts the creditor gets claim on the property rights of the debtor without actually loosing property rights on the money lent, irrespective of the future outcomes. This shifts the risk arising from the environmental uncertainty of future outcomes and the managerial/operational risks to be borne only by the borrower. However, in the *Shariah* based contracts the lender and the borrower have predefined stake in the future outcomes, irrespective of profit or loss from the venture. Thus the risk/reward is not only borne by the borrower, but is also shared by creditor. Islam recommends engaging in contracts, which involves dependence on future outcomes to decide on the claim on property rights. Quran not only teaches people to be patient "*Allah is with those who are patient*" (Chapter 8, verse 46) but also ask them to be ready to be tested with hardships and uncertainties (Chapter 2, verse 76 & 155). These along with a very high degree of impetus on the faithfulness of individual to their contracts and covenants (Chapter 2, verse 172; Chapter 7, verse 172-173; Chapter 8, verse 32; Chapter 16, verse 91-92; Chapter 17, verse 34), forms the basis of human behavior.

Thus, Quran has enough direct and indirect references, which states that a market where contracts and covenants control human behavior and transactions should involve real commodity with proportional claim of two parties from the future outcomes. But this does not meant that those who could not find market-means of risk sharing due to poverty or inability to get into such contracts would get deprived of easy finance for their business. This in Islam is done through the redistributive instruments like, *Zakat* (annual social welfare tax to be given to needy relatives, neighbors and society), *Sadquah* (charity, voluntary in nature), and *Qard-al-Hassan* (generous loans, given on very easy terms with no expectations of returns) (Chapter 2, Verse 276). These instruments of redemption are designed to put the burden of risk more on those who are able to bear it.

Thus, it may be stated that the Islamic financial thought was founded primarily on the principle of prohibition of payment (or receipt) of predetermined rate of interest on any financial contract (Metwally, 1997).   This transforms the lender into an investor rather than a creditor, which warrants for sharing the profit and bearing the loss in the business (Moore, 1997). A fixed income based lending in the conventional system puts double burden on the borrower by charging for use of funds and the fund itself (Iqbal and Molyneux, 2005). In Islamic finance, money lending is allowed only for

tangible goods or services - hence, *Riba*, making money from money, is not permissible.

RISK-SHARING CONCEPT IN CONVENTIONAL FINANCIAL SYSTEM

The conventional financial system is traced back to the idea given by Adam Smith, in his renowned book – *Wealth of Nations (1776)*. It was only in the 20th century when the Adam Smith's vision of economy was presented in the literary works. It was the conception of an economy where the market system was guided by the "*Invisible hand*" leading to a smooth functioning and management of "*the autonomous individual choices in an interdependent world*" (Evensky, 1993, p197). If we look into the past literary works, we would find three prominent names who contributed substantially towards this stream of literature – Arrow, Debreu,and Hahn. Seminal work of Arrow & Hahn (1971) highlighted that in a decentralized economic system, guided by self-interest, will allocate resources in a possible superior way. Although they centered their work on Adam Smith's idea of decentralized economy, but missed to incorporate Smith's original thought focused on society as a whole while emphasizing on moral and ethical values, which was penned in his earlier book *The Theory of Moral Sentiments* (Smith, 1759).

Arrow and Debreu (1954) primarily aimed on the optimal risk sharing and decentralization of the market economy. While trying to identify the most optimal way in which risk in an economy may be allocated, they came up with a conclusion that risk should be billed to those who could best bear it. But, Arrow and Debreu (1954), in their analysis somehow digressed from the idea of institutional structure, which was evident in Smith's original work in the *Theory of Moral Sentiments* and subsequently in *Wealth of Nations (*Mirakhor and Smolo, 2012). Arrow and Debreu (1954) in their analysis assumed that institutions like property rights, rules of law, trust, moral and ethical values exist and are uniformly practiced. The two assumptions, which were central to Arrow and Debreu's seminal work, were the theories of "*complete markets*" and "*complete contracts*". But there was neither a market for every conceivable risk nor existed such contracts that could cover all the contingencies (Mirakhor and Smolo, 2012). Thus, according to Arrow-Debreu (1954) any payoffs at a later date were dependent on uncertain future outcomes, which meant that the rate of interest for the contracted debt was neither fixed nor predetermined, unlike what is being followed by the conventional financial system today.

Arrow (1971) identified some other factors like trust, which works as lubricant for the smooth functioning of an economy. He proposed, "*it is possible that the process of exchange requires or at least is greatly facilitated by the presence of several ... virtues (not only truth, but also trust, loyalty and justice in future dealings)... The virtue of truthfulness in fact contributes in a very significant way to the efficiency of the economic system ... ethical behavior can be regarded as a socially desirable institution which facilitates the achievement of economic efficiency in a broad sense*" (Arrow 1971, p345-346). For example, in an economy where trust is very strong and simple contracts may be a surrogate for a complete contract as the contracting parties' trust is so high that at the time of contingency the terms and conditions of the contract may be reversed without much problem. However, Arrow could not incorporate some original ideas of Smith's institutional system, which were integral to the idea of an economy, primarily focusing on two key concepts – "*invisible hands*" and "*self-interest*".

According to Walsh (2000, p6), it is a "*vulgar ... misunderstanding*" of what Smith intended by "*self-interest*". Ignoring the *Smithian* view of humans, as explained in *The Theory of Moral Sentiments* leads to a substantive digression in the growth of conventional economic thought from *Smithian* thought. In the same lines, Evensky (1993, p203) stated, "*the Smithian story told by Arrow and Hahn—and they are representative of modern economists—is an abridged edition. The spring that motivates action in Smith's story has been carried forward, but much of the rest of his tale has been forgotten*". Similarly, Arrow (1971) argued that "*rest of [Smith's] tale*" would had been idea of the institutional infrastructure, which are behavioral rules predicted by Smith in his famous work - *The Theory of Moral Sentiments* (Smith, 1959)*,* as cited by Mirakhor and Smolo (2012). To sum up, it was the existence of predetermined fixed rate of interest which was the sole reason why the original financial thought got derailed from the set path (*Smithian* thought).

According to Mirakhor (2012), invariably all financial intermediation theories, be it contemporary or classical, elucidated *interest rate* as a price that brings in '*demand for*' and '*supply of*' finance into equilibrium. Thus, instead of fixing ex-ante, the interest rates should be dictated by the market forces. Although, it is difficult to cite any strong argument in favor of the ex-ante fixed interest rate, many financial theories developed after the Arrow-Debreu and Arrow-Hahn models, assumed its existence as a risk-free asset in the form of government issued treasury-bills (T-Bills). Slowly, the rate of return for other assets and equities had been calculated based on these so-called risk-free assets, which were treated as the benchmark of the industry. All the well know theories like the *Modern Portfolio Theory (MPT)*, *the Capital Asset Pricing Model (CAPM)*, or the famous *Black-Sholes's Option Pricing Formula*, succumbed to this practice of using the T-bills as the benchmark for analyzing the risk or calculating the rate of return on the assets.

Thus we may conclude, had actual financial system developed along the suggested trajectory of the original *Smithian* works, the results would have been emergence of the ideal conventional financial system which would had been different from the existing conventional one. Such ideal financial system would have developed financial instruments contingent upon the principle of risk-sharing rather than risk-delegating framework (Mirakhor and Smolo, 2012).

DISCUSSION AND IMPLICATIONS

The evolution of Islamic finance, inspired by the vision of equitable socio-economic paradigm, is based on sharing: where all the stakeholders equally share the profit and bear the loss. On the other hand, the conventional financial system, a slightly digressed version of its ideal root envisioned by Adam Smith, delegates the risk, and assumes risk-free rate, an artificial floor, which distort pricing structure and subsequent decisions. This, in turn, developed a financial system with a focus on *shifting to* or *transferring,* rather than *sharing,* of risk (Mirakhor, 2012). Conventional finance advocates debt financing as a device to tackle the agency problem (Jensen and Meckling, 1976). But such a financing in a firm would shift the additional risk to the existing shareholders, as the debt holders get the first claim in any situation of distress. Even the *Efficient Market Hypothesis* advocates competitive market to avoid the scope for arbitrage leading to innovation. But such an over innovation resulted in complex engineering products and instruments, to hedge the risk deriving on one base-instrument, which is not sustainable (Askari et al, 2009). According to an estimate, the total value of the derivative instruments in the world at the start of the 21st century was twelve times larger than the overall global Gross Domestic Product (GDP) (Mirakhor, 2002). Rogoff (2011), in another study, highlighted that there is approximately $200 trillion worth of financial papers in the global financial systems, 75 percent of which ($150 trillion) is in interest-based debt instruments. And to add to the woes, the global GDP is not more than $63 trillions, making it unlikely that it would ever be able to validate such oversized debts.

High scale engineering of financial instruments, in the amalgamation of fractured and the multi-directional central banking system, gave rise to such a high scale money-credit creation process, which eventually lead to financial crises in the past decade. This happened primarily because of the divergence from the original risk-sharing vision of *Smithian* financial system or Islamic Financial system. The conventional financial system, which took shape in the early half of 1970s, was based on the assumption of perfect markets and contracts, majorly focused on risk-transfer, which slowly transformed into a risk-shifting system. The original idea of *'diverting the risk to those who could best bear' it* got diluted, creating bubbles in the economy which lead to multiple crises and culminating into bail outs at the expense of innocent tax payers money (Mirakhor and Krichene, 2009). In fact, inadvertent lending devoid of commensurate tangible productivity gain will be unsustainable and lead to systematic risk, whose burden will primarily fall on the shoulders of weaker sections of the society (Siddiqi, 2005). Ideal financial system as proposed by Smith emphasizes the importance of risk sharing as a means to achieve distribution of wealth. Keeping the spirit of risk-sharing, Islamic finance converges with ideal financial system but diverges from conventional financial system, which emphasizes risk transferring.

CONCLUSION

Though conventional financial system has its root in *Smithian* thoughts, but during its evolution it has abstracted from many of the tenets suggested by Adam Smith. Literature also revealed that Islamic finance is closer, in spirit and assumptions, to *Smithian* thought than contemporary financial system is. The diversion apparent in conventional and Islamic system, to a large extent, is because of the fact that many insights of Adam Smith got sidelined in conventional finance. Risk sharing is at the best putting risk under the carpet but it will remain in the system. This risk delegation also motivated financers to over-engineer derivative instruments and have altogether created a world where everyone is trying to pass on the risk to someone else; eventually the one who is not technically sophisticated and savvy enough is paying the price of ignorance by taking all the unreasonable risk, as evident from the recent financial crisis.

In summary, based on the brief review and discussion on the concerned literature, we can conclude that modern conventional finance has diverged from the ideal conventional financial thought over the past few decades. However, Islamic finance converges with the basic conceptions of ideal conventional financial thought, especially on the principle of risk sharing.

REFERENCES

Ahmed, A. (2010). Global financial crisis: an Islamic finance perspective. *International Journal of Islamic and Middle Eastern Finance and Management*, 3(4), 306-320.

Ali, M. M. (2011). *Holy Quran*. Ahmadiyya Anjuman Ishaat Islam Lahore USA.

Ariff, M. (1988). Islamic banking. Asian Pacific Economic Literature, 2(2), 48-64.

Arrow, K. J., & Debreu, G. (1954). Existence of an equilibrium for a competitive economy. *Econometrica: Journal of the Econometric Society*, 265-290.

Arrow, K. J., and F. Hahn. (1971), General Competitive Analysis. San Francisco, CA: Holden-Day.

Arrow, Kenneth J. (1971), Essays in the Theory of Risk-Bearing. Chicago, IL: Markham Publishing Company.

Askari, H., &Krichene, N. (2014). Islamic finance: an alternative financial system for stability, equity, and growth. *PSL Quarterly Review*, *67*(268), 9-54.

Askari, H., Z. Iqbal, and A. Mirakhor. (2009). New Issues in Islamic Finance and Economics. Singapore: John Wiley and Sons (Asia).

Bashir, A. H. M. (1999). Risk and profitability measures in Islamic banks: the case of two Sudanese banks. *Islamic Economic Studies*, *6*(2), 1-24.

Beck, T., Demirgüç-Kunt, A., &Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking & Finance*, *37*(2), 433-447.

Chachi, A. (2005). Origin and development of commercial and Islamic banking operations.*Islamic Economics*, *18*(2). 3-25.

Chapra, M. (1992). Umer. *Islam and the Economic Challenge*, 426.

Chapra, M. U. (1998). The major modes of Islamic finance.*Islamic Economics, Banking and Finance (Working Paper), Leicester, UK*.

Chapra, M. U. (2008, October). The global financial crisis: can Islamic finance help minimize the severity and frequency of such a crisis in the future? In *A paper presented at the Forum on the Global Financial Crisis at the Islamic Development Bank on* (Vol. 25).

Cihak, M., &Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research*, *38*(2-3), 95-113.

El-Gamal, M. A. (2000).*A basic guide to contemporary Islamic banking and finance* (Vol. 1). Houston: Rice University.

Ernst & Young. (2012). The World Islamic Banking Competitiveness Report 2012–13: Going Beyond DNA of Successful Transformation (December). Bahrain: Ernst & Young.

Evensky, J. (1993). Retrospectives: Ethics and the invisible hand. *The Journal of Economic Perspectives*, 197-205.

Hassan, M. K., & Bashir, A. H. M. (2003, December). Determinants of Islamic banking profitability. In *10th ERF Annual Conference, Morocco* (pp. 16-18).

Iqbal, M., &Molyneux, P. (2005). Thirty years of Islamic banking: history, performance, and prospects. Palgrave Macmillan, Houndmills: New York.

Iqbal, Z., &Mirakhor, A. (2011). *An introduction to Islamic finance: Theory and practice* (Vol. 687). John Wiley & Sons.

Jensen, M. C., &Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, *3*(4), 305-360.

Khan, M. S., &Mirakhor, A. (1990). Islamic banking: Experiences in the Islamic Republic of Iran and in Pakistan. *Economic Development and Cultural Change*, 353-375.

Khan, T. (1997).An analysis of risk sharing in Islamic finance with special reference to Pakistan.*Loughborough University, Loughborough, PhD dissertation*.

Khan, W. M. (1985).Towards an interest-free Islamic economic system.*The Islamic Foundation, Leicester & International Association for Islamic Economics, Islamabad*, 84.

Metwally, M. M. (1997). Economic consequences of applying Islamic principles in Muslim societies.*International Journal of Social Economics*, *24*(7/8/9), 941-957.

Mirakhor, A. (2002). Hopes for the future of Islamic Finance.*New Horizon*, *121*, 5-8.

Mirakhor, A. (2012). Islamic Finance, Risk Sharing and Macroeconomic Policies.

Mirakhor, A., &Krichene, N. (2009). The recent crisis: lessons for Islamic finance.

Mirakhor, A., &Smolo, E. (2012) The State of Islamic Finance: Post-crisis and Future Prospects.

Mohanty, S. K., Nandha, M., Turkistani, A. Q., &Alaitani, M. Y. (2011). Oil price movements and

stock market returns: Evidence from Gulf Cooperation Council (GCC) countries. *Global Finance Journal*, 22(1), 42-55.

Moisseron, J. Y., &Moschetto, B. L. (2014). *Islamic finance a review of the literature* (No. 2014-093 Keywords: Islamic finance, Islamic banks).

Moore, P. (1997). *Islamic finance: A partnership for growth*. London: Euromoney Publications.

Morrison, S. (2015). Islamic Banking and Financial Crisis: Reputation, Stability and Risks Edited by Habib Ahmed, Mehmet Asutay and Rodney Wilson. *Journal of Islamic Studies*, 26(1), 103-107.

Obaidullah, M. (2005). Islamic Financial Services, Islamic Economics Research Centre, Jeddah.

Peillex, J., &Ureche-Rangau, L. (2013). Is There A Place for A Shariah-Compliant Index on the Paris Stock Market?.*International Journal of Business*, 18(2), 131.

Pryor, F. L. (1985). The Islamic economic system.*Journal of Comparative Economics*, 9(2), 197-223.

Rogoff, K. (2011). Global imbalances without tears.*Project Syndicate, March*.

Rosman, R., Wahab, N. A., &Zainol, Z. (2014). Efficiency of Islamic banks during the financial crisis: An analysis of Middle Eastern and Asian countries. *Pacific-Basin Finance Journal*, 28, 76-90.

Siddiqi, M. N. (1983). *Banking without interest* (Vol. 5). Islamic Foundation.

Siddiqi, M. N. (2005). *Riba, bank interest and the rationale of its prohibition*.MarkaziMaktabaIslami Publishers.

Siddiqi, M. N. (2006). Islamic banking and finance in theory and practice: A Survey of state of the Art. *Islamic Economic Studies*, 13(2), 1-48.

Smith, A. (1759) (2006). The Theory of Moral Sentiments. London: A. Milar. Reprint, Courier Dover Publications. Citations refer to the 2006 edition.

Smith, A. (1776) (1976). An Inquiry into the Nature and Causes of the Wealth of Nations. Reprint, edited in two volumes by W. B. Todd. Citations are to vol. 2 of the Glasgow Edition of The Works and Correspondence of Adam Smith. Oxford, U.K.: Clarendon Press.

UlHaque, N., &Mirakhor, A. (1986). Optimal Profit-sharing Contracts and Investment in an interest-free Islamic Economy.

Uppal, J. Y., &Mangla, I. U. (2014). Islamic Banking and Finance Revisited after Forty Years: Some Global Challenges. *Journal of Finance*.

Venardos, A. M. (2012). *Islamic Banking and Finance in South-East Asia: Its Development & Future* (Vol. 6). World Scientific.

Walsh, V. (2000).Smith after Sen. *Review of political economy*, 12(1), 5-25.

Implementation of Basel Norms: An Analytical Study of Indian Scheduled Commercial Banks

Dr. Shalu Bansal, Assistant Professor, LM Thapar School of Management,
Thapar University, Patiala, India

ABSTRACT

In the present study, implementation of Basel Norms, position of Capital Adequacy Norms in India is assessed. The study has focused to achieve the two objectives i.e. to analyse the Basel Norms transformation into domestic regulation of Indian banks according to agreed international timelines and to identify the gap between regulation of banks and Basel Norms in India. For this purpose, total study period has been divided into three phases: first phase includes the time period from 1995-1996 to 2003-2004, second phase includes the time period from 2004-2005 to 2012 -2013 and third phase include the time period of 2013-14. For the present study, data is collected from the various secondary sources. The most important finding is the position of CRAR in Indian Scheduled Commercial Banks during second phase was better than the first phase. During third phase all Scheduled Commercial Banks are meeting minimum capital adequacy requirement as per Basel III norms and also majority of Scheduled Commercial Banks are meeting 10.5 percent limit of CAR. It has been observed that with respect to capital standards, the Basel Norms, India's banking industry (Scheduled Commercial Banks) is performing reasonably well, with an average CRAR of about 12 percent, which is not only higher than the internationally acceptable level of 8 percent, but also higher than India's own regulatory requirements of 9 percent.

INTRODUCTION

In July 1988, the Basel Committee on Banking Supervision approved the adoption of a risk based capital standards for banks in member countries. The Bank for International Settlement recommended certain guidelines that central bank could adopt to periodically monitor their banks and financial institution's balance sheet, and thereby mitigate the possibilities of adverse impact over the economy. These recommendation were known as the Bank for International Settlement Norms and the first set of guidance rules, referred to as Basel I Norms, were set out in 1988 and accepted over the years by around 100 Central Banks across the globe under what came to be known as the Basel Accord. Capital adequacy has traditionally been regarded as a sign of strength of the financial system in India. Capital to risk-weighted assets system was introduced for banks in India since April 1992, largely in conformity with international standards, under which banks were required to achieve 8 per cent capital to risk-assets ratio. In its midterm review of Monitory and Credit Policy in October 1998, the Reserve Bank of India raised the Minimum Regulatory CRAR requirement to 9 percent and banks were advised to achieve this 9 percent CRAR level by March 31, 2000. Thus the Capital Adequacy Norms for India's Commercial Banks are higher than the internationally accepted level of 8 percent. The Reserve Bank of India has announced the implementation of Basel II Norms in India for internationally active banks from March 2008 and for the domestic Commercial Banks from March 2009. Such standards are aimed at putting all banks on an equal footing with respect to Capital Adequacy so as to promote safety and soundness in banking. In 2010–11, it was agreed upon by the members of the Basel Committee on Banking Supervision and was scheduled to be introduced from 2013 until 2015; however, changes from 1 April 2013 extended implementation until 31 March 2018 and again extended to 31 March 2019. Basel III was supposed to strengthen bank capital requirements by increasing bank liquidity and decreasing bank leverage. Basel III Capital Regulations is being implemented in India with effect from April 1, 2013 in a phased manner. Basel III provides for a timeline of implementation that is quite acceptable in the case of Indian context as it is observed that Indian banks are relatively well positioned for smoother implementation of the new standards.

Review of Literature

Raghavan (2008) outlined the concept of Basel II norms for Indian banks. The study concluded that Basel II principles should be viewed more from the angle of fine tuning one's risk management capabilities through constant mind searching rather than as regulatory guidelines to be compiled with. Gambhire (2007) presented the study related to Basel II gains for Indian banks a comparative study. In this study firstly Basel II norms are broadly described and how the risk i.e. credit, operational and market risks are calculated. Dash (2006) outlined the concept of capital adequacy ratio issues in India. The study examined the capital adequacy ratio of Indian banks related to CRAR as per Basel accord. It was concluded that to meet the Basel II requirement of Capital Adequacy Norms, banks would need to raise additional capital. Ghosh and Das (2005) explained the government or alternatively the market forces could also ensure the stability of banking system. An empirical test for Indian Public Sector Banks during the 1990s demonstrates

that better capitalized banks experienced lower borrowing costs. Nitsure (2005) outlined that Indian banking sector needs to look at Basel II as an opportunities to keep its own house in order. However, it is unfortunate that the current Basel proposals do not explicitly incorporates the mutual benefits of international diversification for advanced as well as developing countries. Nachane (2006) investigated the relationship between changes in risk and capital in Indian banking sector with reference to Public Sector Banks.

RESEARCH METHODOLOGY

▋ Objectives of the Study
- To analyze the Basel Norms transformation into domestic regulation of Indian banks according to agreed international timelines.
- To find out the gap between framework of Basel Norms and regulation of banks in India.

▋ Data Sources and Methodology
For the study, secondary data has been collected. Secondary data has been collected from Annual Report of 'Reserve Banks of India' and other publications including 'Trend and Progress of Banking in India', Statistical Tables related to banks in India and Report on Currency and Finance. Major guide lines issued by Reserve Banks of India from time to time were studied in depth. The study covers the period from 1995 to 2014. Total study period has been divided into three phases: first phase includes the time period from 1995-1996 to 2003-2004, second phase includes the time period from 2004-2005 to 2012-2013 and third phase include the time period of 2013-2014.

ANALYSIS

▋ First Phase
First phase has been analyzed after dividing into two sections i.e. from 31st March 1996 to 31st March 1999 in first section and from 31st March 2000 to 31st March 2004 in second section. As it was required for Indian Banks to achieve 8 percent Capital Adequacy Ratio by March 1996 so the position of Capital Adequacy Ratio bank wise from March 1996 to March 1999 has been covered under first section of first phase. In midterm review of Monitory and Credit Policy in October 1998, the Reserve Bank of India raised the minimum regulatory CRAR requirement to 9 percent and banks were advised to achieve this 9 percent CRAR level by March 31, 2000. As the Reserve Bank of India increased the CRAR requirement to 9 percent and the time period was given to achieve this level of CRAR till 31st March 2000 so the position of Capital Adequacy Ratio bank wise from March 2000 to March 2004 has been covered under second section of first phase.

Table 1. Capital Adequacy Ratio of Nationalized Banks (Figure in %age)

Sr. No.	Bank Name	Section I				Section II				
		1995-96	1996-97	1997-98	1998-99	1999-2K	2000-01	2001-02	2002-03	2003-04
1	Allahabad Bank	9.68	11.00	11.64	10.38	11.51	10.5	10.62	11.15	12.52
2	Andhra Bank	5.07	12.05	12.37	11.02	13.36	13.4	12.59	13.62	13.71
3	Bank of Baroda	11.19	11.80	12.05	13.30	12.1	12.8	11.32	12.65	13.91
4	Bank of India	8.44	10.26	9.11	10.55	10.57	12.23	10.68	12.02	13.01
5	Bank of Maharashtra	8.49	9.07	10.90	9.76	11.66	10.64	11.16	12.05	11.88
6	Canara Bank	10.38	10.17	9.54	10.96	9.64	9.84	11.88	12.5	12.66
7	Central Bank of India	2.63	9.41	10.40	11.88	11.18	10.02	9.58	10.51	12.43
8	Corporation Bank	11.3	11.30	16.90	13.20	12.8	13.3	17.9	18.5	20.12
9	Dena Bank	8.27	10.81	11.88	11.14	11.63	7.73	7.64	6.02	9.48
10	Indian Bank	Neg.	0	1.41	Neg.	Neg	Neg	1.7	10.85	12.82
11	Indian Overseas Bank	5.95	10.07	9.34	10.15	9.15	10.24	10.82	11.3	12.49
12	Oriental Bank of C	16.99	17.53	15.28	14.10	12.72	11.81	10.99	14.04	14.47
13	Punjab & Sind Bank	3.31	9.23	11.39	10.94	11.57	11.42	10.7	10.43	11.06
14	Punjab National Bank	8.23	9.15	8.81	10.79	10.31	10.24	10.7	12.02	13.1
15	Syndicate Bank	8.42	8.80	10.50	9.57	11.45	11.72	12.12	11.03	11.49
16	UCO Bank	7.83	3.16	9.07	9.63	9.15	9.05	9.64	10.04	11.88
17	Union Bank of India	9.50	10.53	10.86	10.09	11.42	10.86	11.07	12.41	12.32
18	United Bank of India	3.50	8.23	8.41	9.60	9.6	10.4	12.02	15.17	17.04
19	Vijaya Bank	Neg.	11.53	10.3	10.00	10.61	11.5	12.25	12.66	14.11

Table 1 presents the position of Capital Adequacy Ratio of Nationalized Banks from 1995-1996 to 1998-1999. This ratio was more than 8 percent in majority of Nationalized Banks at the end of March 1996. But at the end of March 1997, March 1998 and March 1999 every Nationalized Bank contained more than 8 percent Capital Adequacy Ratio except Indian Bank. But in Section II, this ratio was more than 8 percent in each Nationalized Banks except Indian Bank during the second section of first phase.

Table 2. Capital Adequacy Ratio of State Bank Group (Figure in %age)

Sr. No.	Bank Name	Section I				Section II				
		1995-9	1996-9	1997-9	1998-9	1999-2	2000-0	2001-0	2002-0	2003-04
1	State Bank of India	11.60	12.17	14.58	12.51	11.49	12.79	13.35	13.5	13.53
2	State Bank of Bikaner &	9.33	8.82	10.65	12.26	12.35	12.39	13.42	13.18	12.93
3	State Bank of Hyderabad	9.90	10.84	10.83	10.65	10.86	12.28	14.03	14.91	14.29
4	State Bank of Indore	8.80	9.31	9.83	12.35	11.26	12.73	12.78	13.09	12.39
5	State Bank of Mysore	8.81	10.80	11.61	10.23	11.5	11.16	11.81	11.62	11.53
6	State Bank of Patiala	9.51	11.25	13.24	12.47	12.6	12.37	12.55	13.57	13.56
7	State Bank of Saurashtra	12.38	12.14	18.14	14.35	14.48	13.89	13.2	13.68	14.53
8	State Bank of Travancore	9.40	8.17	11.48	10.27	11.09	11.79	12.54	11.3	11.36

From the Table 2, it is observed on the basis of average value of CRAR of State Bank Group that during first section of the first phase the ratio was above 10 percent in each Bank of State Bank Group except one bank i.e. State Bank of Travancore. But in second section, each bank of State Bank Group contained more than 10 percent Capital Adequacy Ratio over the years which show the strong position of State Bank Group.

Table 3. Capital Adequacy Ratio of Private Sector Banks (Figure in %age)

Sr. No.	Bank Name	Section I				Section II				
		1995-96	1996-97	1997-98	1998-99	1999-2K	2000-01	2001-02	2002-03	2003-04
1	Bank of Rajasthan Ltd	11.08	10.13	5.54	0.83	5.73	10.57	12.07	11.29	11.18
2	Catholic Syrian Bank Ltd.	-	-	-	-	5.94	6.08	9.57	10.58	11.23
3	City Union Bank Ltd	9.26	9.47	11.60	14.30	13.33	13.59	13.97	13.95	13.36
4	Development Credit Bank Ltd	27.35	23.47	19.79	16.90	11.34	11.28	11.49	10.08	14.14
5	Dhanalakshmi Bank Ltd.	-	-	-	-	10.02	9.69	11.23	10.45	13.56
6	Karnataka Bank Ltd	12.74	12.27	13.23	10.85	11.04	11.37	12.96	13.44	13.03
7	Lord Krishna Bank Ltd	7.42	5.40	8.35	11.85	11.25	12.90	16.5	12.82	16.68
8	Nainital Bank Ltd	9.19	9.86	9.46	13.81	15.11	15.81	14.88	20.93	18.54
9	SBI Comm & Int Bank Ltd	11.56	30.59	27.69	28.90	24.32	19.85	22.1	21.19	30.43
10	Tamilnad Mercantile Bank Ltd	12.88	15.65	19.11	18.40	18.02	17.59	18.02	18.54	21.07
11	The Federal Bank Ltd	8.35	9.22	9.43	10.32	11..33	10.29	10.63	11.23	11.48
12	The Jammu & Kashmir Bank Ltd	13.40	15.58	20.48	24.48	18.82	17.74	15.46	16.48	16.88
13	The Karur Vysya Bank Ltd	10.92	12.76	14.47	14.53	15.16	15.56	16.9	17.01	17.11
14	The Lakshmi Vilas Bank Ltd	9.80	10.64	10.35	9.64	10.45	10.21	11.54	11.35	13.79
15	The Ratnakar Bank Ltd	11.11	9.85	10.41	9.72	11.56	10.00	13.6	14.05	16.65
16	The Sangli Bank Ltd	6.21	8.03	10.98	11.58	12.13	11.47	11.64	14.94	13.68
17	The South Indian Bank Ltd	8.27	8.27	9.40	10.40	10.41	11.17	11.2	10.75	11.32
18	The Vysya Bank Ltd	11.91	14.21	12.48	10.63	12.24	12.05	11.57	9.81	11.05
19	Centurion Bank Ltd	60.00	27.00	20.00	8.45	9.31	9.61	4.16	1.95	4.41
20	HDFC Bank Ltd	23.53	22.25	13.92	11.86	12.19	11.09	13.93	11.12	11.66
21	ICICI Banking Corporation Ltd	17.52	13.04	13.48	11.06	19.64	11.57	11.44	11.1	10.36
22	IDBI Bank Ltd	16.20	17.90	9.82	11.26	-	-	-	-	-
23	IndusInd Bank Ltd	18.19	12.90	17.91	15.16	13.24	15.00	12.51	12.13	12.75
24	Axis Bank					11.37	9.00	10.65	10.90	11.21
25	Kotak Mahindra Bank Ltd.					-	-	-	25.97	15.25

* Bank of Madura Ltd., Bareilly Corporation Bank Ltd., Bharat Overseas Bank Ltd., Times Bank Ltd., UTI Bank Ltd., Global Trust Bank Ltd., Bank of Punjab Ltd., The Benares State Bank Ltd., The Catholic Syrian Bank Ltd., The Dhanalakshmi Bank Ltd., The United Western Bank Ltd., Ganesh Bank of Kurundwad Ltd., The Nedungadi Bank Ltd. are not included in table 3 as these banks are no more in business as Private Sector Banks since 1999-2K.

From Table 3, high variation in CRAR can be observed as this ratio is more than 20 percent in some banks while this ratio was less than 3 percent in case of some other Private Sector Banks.

Table 4. Capital Adequacy Ratio of Foreign Banks (Figure in %age)

Sr. No.	Bank Name	Section I				Section II				
		1995-	1996-9	1997-	1998-9	1999-2	2000-	2001-	2002-0	2003-0
1	ABN-AMRO Bank N.V.	8.13	9.16	9.82	9.27	10.09	11.42	13.17	12.57	13.48
2	Abu Dhabi Commercial	8.65	9.47	10.29	10.01	10.65	10.05	10.42	10.14	14.22
3	American Express Bank	8.06	10.4	9.86	9.25	10.09	9.59	10.71	10.93	10.74
4	Arab Bangladesh Bank	-	122	144	124	123	96.34	138.5	105.64	111.34
5	Bank Internasional	-	27.46	28.03	57.26	59.92	103.6	123.0	103.99	133.94
6	Bank of America NT&SA	7.12	8.37	8.95	9.26	12.93	13.03	21.07	21.08	22.92
7	Bank of Bahrain and	18.93	17.1	10.48	13.38	12.3	11.83	17.03	17.19	21.06
8	Bank of Ceylon	68.61	48.98	40.05	37.05	29.07	36.49	30.94	32.29	45.26
9	Banque Nationale De	8.71	8.88	8.80	9.09	9.55	9.92	9.66	10.74	21.7
10	Barclays Bank PLC	9.56	11.62	14.52	12.90	17.75	26.97	63.56	45.68	37.16
11	Chinatrust Commercial	-	84.09	146.3	28.25	25.56	28.27	40.11	36.96	39.98
12	Citibank N.A.	10.1	9.46	8.61	10.0	10.62	11.24	11.04	11.3	11.11
13	Deutsche Bank AG	7.77	9.31	9.69	9.50	10.68	12.67	14.55	17.35	14.42
14	Krung Thai Bank	-	398.59	347.2	235.93	197.74	148.9	167.6	119.88	115.98
15	MashreqBank psc	10.97	17.52	29.84	12.13	9.04	10.54	20.54	39.38	54.71
16	Oman International Bank	8.71	12.36	13.38	9.07	11.08	14.21	18.86	14.62	16.48
17	Societe Generale	8.76	10.55	10.93	12.5	13.95	13.93	12.85	32.63	32.71
18	Sonali Bank	8.49	13.54	27.8	38.39	24.91	88.14	113.6	46.86	60.55
19	Standard Chartered Bank	15.62	8.60	8.50	8.30	9.5	9.6	9.28	10.56	10.87
20	State Bank of Mauritius	100.0	66.42	73.5	46.78	35.23	30.78	46.78	31.74	35.08
21	The Bank of Nova Scotia	9.19	8.23	10.3	9.06	9.67	9.97	10.12	13.38	13.78
22	The Bank of	8.54	8.88	8.73	9.92	17.62	15.51	15.36	30.4	32.78
23	The Development Bank of Singapore Ltd.	24.84	26.41	31.47	23.26	18.14	15.93	13.31	15.98	55.49
24	Antwerp Diamond Bank					-	-	-	92.69	53.22
25	Calyon Bank					29.07	36.49	11.23	20.04	24.51
26	HSBC Ltd.					10.3	10.37	10.92	18.1	14.54
27	JPMorgan Chase Bank					45.86	43.79	85.88	72.95	34.83
28	Mizuho Corporate Bank					25.29	18.38	11.14	18.5	36.09
29	Shinhan Bank					-	-	27.65	37.17	54.43]

* ANZ Grindlays Bank Ltd., Chase Manhattan Bank, Cho Hung Bank, The Sakura Bank Ltd., The Sanwa Bank Ltd., Toronto-Domonion Bank, Bank Muscat Internationa,l Morgan Guaranty Trust Co. of New York, K.B.C.Bank, N.V. The British Bank of Middle East, Sumitomo Bank Ltd., Oversea-Chinese Banking Corp. Ltd,.Siam Commercial Bank, Commercial Bank of Korea Ltd., Commerzbank AG, Credit Agricole Indosuez, Credit Lyonnais, Dresdner Bank AG, Fuji Bank Ltd.,.Hanil Bank, Hongkong Bank, ING Bank N.V. are not included in table 3 as these banks are no more in business as Foreign Banks since 1999-2K.

Table 4 presents the position of Capital Adequacy ratio of Foreign Banks from 1995-1996 to 2003-2004. This ratio was more than 8 percent in each Foreign Banks except Bank of America NT & SA. In case of some Foreign Banks this ratio was more than 100 percent as Capital Adequacy Ratio was 885.56 in case of Commercial Bank of Korea Ltd. at the end of year 1996-97. It is due to lack of management of capital in these Foreign Banks.

▉ Second Phase

Basel Committee on Banking Supervision issued the revised framework i.e. Basel II Norms on 26th June, 2004 but Basel II Norms has been implemented in Indian banks from March 2009. Starting 2013, banks across the world are implementing the Basel III Norms and Reserve Bank of India has announced the implementation of Basel III Norms in India from 1st April, 2013. To analyze the Basel Norms transformation into domestic regulation of Indian banks according to agreed international timelines and to identify the gap between regulation of banks and Basel Norms in India, time period from March 2005 to March 2013 has been included under second phase. Second phase is also analyzed

after dividing into two sections i.e. from March 2005 to March 2008 has been covered under first section and from March 2009 to March 2013 under second section. The Reserve Bank of India has announced the implementation of Basel II Norms in India for internationally active banks from March 2008 and for the domestic Commercial Banks from March 2009 which is taken as a base for categorization of time period of sections of second phase.

Table 5. Capital Adequacy Ratio of Nationalized Banks (Figure in %age)

Sr. No	Bank Name	Section I				Section II				
		2004-0	2005-0	2006-0	2007-0	2008-0	2009-1	2010-1	2011-1	2012-1
1	Allahabad Bank	12.53	13.37	12.52	12.04	13.1	13.62	12.96	12.83	11.03
2	Andhra Bank	12.11	14	11.33	11.61	13.2	13.93	14.38	13.18	11.76
3	Bank of Baroda	12.61	13.65	11.8	12.91	14.1	14.36	14.52	14.67	13.30
4	Bank of India	11.52	10.75	11.75	12.04	13.0	12.94	12.17	11.95	11.02
5	Bank of Maharashtra	12.68	11.27	12.06	10.26	12.1	12.78	13.35	12.43	12.59
6	Canara Bank	12.78	11.22	13.5	13.25	14.1	13.43	15.38	13.76	12.40
7	Central Bank of	12.15	11.03	10.4	10.42	13.1	12.23	11.64	12.40	11.49
8	Corporation Bank	16.23	13.92	12.76	12.09	13.6	15.37	14.11	13.00	12.33
9	Dena Bank	11.91	10.62	11.52	11.09	12.1	12.77	13.41	11.51	11.03
10	Indian Bank	14.14	13.19	14.14	12.86	14.0	12.71	13.56	13.47	13.08
11	Indian Overseas	14.2	13.04	13.27	11.96	13.2	14.78	14.55	13.32	11.85
12	Oriental Bank of	9.21	11.04	12.51	12.12	13.0	12.54	14.23	12.69	12.04
13	Punjab & Sind Bank	9.46	12.83	12.88	11.57	14.4	13.10	12.94	13.26	12.91
14	Punjab National	14.78	11.95	12.29	12.96	14.0	14.16	12.42	12.63	12.72
15	Syndicate Bank	10.7	11.73	11.74	11.22	12.7	12.70	13.04	12.24	12.59
16	UCO Bank	11.26	11.12	11.56	10.09	11.9	12.51	13.71	12.35	14.15
17	Union Bank of India	12.09	11.41	12.8	12.51	13.3	12.80	12.95	11.85	11.45
18	United Bank of	18.16	13.12	12.02	11.88	13.3	13.21	13.05	12.69	11.66
19	Vijaya Bank	12.92	11.94	11.21	11.22	13.2	12.50	13.88	13.06	11.32
20	IDBI Ltd	-	-	-	-	11.5	11.31	13.64	14.58	13.13

From the table – 5, it is observed that this ratio was more than 11 percent in each Nationalized Banks during the both sections of second phase which shows the strong position of Nationalized Banks.

Table 6. Capital Adequacy Ratio of State Bank Group (Figure in %age)

Sr. No	Bank Name	Section I				Section II				
		2004-	2005-	2006-0	2007-0	2008-	2009-	2010-1	2011-1	2012-
1	State Bank of India	12.45	11.88	12.34	12.64	11.5	14.9	11.98	13.86	12.92
2	State Bank of Bikaner &	12.6	12.08	12.89	12.51	14.3	13.39	11.68	13.76	12.16
3	State Bank of Hyderabad	11.74	12.08	12.51	12.35	14.5	13.3	14.25	13.56	12.36
4	State Bank of Indore	11.61	11.4	11.77	11.29	13.5	13.53	-	-	-
5	State Bank of Mysore	12.08	11.37	11.47	11.73	13.4	12.42	13.76	12.55	11.79
6	State Bank of Patiala	14.21	13.67	12.38	12.5	12.6	13.26	13.41	12.30	11.12
7	State Bank of Saurashtra	11.45	12.03	12.78	12.34					
8	State Bank of Travancore	11.05	11.15	11.68	12.68	14.0	13.74	12.54	13.55	11.70

From the table – 6, it is observed that this ratio was more than 11 percent in each bank of State Bank Group during the both sections of second phase. But CRAR has been decreased in case of each bank of State Bank Group at the end of year 2013 as compare to the previous year 2011-12.

Table 7. Capital Adequacy Ratio of Private Sector Banks (Figure in %age)

Sr. No.	Bank Name	Section I				Section II				
		2004-0	2005-06	2006-	2007-08	2008-	2009-1	2010-	2011-	2012-
1	Catholic Syrian Bank	11.35	11.26	9.58	10.87	12.3	10.82	11.22	11.08	12.29
2	City Union Bank Ltd.	12.18	12.33	12.58	12.48	12.7	13.46	12.75	12.57	13.98
3	Dhanalakshmi Bank Ltd.	10.16	9.75	9.77	9.21	15.4	12.99	11.80	9.49	11.06

Sr. No.	Bank Name	Section I				Section II				
		2004-0	2005-06	2006-	2007-08	2008-	2009-1	2010-	2011-	2012-
4	Federal Bank Ltd.	11.27	13.75	13.43	22.46	20.2	18.36	16.79	16.64	14.73
5	ING Vysya Bank Ltd.	9.09	10.67	10.56	10.20	11.7	14.91	12.94	14.00	13.24
6	Jammu & Kashmir Bank	15.15	13.52	13.24	12.8	14.5	15.89	13.72	13.36	12.83
7	Karnataka Bank Ltd.	14.16	11.78	11.03	12.17	13.5	12.37	13.33	12.84	13.22
8	Karur Vysya Bank Ltd.	16.07	14.79	14.51	12.58	14.9	14.49	14.41	14.33	14.41
9	Lakshmi Vilas Bank Ltd.	11.32	10.79	12.43	12.73	10.3	14.82	13.19	13.10	12.32
10	Nainital Bank Ltd.	14.85	13.88	12.89	12.32	13.1	15.68	16.35	15.09	14.43
11	Ratnakar Bank Ltd.	12.03	10.77	34.34	49.15	42.3	34.07	56.41	23.20	17.11
12	South Indian Bank Ltd.	9.89	13.02	11.08	13.80	14.8	15.39	14.01	14.00	13.91
13	Tamilnad Mercantile	19.74	18.33	16.77	15.35	16.1	15.54	15.13	14.69	15.01
14	Axis Bank	12.66	11.08	11.57	13.73	13.7	15.8	12.65	13.66	17.00
15	Development Credit	9.88	9.66	11.34	13.38	13.3	14.85	13.25	15.41	13.61
16	HDFC Bank	12.16	11.41	13.08	13.60	15.7	17.44	16.22	16.52	16.80
17	ICICI Bank	11.78	13.35	11.69	14.92	15.5	19.41	19.54	18.52	18.74
18	IndusInd Bank Ltd.	11.62	10.54	12.54	11.91	12.6	15.33	15.89	13.85	15.36
19	Kotak Mahindra Bank	12.80	11.27	13.46	18.65	20	18.35	19.92	17.52	16.05
20	Yes Bank Ltd.	18.81	16.4	13.6	13.6	16.6	20.6	16.50	17.90	18.30

* Bank of Rajasthan Ltd.,.Lord Krishna Bank Ltd., Sangli Bank Ltd., Centurion Bank of Punjab Ltd., SBI Commercial and IB Ltd. are not included in table 3 as these banks are no more in business as Private Sector Bansk since 2008-09.

Table 7 presents the position of Capital Adequacy Ratio of Private Sector Banks from 2004-05 to 2012-2013. In case of few Private Sector Banks, CRAR was more than 20 percent which show the strong position of Private Sector Banks. CAR of few Private Sector Banks during second section is above than the required ratio i.e. 9 percent as per Basel Norms. So it can be concluded that majority of Private Sector Banks has been complied with the statutory requirement of 9 percent Capital to Risk Weighted Assets Ratio.

Table 8. Capital Adequacy Ratio of Foreign Banks (Figure in %age)

Sr. No	Bank Name	Section I				Section II				
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	A B Bank Ltd.	109.39	86.21	100	43.09	50.7	30.01	30.57	34.36	19.10
2	Abu Dhabi	14.38	36.98	27.66	51.71	47.6	44.79	45.25	80.88	66.82
3	American	10.87	10.26	13	-	21.3	19.10	23.61	19.30	18.17
4	Antwerp	39.99	39.67	46.48	37.09	26.8	33.72	33.73	25.60	32.72
5	Bank of America	30.07	23.4	13.33	12.14	12.7	15.49	14.51	17.59	18.40
6	Bank of Bahrain	11.66	20.01	22	21.61	25.6	25.01	23.28	38.60	34.70
7	Bank of Ceylon	49.4	56.37	63.21	55.86	45.2	50.85	42.09	96.58	71.45
8	Bank of Nova	15.27	13.71	23.26	20.15	13.4	13.15	11.80	14.93	11.95
9	Bank of	32.1	33.38	30.71	26.87	29.5	68.16	58.67	51.60	44.53
10	Barclays Bank	20.85	22.92	13.68	21.11	17.1	16.99	14.89	14.99	19.09
11	BNP Paribas	9.41	11.61	10.76	11.79	12.4	15.78	11.92	14.70	13.82
12	Chinatrust	59.94	38.01	22.14	22.72	45.4	31.12	36.27	44.78	35.12
13	Citibank N.A.	10.78	11.33	11.06	12	13.2	18.14	17.31	16.03	15.90
14	DBS Bank Ltd.	35.06	31.33	29.24	18.15	15.7	16.96	14.98	14.38	12.99
15	Deutsche Bank	16.22	12.74	10.62	13.58	15.3	16.45	15.03	14.12	14.08
16	HSBC Ltd.	14.03	10.61	11.06	10.59	15.3	18.03	-	-	55.76
17	JPMorgan Chase	10.19	11.76	16.14	17.72	15.9	23.63	22.99	23.96	26.89
18	Krung Thai Bank	99.59	133.53	121.73	110.11	80.9	61.02	71.18	62.57	54.57
19	Mashreq Bank	60.14	136.92	97.06	52.81	76.8	78.21	59.07	55.37	49.62
20	Mizuho	28.76	65.76	34.4	27.8	37.6	38.98	87.25	60.27	48.11
21	Oman	13.52	9.58	10.99	23.09	25.2	41.08	45.64	52.01	-

Sr. No	Bank Name	Section I				Section II				
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
22	Shinhan Bank	55.31	81.71	89.26	48.66	36.8	40.85	50.73	40.26	34.48
23	Societe Generale	64.81	37.4	31.82	26.62	22.5	22.77	16.23	36.61	29.35
24	Sonali Bank	105.81	93.78	71.42	41.25	NA	20.03	21.60	16.81	12.91
25	Standard	10.46	9.93	10.44	10.59	11.6	12.41	11.88	11.05	13.00
26	State Bank of	31.06	35.42	38.99	41.13	38	34.40	45.66	39.02	55.01
27	Commonwealth					-	-	143.96	78.29	63.77
28	Credit Agricole					-	-	13.98	14.34	17.27
29	Credit Suisse AG					-	-	453.59	118.02	60.07
30	First Rand Bank					NA	74.73	94.81	61.47	47.84
31	Hongkong & Shanghai Banking Corporation					-	-	-	-	17.10
32	Industrial and Commercial Bank of China					-	-	18.03	16.04	69.43
33	Australia and					-	-	..	25.50	26.39
34	JSC VTB Bank					371.9	225.93	123.59	86.96	66.45
35	National					-	-	0.00	423.74	96.08
36	Rabobank					-	-	..	123.86	70.34
37	Royal Bank					NA	12.50	11.65	12.46	14.50
38	Sberbank					-	-	..	329.86	193.98
39	Sumitomo Mitsui					-	-	-	-	625.69
40	USB AG					229.4	157.86	90.01	53.75	52.86
41	United Overseas					-	-	341.49	306.12	154.76
42	Westpac Banking					-	-	-	-	280.06
43	Woori Bank					-	-	..	421.70	163.28

* ABN-AMRO Bank, N.V.Bank Internasional Indonesia, Calyon Bank are not included in table 3 as these banks are no more in business as Foreign Banks since 2008-09.

Table 8 presents the position of Capital Adequacy Ratio of Foreign Banks from 2004-05 to 2012-2013. Variation in Capital Adequacy Ratio of Foreign Banks can be observed as CAR was above 100 percent in case of few Foreign Banks while it is less than 10 percent in case of some other Foreign Banks.

Third Phase

It was agreed upon by the members of the Basel Committee on Banking Supervision in 2010–11, and was scheduled to be introduced from 2013 until 2015; however, changes from 1 April 2013 extended implementation until 31 March 2018 and again extended to 31 March 2019. Basel III was supposed to strengthen bank capital requirements by increasing bank liquidity and decreasing bank leverage. Though the Basel III norms, as an international accounting standard for banks, were to come into force from Jan 1, the central bank of India rescheduled them to April 1, giving Indian banks three months to improve their capital adequacy in conformity with the new norms. CAR as per Basel III norms has been calculated and published by Scheduled Commercial Banks for the year ended 31st March 2014 which are given in following tables.

Table 9. Capital Adequacy Ratio of Nationalized Banks (Figure in %age)

Sr. No.	Bank Name	2013-14	Sr. No.	Bank Name	2013-14	Sr. No.	Bank Name	2013-14
1	Allahabad Bank	9.96	8	Corporation Bank	11.65	15	Syndicate Bank	11.41
2	Andhra Bank	10.78	9	Dena Bank	11.14	16	Union Bank of India	10.80
3	Bank of Baroda	12.28	10	Indian Bank	12.64	17	United Bank of India	9.81

Sr. No.	Bank Name	2013-14	Sr. No.	Bank Name	2013-14	Sr. No.	Bank Name	2013-14
4	Bank of India	9.97	11	Indian Overseas Bank	10.78	18	UCO Bank	12.68
5	Bank of Maharashtra	10.79	12	Oriental Bank of Commerce	11.01	19	Vijaya Bank	10.56
6	Canara Bank	10.63	13	Punjab & Sind Bank	11.04	20	IDBI Bank Ltd.	11.68
7	Central Bank of India	9.87	14	Punjab National Bank	11.52			

Table 9 presents the position of Capital Adequacy Ratio as per Basel III Norms of Nationalized banks. This ratio is more than 10.5 percent in majority of the Nationalized Bank Group which is more than minimum capital requirement of 8% as per internationally accepted norms and 9% as per RBI guidelines. Although the minimum total capital requirement is remain at the current 8% level, yet the required total capital has increased up to 10.5% when combined with the conservation buffer which is not fulfilled by four Nationalized Banks.

Table 10. Capital Adequacy Ratio of State Bank Group (Figure in %age)

Sr.	Bank Group	2013-14	Sr. No	Bank Group	2013-14
1	State Bank of Bikaner and	11.55	4	State Bank of	11.08
2	State Bank of Hyderabad	12	5	State Bank of Patiala	10.38
3	State Bank of India	12.44	6	State Bank of	10.79

Table 10 presents the position of Capital Adequacy Ratio as per Basel III Norms of State Bank Group. This ratio is more than 10.5 percent in each bank of the State Bank Group which is more than minimum capital requirement as per Basel III norms except State Bank of Patiala.

Table 11. Capital Adequacy Ratio of Private Sector Banks (Figure in %age)

Sr. No	Old Private Sector Banks	2013-14	Sr. No	Old Private Sector Banks	2013-14	Sr. No	New Private Sector Banks	2013-14
1	Catholic Syrian Bank	11.00	8	Karur Vysya Bank	12.59	1	Axis Bank	16.07
2	City Union Bank	15.01	9	Lakshmi Vilas Bank	10.90	2	Development	13.71
3	Dhanalakashmi Bank	8.67	10	Nainital Bank Ltd.	15.13	3	HDFC Bank	16.07
4	Federal Bank Ltd.	15.14	11	Ratnakar Bank Ltd.	14.64	4	ICICI Bank	17.70
5	ING Vysya Bank	16.76	12	South Indian Bank	12.42	5	Induslnd Bank	13.83
6	Jammu & Kashmir	12.69	13	Tamilnad	15.59	6	Kotak Mahindra	18.83
7	Karnataka Bank Ltd.	13.20				7	Yes Bank	14.40

From the Table 11, it is observed that Capital Adequacy Ratio as per Basel III Norms is more than 10.5 percent in each bank of the Old Private Sector Bank Group except Dhanalakashmi Bank Ltd. and CAR is more than 13 percent in case of each New Private Sector Bank which is more than minimum capital adequacy ratio requirement of 10.5 percent as per Basel III norms.

Table 12. Capital Adequacy Ratio of Foreign Banks (Figure in %age)

Sr. No.	Name of Bank	2013-14	Sr. No.	Name of Bank	2013-14	Sr. No.	Name of Bank	2013-14
1	AB Bank Ltd.	29.10	16	Commonwealth Bank of Australia	--	31	Rabobank International	39.04
2	Abu Dhabi Commercial Bank Ltd.	35.92	17	Credit Agricole	35.59	32	Royal Bank Scotland	15.32
3	American Express Bank Ltd.	16.56	18	Credit Suisse AG	19.36	33	Sberbank	51.92
4	Antwerp Diamond Bank	34.19	19	DBS Bank Ltd.	19.93	34	Shinhan Bank	46.24
5	Australia And New Zealand Banking Group	30.82	20	Deutsche Bank AG	13.81	35	Societe Generale	30.26
6	Bank International	--	21	First Rand Bank	14.84	36	Sonali Bank	12.12

Sr. No.	Name of Bank	2013-14	Sr. No.	Name of Bank	2013-14	Sr. No.	Name of Bank	2013-14
7	Bank of America NA	16.70	22	Hongkong & Shanghai Banking Corporation	40.53	37	Standard Chartered Bank	12.48
8	Bank of Bahrain and Kuwait B.S.C	33.57	23	Industrial And Commercial Bank of China	17.36	38	State Bank of Mauritius Ltd.	39.47
9	Bank of Ceylon	55.72	24	JP Morgan Chase Bank	--	39	Sumitomo Mitsui Banking Corporation	80.12
10	Bank of Nova Scotia	--	25	JSC VTB Bank	--	40	USB AG	247.28
11	Bank of Tokyo-Mitsubishi Ltd.	39.15	26	Krung Thai Bank Public Co. Ltd.	--	41	United Overseas Bank	90.07
12	Barclays Bank PLC	19.72	27	Mashreqbank psc	--	42	Westpac Banking Corporation	43.67
13	BNP Paribas	13.89	28	Mizuho Corporate Bank Ltd.	--	43	Woori Bank	141.52
14	China Trust Commercial Bank	45.55	29	National Australia Bank	201.85			
15	Citibank N.A.	16.49	30	Oman International Bank S.A.O.G.	70.01			

It is observed from the Table 12 that CAR is more than 12 percent in case of each Foreign Bank which is more than minimum capital adequacy ratio requirement of 10.5 percent as per Basel III norms. Position of Capital Adequacy Ratio seems to be highly volatile in case of Foreign Banks as Capital Adequacy Ratio is above 100 percent in case of few Foreign Banks while less than 13 percent in case of some other Foreign Banks.

Comparative distribution of Scheduled Commercial Banks during different phases has been given in Table13.

Table 13. Scheduled Commercial Banks – Summarized Status of CRAR during Different Phases

CRAR	First Phase				Second Phase				Third Phase	
	Section I	Section II	Total	%age	Section I	Section	Total	%age	Total	%age
Less than 8	6	2	8	4	1	-	1	1	-	0
8 to 10	27	4	31	17	3	-	3	2	5	6
10 to 12	23	24	47	25	24	3	27	17	19	21
Above 12	48	51	99	54	53	71	124	80	65	73
Total	106	81	187	100	81	74	155	100	89	100

*Number of Banks is counted on the basis of average CAR of study period

From the table 13 it is observed that Scheduled Commercial Banks has performed well during second phase as compare to first phase and third phase. In second phase 80 percent banks has obtained CRAR above 12 percent while it is 73 percent in case of third phase and 54 percent in first phase. On the basis of number of Scheduled Commercial Banks falling in category of above 12 percent CRAR it can be concluded that the position of CRAR in Scheduled Commercial Banks has improved in second phase as compare to first phase. During third phase majority of Scheduled Commercial Banks has more than 12 percent CAR which is above than minimum capital adequacy requirement as per Basel III norms.

CONCLUSION

Capital to risk-weighted assets system was introduced for banks in India since April 1992, largely in conformity with international standards, under which banks were required to achieve 8 per cent capital to risk-assets ratio. Basel II Norms has been implemented in Indian Banks since 2008 while BCBS issued the guidelines about it in 2004. Indian Scheduled Commercial Banks are implementing Basel III Norms since April, 2013 with 3 months delay as these norms have been implemented worldwide since January, 2013. The distribution of Scheduled Commercial Banks has shown an increasing trend for above 12 percent CRAR during the second phase. During third phase all Scheduled Commercial Banks are meeting minimum capital adequacy requirement as per Basel III norms and also majority of Scheduled Commercial Banks are meeting 10.5 percent limit of CAR. On

the basis of position of CRAR in Indian Scheduled Commercial banks, it is observed that Basel Norms has been implemented in Indian banks since 1992 and meeting the Indian as well as international standards meant for in this regard.

REFERENCES

Sarma Mandira and Nikaido Yuko (2007), "Capital Adequacy Regime in India", Indian Council for Research on International Economic Relations, Working Paper No. 196.

Ratna Bharat (2008), "NBFCs Capital Adequacy Norms Tightened", The India Street available at www.bis.org.

Ghosh saibal and Das Abhiman (2005), "Market Discipline, Capital Adequacy and Bank Behaviour", Economic and Political Weekly, pp. 1210-1215.

Bandyopadhyay, Arindam (2006), "Pridicting Probability of Default of Indian Corporate Bonds: Logistic and Z Score Model Approaches", The Journal of Risk Finance, Vol. 7, No-3, pp. 255-272.

Nitsure Rege Pura (2005), "Basel II Norms-Emerging Market Perspective with Indian Focus", Economic and Political Weekly, pp. 1162-1166.

Sen Sunanda and Ghosh Soumya Kanti (2005), "Basel Norms, Indian Banking Sector and Impact on Credit to SMEs and the Poor", Economic and Political Weekly, pp. 1167-1171.

Rajeev R.S (2004), "Basel II-Issues and Constraints", IBA Bulletin, pp. 1-6.

Ganti Subrahmanyam (2004), "Capital Adequacy Norms-Aggravate Banks' Regulatory Burden", The Journal of the Indian Institute of Bankers, pp. 182-184.

Dash Parvesh Chander (2006), "Capital Adequacy Ratio-Issues in India", Banking, pp. 52-54.

Raghavan R.S. (2008), "Basel II, The Way Forward for Banks", The Chartered Accountant, pp. 1767-1774.

Ferguson Roger W. (2001), "Credit Risk Management- Models and Judgement", PNB Monthly Review, Vol.-23, No – 10, pp. 23-31.

Froot, Kenneth A., and Jeremy C. Stein (1998), "Risk Management, Capital Budgeting and Capital Structure Policy for Financial Institutions: An Integrated Approach", Journal of Financial Economies, 47, pp. 55-82.

Gambhir N. Santosh (2007), "Basel II – Are Indian Banks Going to Gain", Jamanala Bajaj Institute of Management Studies, Mumbai.

Nachane D M, Ghosh Saibal and Ray Partha (2006), "Basel II and Bank Lending Behaviour", Economic and Political Weekly, pp. 1053-1058.

Basel Committee on Banking Supervision (1996), "Amendments to the Capital Accord to Incorporate Market risk" available at www.bis.org.

Reserve Bank of India (2006), "Reserve Bank of India Annual Report 2005-06", available at www.rbi.org.in.

Reserve Bank of India (2007), "Revised Draft Guidelines for Implementation of the New Capital Adequacy Framework", RBI Circular DBOD No. BP.

Determinants of Capital Structure – An Indian Case Study Using Artificial Neural Network

Palanisamy Saravanan, Suhas M Avabruth
Indian Institute of Management, Shillong
India

ABSTRACT

The capital structure is one of the highly researched topics in the field of corporate finance but the amount of empirical study done on Indian markets is sparse. Amongst the available studies, majority of the studies have been conducted on the assumption of the linear relationship between debt equity choice and variables of interest. In tour current work, we have used Artificial Neural Networks (ANN) as the tool for estimating the relationship which is a model free estimate and lead to better estimation of the relationship. Our investigation shows that long term debt scaled by the total assets as the best measure to determine the capital structure of the Indian firms and the factors affecting the capital structure of the firms in India are not much different from the developed markets as most of the borrowings were transacted through banks and financial institutions the factors such as size, profitability, collateral value etc. have been found to be of the utmost important variables in determining the capital structure of the firms.

INTRODUCTION

The puzzle of capital structure is not new to finance world. Many theories such as Modigliani and Millers'(1958) irrelevance of capital structure, pecking order theory of Mayers and Majluf (1984) , and Jensen's free cash flow approach (1986)   which argues for the relevance of the capital structure based on agency cost and its effect has been proposed to explain the behavior and the determinants of the capital structure. Every theory tries to explain the relevance, irrelevance and the determinants of the capital structure in its own ways and hence Mayers(2003) suggests that there is no universal capital structure because it is conditional in nature.

Capital structure in its essence is the mix of various debt and ownership bearing securities to achieve the optimum mix of financing which will result in the maximization of the shareholders' value (Brealey and Myers, 2003). Inspite of being one of the major areas of corporate finance, most of the studies done on capital structure are limited to the developed countries. To cite a few empirical studies, Rajan and Zingales(1995) studied the capital structure of the G-7 countries observed that the capital structures of these countries are similar. They further concluded that in the developed countries the debt ratios increases with the size and the asset structure but it tends to decrease with the profitability and the growth opportunity. According to Mayer(1990) financial decisions made by the developing countries are somewhat different from the developed countries. Booth, et al. (2001) studied the capital structure of ten developing countries (Brazil, Mexico, India, South Korea, Jordan, Malaysia, Pakistan, Thailand, Turkey and Zimbabwe) and noted that the capital structure of the developing countries are affected by the same factors as that of the developed countries, however they expressed some skepticism as the relationship between the cause and the effect was not as strong as that of developed countries and for some countries the signs were different. Even in developing markets there is a large disparity on the work done on capital structure (Boquist & Moore, 1984 ;DeAngelo & Masulis, 1980;Harris & Raviv, 1991). Most of the studies (Hsiao-Tien & Yao-Yu, 2005;Chang, et al., 2009;Wiwattanakantang, 1999; Pandey, 2004) have been done in Malaysia, Thailand and China and the number of works dedicated to the capital structure of the Indian companies is sparse. Garg and Shekhar (2002) studied the capital structure of four industries and concluded that the factors affecting the capital structure are different from that of the studies done on the developed market. They found that asset composition, collateral value, size and age of the company as the major determinant of the capital structure in India and also concluded that the business risk has no significant effect on the capital structure. Bhaduri (2002) studied 363 manufacturing firms in India and found a different result stating that uniqueness of the firm and industry as the consistent variables in estimating the capital structure. However, the above study showed some of the variables which are perceived to be significant such as collateral value of the assets and growth as insignificant.   The reason for the lesser empirical work on the capital structure with respect to developing country especially India could be due to lenient disclosure norms of the listed firms (of late stringent disclosure norms were imposed by the regulators) leading to non-availability of data and the under-developed capital and bond markets.

Another limitation of the capital structure studies is most of the studies (((Booth, et al., 2001;Garg & Shekhar, 2002; Bhaduri, 2002) conducted on the capital structure are based on the assumption of a linear relationship between variables of interest and debt equity ratio which is captured through regression equation when in only one unique variable has been used as a proxy

dependent variable to measure the capital structure of the firm. This might lead to measurement errors in estimation, drawing erroneous conclusions about the capital structure and its determinants (Chang, et al., 2009). Titman and Wessels (1988) discussed some of the problems associated with the use of single proxy variable when there are many different proxy variables to represent the same, the researcher might be tempted to select a particular variable which gives the best fit estimate resulting in a bias in the measurement. In case, the selected proxy is an imperfect representation of the attribute then the regression might produce measurement errors and can also lead to spurious correlations. In our work, we have used of the Artificial Neural Network (ANN) model as neural networks are the better tools for modelling the time series modelling and forecasting, and they do not impose any restrictions on the data and tries to capture the relationship by learning from the data and particularly useful in capturing the nonlinear relationship in the data (Saxen, 1996).

DETERMINANTS OF CAPITAL STRUCTURE

Capital structure is the effect caused by the determinants which can be modelled as a causal relationship between the determinants and the capital structure (Chang, et al., 2009). Market value based debt ratios and the book value based ratios have been used by many researchers (Titman & Wessels, 1988) as the measure of the capital structure and hence we were considering both the market and book value based measure of capital structure. Since the corporate debt market is not developed in India, majority of the debt by the Indian firms are from the banks and only few debt instruments are issued to the public (not traded regularly) leading to no significant difference between the market value of the debt and the book value of the debt. As a result, while calculating the market value based ratios we have used the book value of the debt for measuring the amount debt and the market value of the firm was used as a proxy to measure the market value of the assets.

Titman and Wessels(1988) summarized eight variables which act as a determinants of the capital structure. They are growth, uniqueness, non-debt tax shield, asset collateral value, volatility of earnings, profitability, industry and the size of the company. Harris and Raviv (1991) in their paper found that the consensus has been reached on the fact that leverage increases with the fixed costs, non-debt tax shield, investment opportunities and firm size and decreases with the volatility, probability of bankruptcy and uniqueness of the product. We have used proxies for the above mentioned variables and liquidity, management efficiency, age of the company and the promoter holding as other independent variables in our current work.

▌ Profitability

Relationship between profitability and the capital structure differs based on the various theories proposed (Modigliani & Miller, 1963;Jensen, 1986;Williamson, 1988) to explain the capital structure. Modigliani and Miller (1963) expected a positive relationship between the capital structure and the profitability of the firm because with the increase in profitability, firms try to reduce the burden of tax by increasing the debt in the balance sheet as the payment of interest by the firm will qualify them for the tax rebate. Jensen (1986) and Williamson (1988) considered debt as a disciplinary mechanism to ensure discipline amongst the managers by forcing them to go for efficient projects as debt require a mandatory payment of interest to the bond holders and hence firms with higher profitability tend to have higher debt to ensure discipline amongst the managers resulting in a positive relationship between debt and profitability. Mayers and Majluf (1984) suggested that firms would depend on the internally generated funds for their expansion as the external funds involves higher costs. This indicates a negative relationship between profitability and the capital structure of the firm which was supported by the empirical studies (Kester, 1986; Titman & Wessels, 1988; Rajan and Zingales, 1995). Fama and French (1998) argued that higher degree of leverage results in higher agency costs for the shareholders and hence results in a negative relationship between the profitability and the tax benefits which was also empirically supported (Graham, 2000). In the Indian context, Chakraborty (2010) found evidence of negative relationship between the capital structure and profitability. In our research we expect the profitability to be significantly associated with both the short term debt and the long term debt ratios in an inverse manner as observed by the various researchers across the world.

Titman and Wessels (1988) and Chang, et al. (2009) defined profitability in terms of return on assets (Operating profit/ Total Assets) and also in terms of operating profit margin (Operating Profit/ Sales). We have adopted the same to define profitability. Along with these ratios we have used the cash flow based cash profit scaled by total assets as a measure of cash generating capacity of the company. Bhaduri (2002) had used the similar variable in his study. We believe cash profit to be a better indicator than the usual profitability ratios as they clearly indicate the additional money available with the company for the future investments.

▌ Size of the Company

The relationship between size and capital structure suggests a positive relationship as larger firms tend to be more diversified and hence they are less prone to bankruptcy (Titman and Wessels,

1988) resulting in higher debt ratios in the larger firms when compared to the smaller firms leading to a positive relationship between the size and the debt ratios. The empirical studies (Rajan and Zingales, 1995; Booth, et al., 2001; Hsiao-Tien and Yao-Yu, 2005) for both developed markets and the emerging markets suggest a positive relationship between the debt and the capital structure and hence we also expect to find a positive and significant relationship between the size of the company and the debt. We have used of both log of sales and assets as a proxy for the size of the company.

Volatility

With the increase in the volatility of earnings, the debt ratios tend to go down resulting in a negative relationship between the earnings volatility and the debt ratios of the firm. However, Titman and Wessels (1988) could not found any significant relationship between the earnings volatility and the capital structure. Thies and Clock (1992) established a cross sectional relationship between the volatility and the debt ratios and Chang, et al. (2009) observed a significant negative relationship between the earnings volatility and the debt ratios in the developing economies Titman and Wessels (1988) used standard deviation of the percentage change in the operating income as the measure of volatility. Chang, et al.(2009) used standard deviation of percentage changes in operating income (SDGOI), coefficient of variation of return on assets (CVROA), coefficient of variation of return on equity (CVROE) and coefficient of variation of operating income over total assets (CVOITA) as the measure of volatility and found a significant negative relationship between the SDGOI, CVROA, CVOITA and the debt ratios. In our work, we incorporated both the earnings volatility as well as the volatility of the cash flows. Volatility of the earnings were measured as a standard deviation of the percentage changes in operating income whereas volatility of the cash flows were measured as a   coefficient of variation of the cash profit as a percentage of total income. We expect to find negative relationship between the volatility and the debt ratios of the company.

Non Debt Tax Shield

DeAngelo and Masulis (1980) were the first to discuss the effect of non-debt tax shields on the capital structure. They argued that large amount of non-debt tax shield such as depreciation, depletion and investment tax credits will act as a substitute for the debt tax shield and hence variations in the debt ratios can be explained with the help of non debt tax shields. The claim of DeAngelo and Masulis (1980) has been supported by the study conducted by Bowen, et al. (1982). However study conducted by Boquist and Moore (1984) found evidence contrary to the hypothesis of DeAngelo and Masulis (1980). Titman and Wessels (1988) used direct estimate of a non-debt tax shield using income tax payment, operating income and interest apart from the two suggested by the DeAngelo and Masulis (1980). Fama and French (2002) used only depreciation scaled by total assets as the measure of the non-debt tax shield. In our work, we have used depreciation scaled by the fixed assets as the measure of the non-debt tax shield. Similar to other empirical findings, we expect to find a significant negative relationship between the non-debt tax shield and the debt ratios.

Collateral Value Assets

Mayers and Majluf (1984) observed that companies with higher collateral value of assets tend to take up higher debt to take advantage of the lower cost resulting in a positive relationship between the collateral value and the debt ratios. Grossman and Heart (1982) argued for debt as a control mechanism and said the managers in the firm with higher levels of debt will consume lower perquisites due to the increased risk of bankruptcy and the close monitoring by the bond holders. Hence to maintain control over the managers, firm with lower amount of collateral value will issue higher debt. This leads to a negative relationship between the debt ratios and the collateral value. Many researchers (Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth, et al., 2001; Chang, et al., 2009) found a significant positive result between the collateral value and the debt ratios. In our work,   we have measured the collateral value of the asset through two variables namely a) The inventory plus the gross plant and equipment scaled by the total assets and b) log of tangible assets. We expect to find a significant positive relationship between the collateral value of the assets and the debt ratios.

Growth

Titman and Wessels, (1988) noted that growth opportunities are capital assets which cannot be collateralized and hence a negative relationship should be expected between the growth and the capital structure. Mayers (1977) suggested that the agency problem can be reduced by the growth companies by substituting long-term debt with the short-term debt which would result in a positive relationship between the short-term debt and the capital structure. The empirical evidence on the above arguments is mixed. Rajan and Zingales (1995) observed a negative relationship between the growth measured by market to book value ratio and debt ratios. However, they also point to an anomaly between the findings and the theory as according to the capital structure theories the

negative relationship between the growth and the capital structure should be driven by the low market to book value ratios whereas the findings point towards the negative relationship driven by the high market to book value ratio companies. Harris and Raviv (1991) and Frank and Goyal (2009) found a positive relationship between the growth and the capital structure. A study by Beven and Danbolt (2004) concluded an insignificant relationship between the growth and the capital structure with respect to the UK companies. In our work, we have used market to book value ratio as the measure of the leverage. We expect to find a negative relationship between the market to book value ratio and the leverage.

Management Efficiency

According to Jensen and Meckling (1976) an agency relationship is one where one person (principal) engages the other (agent) to perform duties and obligations on behalf of him. Since agent usually responds to the incentives and not towards the gains of the principal, use of debt has been proposed as a disciplinary mechanism to control the managers and to prohibit the managers from making suboptimal investments. The above view has been supported (Hart, 1993; Stulz, 1990) and Milton and Raviv (1990) have further argued that debt will force the managers to liquidate the operations which are suboptimal in creating the value. Asset turnover has been used by Ang, et al. (2000) as a measure of the efficiency with which the assets are used. They argued that asset turnover should be negatively related with the leverage ratio as with the improvement in asset turnover the agency cost especially the monitoring cost should come down. In our analysis we use inventory holding period which shows the operational efficiency of the management and asset turnover as the measure of management efficiency. We expect to find a negative relationship between asset turnover and the leverage ratios and also between the inventory holding period and the leverage ratios.

Short Term liquidity

Short term liquidity is one of the factors which is always looked into while financing of the loans. It determines the firm's ability to meet the payment of interest on the loan. Companies with higher short term liquidity can improve the borrowing capacity because it reduces the probability of short-term insolvency. Williamson (1988) and Shleifer and Vishny (1992) argued that asset liquidity increases the optimum leverage by reducing the monitoring cost and the distress costs. We believe the same explanation can be extended to short term assets. Mayers and Rajan (1998) argue that sometimes the asset liquidity reduces the firm's ability to borrow and excess liquidity might lead to financing of illiquid projects, hence expecting more of a nonlinear relationship between the liquidity and the capital structure. Most of the empirical studies ((Mayers & Rajan, 1998) have used the liquidity index to measure the asset liquidity, but since we are more concerned with the short-term liquidity of the company we have used the following ratios such as current ratio (current asset/ current liability), cash ratio (cash/current assets) and receivables recovery period (365/ Debtors turnover) as the measure of short term liquidity. We believe to find strong negative relationship between the short term liquidity and the short term debt ratios as short term debts are usually taken to finance the day to day operations of the company. We expect to find a positive relationship between the long-term debt ratios and the short term liquidity as with improvement in the short term solvency the risk of insolvency goes down and lenders will be willing to lend higher amount of credit to the company. The other explanation for the positive relationship can be drawn from Jensen's (1986) free cash flow approach, i.e. to avoid the managers from taking non optimal investments; debt might be employed as a control mechanism to avoid the empire building activity.

Industry Classification

Every industry has different requirement of capital and the method of financing differs from industry to industry based on the cash flow structure. Scott (1972) was the first to account for the differences in capital structure amongst the industries and he noted that the differences are mainly due to the different levels of business risks associated with the industry. Bowen et al. (1982) in their cross industry study noted that even though the companies in the same industry can have different capital structure but they exhibit a mean reversion property where they tend to move towards the industry average with the lapse of time. Titman and Wessels (1988) and Chang, et al. (2009) used two category dummy variables to represent the industry classification. We believe classifying the industry into only two categories is too broad and hence we have used the National Industrial Classification (NIC) codes, developed by Government of India, to classify the firms into various industries. We expect to find a significant relationship between the industry and the debt ratios.

Age

The age and the size of the firm usually go hand in hand. Petersen and Rajan (1994) empirically showed that the availability of funds to the firm increases with the aging of the relationship with the lender. They also showed that the leverage of the company decreases with age and increases with the size as the company grows in age it tends to accumulate more and more retained earnings and the new firms usually depend upon external financing for their fund

requirements. Bhaduri (2002) used a dichotomous variable where the firms below 20 years were assigned a value of 1 and otherwise zero. We believe the effect of the age on the capital structure tends to go down as the company matures hence instead of taking the age as a dichotomous variable or taking it directly, we have categorize it into various classes and used the same as an independent variable. We expect to find a negative relationship between the age and the capital structure of the firm.

▌Promoter Holdings

Diversified ownership is a rare case in the developing economies (Khanna, et al., 1997). Most of the firms are owned by conglomerates or as a family owned businesses. Conglomerates and family owned businesses maintain control of their businesses and hence they normally finance the investments by internally generated funds or through debt. Hence we believe that there is a significant positive relationship between the capital structure and the ownership pattern. It has also been argued that the conglomerates and the family owned businesses are prone to carry inefficient investments (Rajan, et al., 2000) and hence the lenders might be reluctant to lend funds to these businesses resulting in a negative relationship between the leverage and the promoter holdings. In our work, we have not categorized the business into a conglomerate or family owned rather we followed a simplistic approach of looking at the promoter stake and if the promoter has a significant control (equity of more than 51%) then we will code it as one and otherwise zero.

Table-1. The model describing the constructs, proxies for the construct and the expected relationship

Constructs	Proxies	Expected Relation
Profitability	Operating Profit/Total Assets (OP/TA)	Negative
	Operating Profit/Total Sales (OP/S)	
	Cash Profit/Total Assets (CP/TA)	
Size	Log of Sales (Log S)	Positive
	Log of Total Assets (Log TA)	
Volatility	Standard deviation of the percentage change in operating profit (STDOP)	Negative
	Coefficient of variation of cash profit as a percentage of total income (CVCPTI)	
	Coefficient of Variation of the Return on Assets (CVROA)	
Non Debt Tax Shield	Depreciation (DEP)	Negative
Collateral Value of Assets	Inventory plus Gross P&M/ Total Assets (COLV/TA)	Positive
	Log of Tangible Assets (Long term assets excluding intangible assets) (Log TAN)	
Growth	Price to Book Value Ratio (PB)	Negative
Management Efficiency	Asset Turnover Ratio	Negative
	Inventory Holding Period	
Short term Liquidity	Current Ratio	Short term Debts (Negetive) and Long term Debt (Positive)
	Cash Ratio	
	Receivable Recovery Period	
Industry Classification	NIC Codes (2 Digits)	
Age	Class interval of Age	Negative
Promoter Holdings	Promoter Holding	Negative
	Effect (Dependent Variable)	
Capital Structure	Long-term debt scaled by Total Assets (LD/TA)	
	Long-term debt scaled by Market Value (LD/MV)	
	Short-term Debt Scaled By Total Assets (SD/TA)	
	Short-term debt scaled by Market Value (LD/TA)	

METHODOLOGY

▌Sample Size and Source of Data:

The data were collected for 500 firms which are part and parcel of Bombay Stock Exchange 500 Index which is a sub-index of BSE-Sensex. After excluding those firms which are involved in financial services and cleansing the data for non-availability of information we were left with 250 firms for which data has been collected for 13 years from 2000 to 2012. Since we are using the standard deviation and coefficient of variation which are computed based on a three year moving average and for one dependent variable change in operating profit is used a total of three years data

is lost and we are left with the data for a period of 2003 to 2012 which gives us a total of 2500 data points (250*10). The data set has been divided into 3 parts i.e. training, validation and testing. 70% of the data has been used for training the neural network and 15% of the data has been used for validation and the rest 30% has been used to test the predictive ability of the neural network. Training data has been used completely for training the network and the network will be adjusted according to the error. Validation data set has been used for generalizing the network and testing an independent set and gives the performance ability of the network. The major source of data for our work has been collected from Centre for Monitoring Indian Economy (CMIE) PROWESS, one of the renowned databases for company specific information and it is maintained by Credit Rating and Information Services of India Limited (CRISIL)

Engagement of ANN

Artificial Neural Networks (ANN) is used in many fields ranging from medicine to finance. They have become a viable and robust computational tool. Development of ANN has been motivated by the working of the human brain and its ability to handle complex and nonlinear tasks. ANN is a massively parallel distributed processors that has the propensity for storing experiential knowledge and making it available for use (IBM, 2011). Many studies (Olden and Jackson, 2002; Hsiao-Tien and Yao-Yu, 2005) have shown the superiority of the neural networks in prediction and forecasting.

Until recently linear models had dominated the field of forecasting. When compared to nonlinear models, the linear models can be developed easily and interpretation of the linear models is also easier to understand. This advantage of the linear model is also one of its major limitations. Makridakis et al. (1982) conducted competition of majorly used linear forecasting methods on more than 1000 real time series and concluded that no single linear forecasting method can be considered as the best method of forecasting. On contrary to the above, ANN has the ability to work parallel with the independent and the dependent variable and its versatility helps in better recognition of the patterns making it a model free estimate. ANN can handle both the linear and nonlinear variables and the linear & nonlinear process makes it a better predictor than the regression estimates. The superiority of the ANN as a method of prediction has been demonstrated by Hsiao-Tien and Yao-Yu, 2005; Pao, 2008, where the comparison of various regression methods of estimation was made with ANN with respect to the capital structure of the Taiwanese companies and it was found that the model based on ANN performed better in estimating the capital structure compared with all other regression methods of estimation.

Structure of Neural Network

The neural network consists of input layer which consists of the predictors or the independent variables, hidden layers which will have multiple neurons and the output layers which consist of the responses. The connection between the neurons is referred to as the synaptic weights and indicates the strength of the relationship. It is usually determined as some function of the predictor based on the network and the user controlled specifications. The user can decide the network architecture based on the problem that needs to be addressed. In our analysis we make use of a one hidden layer feed forward neural network trained by the backpropagation algorithm Figure – 1 shows the basic model that has been used by us in modelling the capital structure.
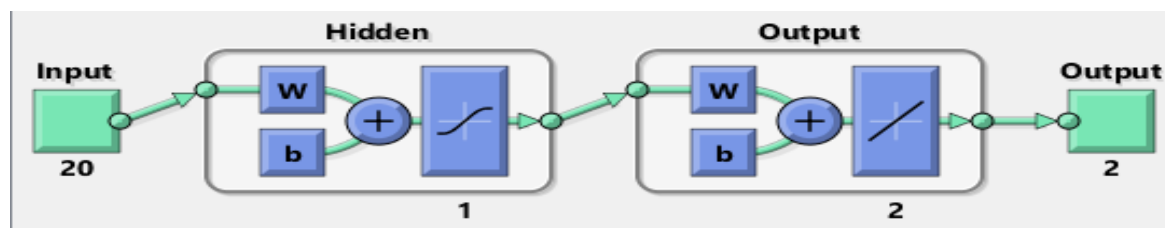

Figure-1. Structure of the Artificial Neural Network

Neural network, even after being a robust technique for modelling the complex real world problems is still referred as a black Box as it does not provide much insight into the explanatory powers of the independent variable (Olden, et al., 2004). In the same paper they suggested that the connection weight methodology as the best method for analyzing the sensitivity of the variable. In our research we will employ the same methodology to find out the importance of the independent variable. To check the suitability of the model we will make use of a correlation between the actual and the predicted values and we will also use mean squared error.

ANALYSIS AND DISCUSSION

Table-2 gives the descriptive statistics of the variables in consideration. The average return on

assets for all the companies put together is more than 20% and operating profit margin is more than 7% and the companies are also generating a cash profit of more than 13%, which is a typical feature in any developing economy. Amongst the three the standard deviation is higher for the operating margin as it is based on sales and as sales tends to be more volatile, so does the ratios based on sales. The overall Price to Book (PB) ratio is at 3.46 and is highest for miscellaneous industries (6.73 times), followed by the business services (5.41) most of the other industries have a PB ratio close to the average PB ratio. The average fixed asset turnover is at 6.76 times consistent with the higher return on assets, the average inventory holding period is very high at more than 62 days and the standard deviation is also at 133.42% indicating a large disparity amongst the companies in the inventory holding. The high inventory holding is supported by the high level of average inventory at around 746 crores. Companies on an average maintain a healthy current ratio (2.47 times) and the overall cash balance also looks satisfactory (20% of current assets). The variation in cash profit is found to be the most volatile amongst all the volatility measures. Most of the borrowings by the Indian companies are through banks and financial institutions. The average borrowings (from the banks) by the companies in the sample are at 1293 crores and the borrowings (by debentures) is at 178 crores indicating nearly 88% (87.89%) of the debt obtained by the corporates is through banks. This might be due to the under developed corporate bond market which creates a high transaction cost and hence is acting as a deterrent for the corporate bond issues. We expect the skewed borrowing pattern displayed by the corporates towards the banks will have its effects when it comes to the capital structure, as banks tends to look for more traditional measures of solvency while lending the money, where as in case of a debenture issue the investor can decide on whether to subscribe to a particular debenture or not based on his risk taking capacity.

Table-2. Descriptive Statistics

	N	Mean		Std. Deviation	Skewness	Kurtosis
	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic
OP/TA (%)	2500	20.654228	.2538884	12.6944214	1.518	4.648
OP/S (%)	2500	7.455805	3.8996731	194.9836531	31.719	1064.035
CP/TA (%)	2500	13.325752	.2356536	11.7826792	-.825	19.537
PB Ratio (Times)	2500	3.462560	.0970997	4.8549830	-.192	71.687
FAT (Times)	2500	6.767535	.3235497	16.1774868	12.115	192.141
IHP (No.of Days)	2500	62.515442	2.6684778	133.4238908	15.450	298.737
Current Ratio (Times)	2500	2.471516	.0377055	1.8852763	2.769	11.506
Cash Ratio (Times)	2500	.205779	.0042775	.2138744	1.419	1.284
Receivable Recovery (Days)	2500	99.769953	17.6334861	881.6743035	42.956	1975.142
STDOPC	2500	8.374369	.5902642	29.5132123	28.685	943.765
CV EBIT/TA	2500	14.628965	.8087847	40.4392330	10.884	329.148
CVCPTA	2500	104.687063	81.8927427	40.9463713	47.604	2351.390
DEP/FA	2500	.099838	.0010915	.0545755	3.428	23.222
Bank & FI Borrowings (Mn)	2500	7091.317760	525.6335299	26281.6764	12.319	211.481
Debenture Borrowings (Mn)	2500	1787.655440	161.4786727	8073.9336	9.651	117.072
Short term debt (Mn)	2500	810.705200	79.2895861	3964.4793	10.211	132.124
Fixed Assets (Mn)	2500	19144.204	1440.95833	72047.914	11.866	189.340
Inventory (Mn)	2500	7462.210720	548.7069722	27435.349	10.753	155.854
LD Final (Mn)	2500	12932.014	877.0253417	43851.267	9.546	119.285

Model Fit

Artificial neural network is a predictive algorithm which learns from the data and tries to model the relationship based on the learnings attained by using the data. Hence it is imperative to know whether the model that has been fit by the ANN is significant or not. Yokum and Armstrong (1995) in their research cited accuracy is the most important criterion for any of the forecasting techniques. We will make use of the correlation between the predicted debt ratios from the ANN model and the actual debt ratios to analyse the fit and the root of mean squared error (RMSE) to analyze the accuracy of the ANN.

Table-3. Model Fit of the Artificial Neural Network

	SD/TA	SD/MV	LD/TA	LD/MV
Predicted SD/TA P-Value RMSE	.377** (.000) 0.5236	-	-	-
Predicted SD/MV P-Value RMSE	-	.137** (.000) 0.5656	-	-
Predicted LD/TA P-Value RMSE	-	-	.739** (.000) 0.3765	-
Predicted LD/MV P-Value RMSE	-	-	-	.205** (.000) 0.5541

Table - 3 provides the result of the correlation analysis between the predicted and the actual values and its significance. All the correlation coefficients are found to be significant at 1% level of significance indicating ANN was able to fit the model for the capital structure. The RMSE was below the desired limit of 55% for all the variables except for SD/MA. It was lowest for LD/TA indicating ANN was able to predict the book value based long term debt ratio in a most accurate manner.

Table -4 provides coefficients for the various independent variables generated by the neural network, and the importance of each variable in determining the capital Structure

Table-4. Coefficients of the independent Variable against various dependent variables and its importance

Construct	Independent Variables	SD/TA	SD/MV	LD/TA	LD/MV
-	Industry Classification	-0.087 (**1.9%**)	0.013 (**2.4%**)	-0.131 (**2%**)	-0.013 (**1.6%**)
-	Age	0.114 (**1%**)	0.051(**1.2%**)	-0.477 (**0.8%**)	-0.013 (**1.3%**)
-	Promoter Holding	0.076(**0.3**)	0.118 (**0.4%**)	-0.069(**0.7%**)	-0.234 (**0.3%**)
Profitability	OP/TA	0.365 (**5.4%**)	0.035 (**3.7%**)	0.358(**5.4%**)	0.045 (**1.7%**)
	OP/S	0.755 (**15.3%**)	-0.248 (**12.1%**)	0.535(**6.7%**)	0.172 (**7.7%**)
	CP/S	-0.643 (**9.8%**)	-0.220 (**13.6%**)	-1.058 (**12.6%**)	-0.258 (**11.9%**)
Size	Log of Sales	-0.522 (**9.5%**)	-0.451 (**19.5%**)	-1.547(**14.8%**)	-0.033 (**2.6%**)
	Log of TA	-0.190 (**3.1%**)	0.269 (**10.7%**)	1.110 (**11%**)	-0.137 (**3%**)
Collateral Value of Assets	Log of Collateral Value	-0.032(**1.6%**)	0.073 (**1.9%**)	0.398 (**4.1%**)	0.112 (**1.7%**)
	Log of Tangible Assets	0.510 (**6%**)	0.076 (**2.4%**)	0.637 (**6.3%**)	0.344 (**7.7%**)
Growth	PB Ratio	0.036 (**3.9%**)	0.061 (**4.5%**)	-0.033 (**4.7%**)	-0.169 (**11%**)
Management Efficiency	Fixed Asset Turnover	0.030 (**3.5%**)	0.103 (**4.5%**)	0.073 (**2.9%**)	0.223(**7.7%**)
	Inventory Holding Period	-0.603 (**3%**)	0.066 (**3.8%**)	-0.046 (**2.4%**)	0.162 (**7.3%**)
Short term Liquidity	Current Ratio	-0.063 (**2.5%**)	-0.082 (**2.8%**)	0.309 (**3.8%**)	0.144 (**5.4%**)
	Cash Ratio	-0.451 (**2%**)	0.056 (**1.7%**)	-0.182 (**1.7%**)	-0.060 (**1%**)
	Receivable Recovery	-0.418 (**4%**)	-0.028 (**3.8%**)	0.309 (**4.8%**)	0.259 (**8.7%**)
Volatility	Std of Change in OP	0.334 (**10.1%**)	0.123 (**4.9%**)	0.3837 (**3.8%**)	0.175 (**6.2%**)
	CV of EBIT/TA	-0.029 (**4.2%**)	-0.002 (**2.2%**)	0.067 (**3%**)	-0.091 (**5%**)
	CV of CP/TA	0.255 (**8.7%**)	-0.006 (**2.1%**)	-0.339 (**6%**)	-0.045 (**6.9%**)
NDTS	DEP on FA	0.162 (**4.2%**)	0.022 (**1.8%**)	-0.214 (**2.5%**)	0.009 (**1.3%**)

After establishing the model fit for the data the next step is to analyze the parameters estimate to find out the determinants of the capital structure in India. The ANN model provides sensitivity of the variable in determining the capital structure of the company and the sensitivity and the importance differs based on the measurement level (Market Value or Book Value) and the type of

debt (Short term or long term). For long term debt measured by book value, sales of the company has emerged as the major variable in determining the long term debt of the company. The size was also found to be negatively related with the borrowings of the company confirming the findings of the previous researches (Booth, et al., 2001; Garg & Shekhar, 2002; Bhaduri, 2002). One explanation for the highest importance for the sales can be because of the borrowing structure of the Indian firms, where majority of the borrowings are from the banks and banks usually find it safer to lend to the larger firms due to the lower bankruptcy risk. The relationship between sales and the capital structure is negative indicating lower borrowing by the larger companies.   In case of short term borrowings operating profit and the cash profit has been found to be the important variable indicating the cash generating capacity is highly regarded for the short term loans. Profitability has also been found to influence the long-term debts of the company and the cash profit has been found to significantly affect the long term debts of the company. The relationship between cash profit generated and the debt ratios turned out to be negative reflecting that the companies generating higher cash profits tend to borrow lower amount of debt whereas the other two indicators of profitability turned out to be positively related with the debt ratios. Hence we can conclude that the companies try to achieve a trade-off between the availability of cash, debt and the tax rates and not just the tax rate and the profitability. The next important factor in the determinant of capital structure is found to be the collateral value of the assets measured by the tangible assets. We have found a positive relationship between the tangible assets, collateral value and the debt ratios of the company indicating companies with higher amount of tangible assets tend to borrow higher amount of money, which is in contrast to a earlier study (Bhaduri, 2002) where it was found that no significant relationship between the collateral value and the capital structure exists. Given that the majority of the borrowings done by the Indian corporates are from the banks, collateral value of the company plays a significant role in determining the capital structure. For the short term debts of the company the importance of collateral value is much lower than the long term debt as the banks usually look for the collateral while financing the long term debt. The volatility measured by the variation in the change in cash profit has also been negatively related with the long term debt and positively related with the short term debt. This phenomenon can be explained as the majority of the borrowings made by the corporates in India are through banks, the banks might not be willing to provide long term finances to the company as they pose higher risk and the company might have to settle with the short term borrowings to finance its operations. The positive relationship with the short term borrowings can also be due to the company's strategy of maintaining higher cushion against the volatility in the earnings.   The other important factor of the measure of volatility, the standard deviation of the change in the operating profit has been observed to be the most important factor in the measure of short term debt ratios and it has also been found to be positively related with the short term debt ratios reinforcing the previous argument. The measure of growth, PB ratio has been found to be negatively related with the long term debt ratios and positively related with the short term debt ratios. Bhaduri (2002) pointed out that the smaller firms usually depend upon the short term debts due to higher transaction costs experienced by the smaller firms in India. We find support for this argument as there is a positive relationship between the growth and the short term debt ratios indicating growth companies which are usually small in size tend to depend more on the short term debt and less on the long term debt to finance their operations. The short term liquidity of the company has also been observed as another important factor in determining the capital structure of the company. Since majority of the debt taken by the company in India are from banks short term liquidity plays a major role in securing the debt. Hence we see a positive relationship between the debt ratios and the short term liquidity ratios measured by receivable recovery period and the current ratio. We do observe a negative relationship between the absolute cash ratio and the debt ratios and this is due to the companies with higher cash balances can finance their operations through the cash generated from the business and might not require any external debt. Non debt tax shield measured by the depreciation has also been observed to be least significant amongst the parametric variables in determining the long term debt ratios. We observe a negative relationship between the depreciation and the debt ratios which is as expected by the capital structure theories.

Amongst the categorical variables we do observed a significant relationship between the industry classification and the debt ratios indicating debt ratios been affected by the industry characteristics. Age has been found to be important and see a negative relationship between the age of the company and the borrowings. If we segregate the age into the various categories that we have classified, we can also observe that with the younger firms the relationship was positive and as the company matured the age coefficient became negative. This is in accordance with the general belief that younger companies tend to borrow more to finance their operations and the older companies tend to borrow less due to the accumulated cash flows. The effect of the promoter holding has turned out to be least significant and we did not observe a significant difference amongst the companies owned by the promoters and the companies with diversified ownership.

Table-5. Importance of the Construct in determining the Capital Structure

Construct	SD/TA	SD/MV	LD/TA	LD/MV
Industry Classification	1.9%	2.4%	2%	1.6%
Age	1%	1.2%	0.8%	1.3%
Promoter Holding	0.3%	0.4%	0.7%	0.3%
Profitability	30.5%	29.4%	24.7%	21.3%
Size	12.6%	30.2%	25.8%	5.6%
Collateral Value of Assets	7.6%	4.3%	10.4%	9.4%
Growth	3.9%	4.5%	4.7%	11%
Management Efficiency	6.5%	8.3%	5.3%	15%
Short Term Liquidity	8.5%	8.3%	10.3%	15.1%
Volatility	23%	9.2%	12.8%	18.1%
NDTS	4.2%	1.8%	2.5%	1.3%

Table-5 provides the importance of the various constructs affecting the capital structure decisions. As expected both the short term and the long term debts are influenced by different factors. Major factor influencing the debt structure of the company is its profitability and it has a consistent influence on both the long term and the short term borrowings. Size of the company has been found to exert significant influence on the capital structure of the company as most of the borrowings of the company are through banks. The Volatility of the earnings has also been found to have significant influence as banks prefer stability of earnings over the volatility. Importance of the management efficiency is not clearly evident from the research and hence we cannot conclude on the use of debt as a control mechanism. Collateral value and short term liquidity of the company are also found to be an important variable in determining the capital structure of the Indian companies

The below table summarizes the findings about the determinants of capital structure amongst the Indian companies.

Table-6. Constructs, Major proxy for the construct and the relationship with short and long term debt

Construct	Major Variable	Relationship	
		Short term Debt	Long term Debt
Size	Sales	Negative	Negative
Profitability	CP/TA	Negative	Negative
Collateral Value	Tangible Assets	Positive	Positive
Volatility	CV of CP/TA	Positive	Negative
Growth	PB ratio	Positive	Negative
Short term Liquidity	Receivables Recovery Period	Negative	Positive
Management Efficiency	Fixed Asset Turnover	Positive(Not Important)	Positive (Not Important)
Non Debt tax shield	Depreciation	Positive	Negative
Industry Classification	Categorical	Significant	Significant
Age	Categorical	Negative	Negative
Promoter Holdings	Categorical	Not important	Not Important

▌ Major Conclusion and Directions for Further Study

The capital structure and its determinants has been one of the major areas of research in the field of corporate finance. We observed that the long term debt scaled by total assets as the major dependent variable which can act as a proxy for the capital structure of the Indian companies. This is because most of the borrowings done by the companies are from the banks and financial institutions which majorly emphasize on book values rather than the market values. We have also captured the importance of the various variables in determining the capital structure rather than looking at the statistical significance. Since majority of the factors like the profitability, size of the company, collateral value etc. which are found to be important in Indian context is similar to that of the developed markets which has a different debt system, we conclude that even though the control system such as the tax system, corporate governance system, legal system, interest rates etc. are different between India and the developed countries, the factors influencing the capital structure of the companies are similar. This similarity of factors between India and the developed markets complements the finding of   (Bhaduri, 2002; Booth, et al., 2001) and we can also say that the firm specific factor plays a major role than the macro economic factors when it comes to capital structure decisions. Our findings also supports the Rajan & Zingales (1995) argument that the finance is portable across the countries.

In this paper we have made an attempt to identify the factors determining the capital structure in India using the artificial neural networks, even though we have identified the importance of the factors we could not establish the statistical significance as ANN is not a tool for establishing the statistical

significance and it is still a black box when it comes to identifying the fitted model. Future researches can be done to establish the statistical significance of the results using various techniques such as Partial Least Square Structural Equation Modelling, Confirmatory Factor Analytic Technique etc. Further research can also be carried on comparing the ANN with other models, and non-linear models can also be used which can throw more light on the capital structure decisions.

REFERENCES

Ang, J. S., Cole, R. A. & Lin, J. W., (2000). "Agency Cost and Ownership structure". *Journal of Finance,* Vol. 55 No. 1, pp. 81-106.

Beven, A. A. & Danbolt, J., (2004). "Testing for inconsistencies in the estimation of UK capital structure determinants". *Applied Financial Economics,* Vol.14 No.1, pp. 55-66.

Bhaduri, S. N., (2002). "Determinants of Capital Structure Choice: A Study of the Indian Corporate Sector". *Applied Financial Economics,* Vol.12 No.9, pp. 655-665.

Bhaduri, S. N., (2002). "Determinants of Corporate Borrowings: Some Evidences from the Indian Corporate Structure". *Journal of Economics and Finance,* Vol.26 No.2, pp. 200-213.

Booth, L., Aivazian, V., Demirguc-Kunt, A. & Maksimovic, V., (2001). "Capital Structure in Developing Countries". *Journal of Finance, Vol.*56 No.1, pp. 87-130.

Boquist, J. A. & Moore, L. A., (1984). "Inter-Industry leverage differences and DeAngelo-Masulis Tax Shield hypothesis". *Financial Management,* pp. 5-9.

Bowen, R. M., Daley, L. A. & Huber, C. C. J., (1982). "Evidences on the existence and determinants of inter-industry differences in leverage". *Financial Management,* pp. 10-20.

Brealey, R. & Myers, S. C., (2003). "*Principles of Corporate Finance".* Boston: McGraw-Hill.

Chakraborty, I., (2010). "Capital Structure in an emerging stock market: The Case of India". *Research in International Business and Finance,* Vol.24 No.3, pp. 295-314.

Chang, C., Lee, A. C. & Lee, C. F.,(2009). "Determinants of Capital Structure Choice: A Structural Equation Modelling Approach". *The Quarterly Review of Economics and Finance,* Vol.49, pp. 197-213.

DeAngelo, H. & Masulis, R., (1980). "Optimum capital structure under corporate and personal taxes". *Journal of Financial Economics,* Vol.8, No.1, pp. 3-27.

Fama, E. F. & French, K. R., (2002). "Testing tradeoff and pecking order predictions about debt dividends and Debt". *Review of Financial Studies,* Vol.15 No.1, pp. 1-33.

Fama, E. & French, K., (1998). "Taxes, financing decisions, and firm value". *Journal of Finance,* Vol.53 No.1, pp. 819-43.

Frank, M. Z. & Goyal, V. K., (2009). "Capital Structure decisioins:Which factors are reliably important?", *Financial Management,* Vol.38, No.1, pp. 1-37.

Garg, M. C. & Shekhar, C., (2002). "Determinants of Capital Structure in Indian". *The Management Accountant,* pp. 86-92.

Graham, J., (2000). "How big are the tax benefits of debt". *Journal of Finance,* Vol.55 No.5,   pp. 1901-41.

Grossman, S. & Heart, O., (1982). "Corporate Financial Structure and Managerial Incentive". In: *The Economics of Information and Uncertainty.* Chicago: University of Chicago Press.

Harris, M. & Raviv, A., (1991). "The Theory of Capital Structure". *Journal of Finance,* Vol.46 No.1, pp. 297-355.

Hart, O. D., 1993. "Theories of Optimal Capital Structure: A Managerial Discretion Perspective."   In: *The Deal Decade: What takeovers and leveraged buyouts mean for corporate governance.* Washington D C: Brookings Institution, pp. 19-53.

Hsiao-Tien, P. & Yao-Yu, C., (2005). "Comparison of Linear and Non Linear Models for Panel Data Forecasting: Debt Policy in Taiwan". *Review of Pecific Basin Financial Markets and Policies,* Vol.8 No.3, pp. 525-541.

IBM, 2011. *IBM SPSS Neural Networks 20.* s.l.:IBM.

Jensen, M. C., (1986). "Agency Cost of Free cashflows , corporate finance and takeovers". *American Economic Review,* Vol.76 No.2, pp. 323-29.

Jensen, M. & Meckling, W. H., (1976). "Theory of Firm: Managerial Behavior, agency costs and

capital structure". *Journal of Financial Economics,* Vol.3 No.4, pp. 305-65.

Kester, C. ,(1986). "Capital and Ownership Structure: A Comparison of United States and Japanese Manufacturing Corporations". *Financial Management,* Vol.15, pp. 5-16.

Khanna, Tarun & Palepu, K., (1997). "Why focused strategies may be wrong for emerging markets". *Harvard Business Review,* Vol.75 No.4 pp. 41-55.

Makridakis, S. et al., (1982). "The Accurecy of Extrapolation (Time Series Methods): Results of a forecasting competition". *Journal of Forecasting,* Vol.1 No.2, pp. 111-153.

Mayer, C., (1990). "Financial Systems, Corporate Finance and Economic Development". In: *Asymmetric Information, Corporate Finance and Investments.* Illinois: University of Chicago Press, pp. 307-332.

Mayers, S., (1977). "Determinants of Corporate Borrowing". *Journal of Financial Economics,* Vol. 5 No.2, pp. 147-75.

Mayers, S. C.,(2003). Financing of Corporations. *Handbook of Economics of Finance,* pp. 216-253.

Mayers, S. C. & Majluf, N. S., (1984). "Corporate Financing and Investment Decisions when firms have information that investors donot have". *Journal of Financial Economics,* Vol.13 No.2, pp. 187-221.

Mayers, S. C. & Rajan, R. G., (1998). "The Paradox of Liquidity". *The Quarterly Journal of Economics,* Vol.113 No.3, pp. 733-771.

Milton, H. & Raviv, A., (1990). "Capital Structure and the information role of debt". *Journal of Finance,* Vol.46 No.1, pp. 321-349.

Modigliani, F. & Miller, H. M., (1958). "The Cost of Capital, Corporation Finance and Theory of investment". *American Economic Review,* Vol.48 No.3, pp. 261-297.

Modigliani, F. & Miller, H. M., (1963). "Corporate Income Taxesand the cost of capital: A Correction". *American Economic Review,* Vol.5 No.3,pp. 433-443.

Olden, J. D. & Jackson, D. A., (2002). "Illuminating Black Box: Understanding Variable contributions in Artificial Neural Networks". *Ecological Model,* Vol.154 No.1, pp. 135-150.

Olden, J. D., Joy, M. K. & Death, R. G., (2004). "An accurate Comparison of Methods for quantifying variable importance in artificial neural networks using simulated data". *Working Paper,* pp. 1-21.

Pandey, I., (2004). "Capital Structure, Profitability and Market Structure: Evidence From Malaysia". *Asia Pacific Journal of Economics and Business,* Vol.8 No.2, pp. 78-91.

Petersen, M. A. & Rajan, R. G., (1994). "The Benifits of Lending Relationships: Evidence from small business data". *Journal of Finance,* Vol.49 No.1, pp. 3-37.

Rajan, R. G., Servacs, H. & Zingales, L., (2000). "The Cost of Diversity: The Diversification discount and inefficient investments". *Journal of Finance,* Vol.55 No.1, pp. 35-80.

Rajan, R. & Zingales, L., (1995). "What do we know about capital structure? Some Evidences from International Data". *Journal of Finance,* Vol.50 No.5, pp. 1421-60.

Scott, D. F. J., (1972). "Evidences on the importence of financial structure". *Financial Management,* Vol.1 No. (Summer 1972), pp. 45-50.

Shleifer, A. & Vishny, R., (1992). "Liquidation Values and Debt Capacity: A market equilibrium approach". *Journal of Finance,* Vol.47 No.4, pp. 1343-1366.

Stulz, R. M., (1990). "Managerial Decisions and Optimal Financing Policies". *Journal of Financial Economics,* Vol.26 No.1, pp. 3-27.

Thies, C. F. & Clock, M. S., (1992). "Determinants of Capital Structure". *Review of Financial Economics,* Vol.2 No.1, pp. 40-50.

Titman, S., (1984). "The Effect of Capital Structure on the Firms Liquidation Decisions". *Journal of Financial Economics,* , Vol.13 No.1, pp. 137-51.

Titman, S. & Wessels, R., (1988). "The Determinants of capital Structure Choice". *Journal of Finance,* Vol.43 No.1, pp. 1-19.

Wald, J., (1999). "How firm characteristics affect capital structure: An international comparison". *Journal of Financial Research,* Vol.22 No.2, pp. 161-87.

Wiwattanakantang, Y., (1999). "An Emperical Study on the Determinants of Capital Structure of Thai Firms". *Pecific-Basin Finance Journal,* Vol.7 No.3-4, pp. 371-403.

Williamson, O. E., (1988). "Corporate Finance and Corporate Governance". *Journal of Finance,* Vol.43 No.3, pp. 567-91.

Yokum, J. & Armstrong, J., (1995). "Beyond Accuracy: Comparison of the Critria used to select the forecasting method". *International Journal of Forecasting,* Vol.11 No.4, pp. 591-597.

Could Knowledge Management Drive Sustainability?

Fawzy Soliman
UTS Business School
University of Technology, Sydney, Australia

ABSTRACT

In manufacturing plants, it is expected that production processes usually yield some reject materials or parts. Accordingly, reduction in material waste could ultimately reduce manufacturing cost. The non-conforming materials or parts are usually found in Supply Chains during: a) inspection of received goods from suppliers; b) production processing; and c) delivery of goods to Customers.

In general the reject materials or parts could be grouped under three categories: a) materials ought to be sent back to its source; b) less useful materials distant for being scrapped; and c) materials that could reused after performing some rework. Some of the completed products containing some minor faulty parts could be dispatched to Factory Seconds Outlets for sale at reduced price. This paper presents a method for incorporating sustainability in production decisions.
Keywords: sustainability, manufacturing, inspection, knowledge based systems.

INTRODUCTION

Competitive advantage requires globalised manufacturers to carefully select their suppliers (vendors) to supply materials, parts, or products in order to increase their performance level (Gaither 2002). Soliman (2015) has identified two main objectives for improving manufacturing performance as:

- **Reduce inventory** investment by 50 percent or more across raw materials, Work In Progress (WIP) and finished goods stock.
- **Reduce manufacturing lead times** by 50 per cent or more: there is of course a one-for-one correspondence of lead time with WIP inventory.

Reducing inventory levels and manufacturing lead times could ultimately reduce the overall manufacturing costs. Soliman (2014) also identified **product innovation** as necessary to condition to achieve competitive advantages. Furthermore, the presence of *Non-Conforming Material* could adversely impact on manufacturing performance (McLaughlin, 2009). A focus on quality alone will not attract new customers. However a faster response time must complement quality (Lau, et al. 2001). The need for faster response to customers' needs has led to the introduction of *Agile Manufacturing* and *Synchronised Manufacturing (*Soliman and Youssef, 2001). Both of these Manufacturing Techniques require the elimination of buffer stocks. To eliminate buffer stocks, some of the critical manufacturing processes, such *Material Procurement*, need to be changed so that right material is procured, from the right supplier, at the right time (Perrot, 2014).

INSPECTION PROCEDURES

In general, many companies use components made and or procured from local and international suppliers to manufacture their products. Most of these components must be inspected and must conform to the standards set. Accordingly, all received goods and components must be vigorously tested and inspected before they are dispatched to different departments within the organisation for use. The three stages in manufacturing where inspection is necessary are:

1. Pre-Production: Material procured from suppliers is inspected for detecting non-conforming parts.
2. During Production: Parts and components are inspected during production for conformity with standards.
3. After Production: Finished goods are inspected before dispatching to customers.

It is important to note here that although most organisations do not believe that inspection is required internally (if the right supplier has been chosen, especially if it is to customer contract), inspection remains an important operation that customers pay for under quality assurance clauses in the contract. The typical procedures used for Inspection are as follows:

1. Information on each item is recorded.
2. The item is then channelled to the testing department within the company together with its Identification Card which contains all recorded information together with the testing procedures.

3. Testing is conducted on items.

COST CONSIDERATION FOR RETURNING NON-CONFORMING MATERIAL TO SUPPLIERS

According to Soliman (1998) minimising material waste is a powerful approach for *Responsive Manufacturing,* since it has been established that at least 50% of manufacturing costs is usually material costs. It is clear from the above discussion that the following factors must be considered in any decision to return the material to suppliers; these are:

a. ***Material's Value Added***: Material that has progressed through the production floor considerably has a higher value added over the same item that has just been introduced to the production.

b. ***Availability of material for production***: Material that is urgently needed for production but its conformity is regarded by the decision maker to be minor, should then be used in production to avoid material shortages and hence non-delivery to customers.

c. ***Freight's Costs***: Cost of freight is an important factor in deciding whether to send the Non-Conforming Material to its suppliers. This is because it would be uneconomical to send an item which is costing few cents to its supplier who is located in a different country. In such case the Freight Costs might be much higher than the Monterey value of the item itself.

COST CONSIDERATION FOR SCRAPPING NON-CONFORMING MATERIAL

For a non-conforming material with a small monetary value, it may be cheaper to scrap it than to return it to its supplier especially if the supplier is located in another country or at a remote distance. On the other hand an item that is very expensive and is supplied from a supplier in the neighbourhood it would be economically feasible to return it to the supplier for either a refund or for a replacement. Similarly non-conforming material that are not expensive but are environmentally hazardous to dispense may require considerable effort and hence cost for scrapping. In such case it may be wiser to return to its supplier.

COST CONSIDERATIONS FOR REUSABLE NON-CONFORMING MATERIAL

These costs must take into consideration the item's Value Added. This is because the work already spent on the item may be so significant and expensive to redo. Furthermore the risk associated with using a non-conforming item need to be evaluated. For example in an external component of a product, the colour match could be significantly important. On the other hand, internal items where slight deviation from the same colour grades as other parts might not be so critical. This is because customers place importance on the appearance of some items. Therefore the decision must be based on the item's Value Added as well as other consideration such as production needs and the risk of using non-conforming material. It is clear that the decision maker is faced with many considerations before deciding what to do with the non-conforming material (Gray, 2007). The following diagram (Figure 1) illustrates these decisions within the supply-chain in a typical manufacturing setting.

In a multi-stage multi-product manufacturing the above decisions become complex and time consuming. What is needed is some way of regulating the decision of what to do with material that is found faulty or being classified as waste. Usually decisions made on the fate of the material are documented and stored for future use because similar situations may warrant the re-use of previous decisions made. This will inevitably require thorough search throw large volume of stored documents.
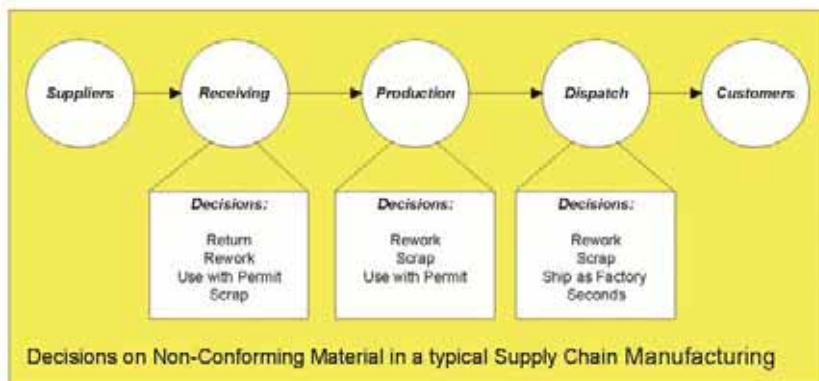
Figure 1. illustration of decisions on the fate of the Non-Conforming
aterial in a general Manufacturing setting

Soliman and Youssef (2003b) identified several driving forces, such as the utilisation of best knowledge in different areas including material management. Many executives found their companies in the midst of a major transition from the utilisation of EDI (Electronic Data Interchange) as a strategic tool in supply chain management, to a much more comprehensive strategy for Electronic-Commerce and in recent time to cloud systems (Soliman, 2013b). The Knowledge Based Systems (KBS) essentially enables companies to enhance their decision making capabilities especially in the material management chain. All of these factors indicate that Information Technology in modern organisations have the potential to greatly impact and support the organisations corporate strategy.

Over the past two decades. Information Systems have emerged as viable tools for supporting the decision-making (Bowersox, et al, 2013). A review of the literature indicates that little attention has been given to the application of Knowledge Based Systems in the field of material management and in particular production waste. Furthermore the importance of Knowledge Based Systems in Procurement has been underestimated (Soliman and Youssef, 2003a). However, the concern over the environments has resulted in significant work addressing a number of sustainability issues such as the bottom line (Elkington, 2004, Spooner and Kaine, 2010).

Knowledge Based technology has already delivered significant commercial benefits and is now useful, easy to use and reliable (Soliman, et al., 2001). Furthermore, they have the ability to automate laborious decision making processes by presenting a number of scenarios and produce a particular conclusion (Piramuthu, 2005). Therefore they offer the best mechanism for storing, updating, retrieving and manipulating data and rules for decision making in the Supply Chain.

AUTOMATION OF SUSTAINABILITY DECISIONS

The rising concern about the impact of business activities particularly manufacturing has led to reservations regarding the likely adverse impact of sustainability initiatives on firms' performance (Ardichvili, 2012).

Experience has shown that manual Non-Conforming Material Decisions are very time consuming and hence costly and their integrity against human error cannot be guaranteed. In addition, the manual systems are slow especially for a crisis situation (Gonzalez-Benito, et al. 2005). To deal with material rejection and waste within the Supply Chain areas because of the:

- increasing need for accurate non-conforming data and results which can be provided by the computerisation of the Decisions of the Non-Conforming Material on a long-term basis*;
- need for faster methods of continuous re-examination and revision of the Non-Conforming Material indicators whenever the there is an Engineering Design Change or a change in the customer requirements;
- fact that manual calculation of the economics and the Value Added of the Non-Conforming Material are labour intensive and inefficient and cannot be generalised from one product to another and must be determined for each new product within the same company;
- Need to identify a criterion for Non-Conforming Material that could be used to indicate which material should be scrapped, returned to the supplier, reworked or used under permit. This requires computational algorithms;
- Manual calculation of production needs for each product is tedious and is subject to human error. The computerised Non-Conforming Material System, on the other hand, could perform this type of calculations in more efficient way.

The calculation of the Value Added of the Non-Conforming Material and the production needs. Such calculation is best performed using digital computers. This in turn requires the development of a comprehensive model. At the heart of the Automated Non-Conforming Material Decision is a set of complex Algorithms and mathematical models. These models are used to compute from the input data all necessary parameters and variables used to calculate the number of nursing staff and their allocated duties on the basis of patients' needs. The sequences of calculation are detailed below.

CALCULATION OF STANDARD TIME OF PROCESSING

Soliman (xx) identified activities that need to be performed over a period of time (Activity Time). The Activity Time is calculated as the difference between the Finish and Start time of the activity. The standard time incorporates frequencies, Average processing time and standard deviations. The following diagram (Figure 2) best describes the movement of data and information within the Non-Conforming Material Decision.
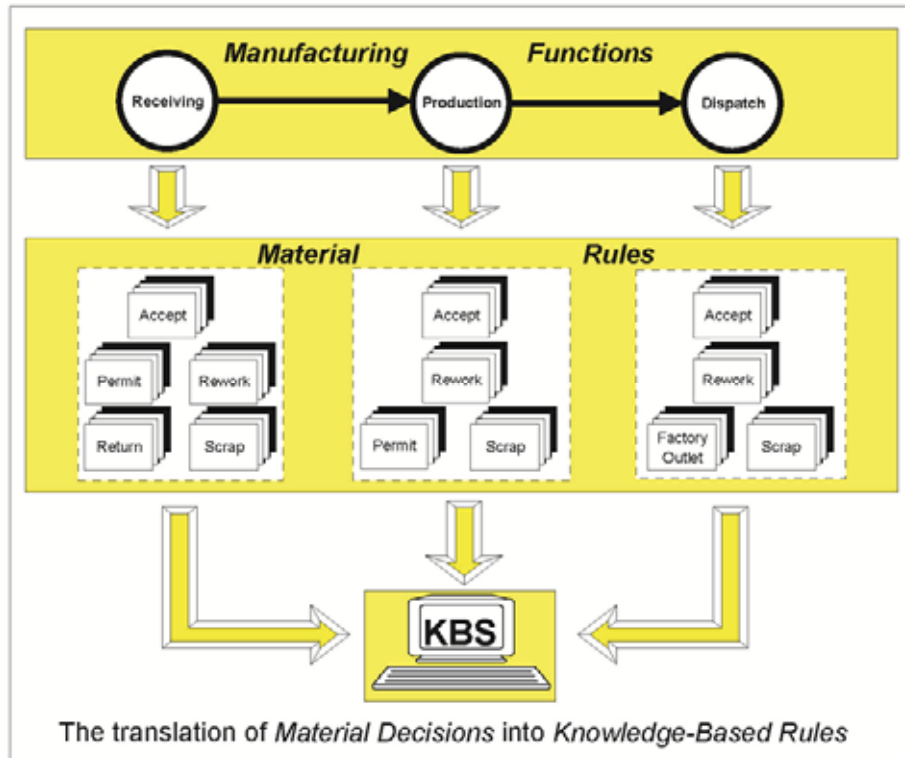
Figure 2. Illustration of the non-conforming material Activities and Information flow.

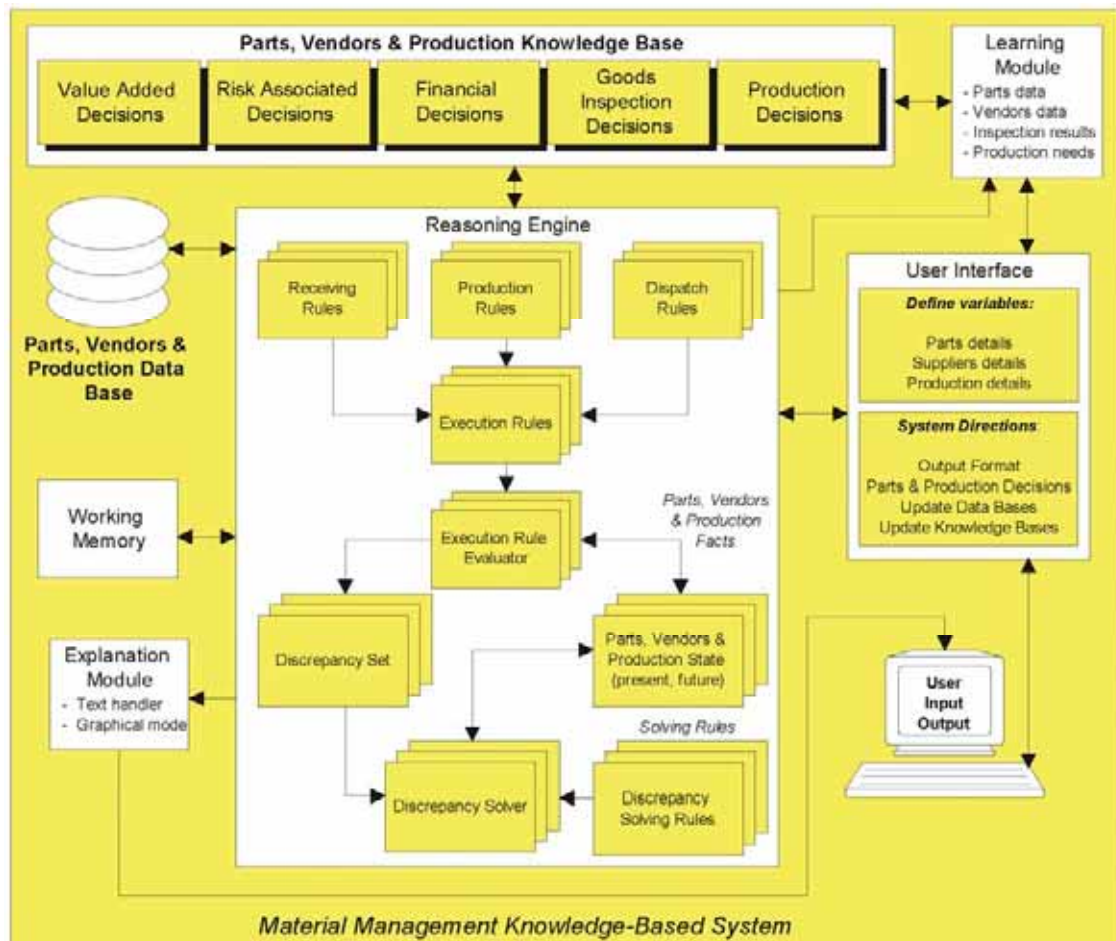## SUSTAINABILITY KNOWLEDGE BASED SYSTEM

The sustainability knowledge based system encompasses the calculation of:

1) Standard Time of processing for each part; and
2) Scores of processing for each part; and
3) Non-conforming material Level for each part; and
4) Throughput Time required to complete processing of each part; and
5) Number of work centres required to process non-conforming material.

In order to enhance the delivery of goods to customers, the non-conforming knowledge based System must automate the above functions and communicate the results to users in a User-Friendly Dialogue. Furthermore, additional information should be extracted from manipulating the non-conforming Databases. Accordingly, for better and faster delivery of goods to customers, the non-conforming knowledge based System must also provide valuable information in the form of:

1. Detailed Reports: Information on all admission, discharge, patients' conditions and needs, staff numbers and activities, staff schedules and rosters, forecast of parts to be processed in each work centre and likely impact on staff duties and allocations.
2. Summary Reports: Concise information on monthly, weekly and daily activities such as non-conforming material numbers, categories of testing levels, moving averages of processing indicators and productivity indexes.
3. Exceptional Reports: Details and alarms of unsuccessful or uncompleted testing.

The sustainability knowledge based System receives data from work centres by means of entries made by staff in Real Time environments (Klettner, et al., 2014). The system then calculates all necessary variables and displays the results in screen dialogue interactivity with the users. The following diagram (Figure 3) illustrates the various components of the non-conforming knowledge based System.

Figure 3. Conceptual Illustration of the Sustainability Knowledge Based System.

In order to enhance the decision-making capabilities, the sustainability Knowledge-Based System communicates the results to users in a *user-friendly dialogue (*Barton, et al., 2000). Furthermore, manipulating the databases and Knowledge Bases provides additional information.

The system receives data from the Keyboard by means of entries made by staff in Real Time environments. The system then calculates all necessary variables and displays the results in interactive screen dialogue.

Transposing the Supply Chain functions (such as parts' data, inspection results and non-conforming parts) in a Concept Context enhances the problem-solving capabilities of the KBS. There is a close relationship with the Concept Context, thus allowing the experts to reason about real world objects.

THE CONCEPT OF DECISION REGULATOR

Knowledge-Based technology has already delivered significant commercial benefits and is now useful, easy to use and reliable. Furthermore, Knowledge-Based Systems have the ability to automate laborious decision-making processes by presenting a number of scenarios and producing a particular conclusion (Dos Santos, 1991). Therefore they offer the best mechanism for storing, updating, retrieving and manipulating data and rules for decision making in production. The *Decision organiser* is a control concept which is associated with the movement of information and material within the materials chain. The *organiser* permits sustainability decisions to be made in response to any small variations between standards and inspection outcomes. It also acts as a book keeper to the process area it services.

The decision organiser concept can be converted to a set of rules in a Knowledge Based System designed to monitor and report the status, trends, and changes, of material classified as waste on the production floor. The Knowledge Based System can be shown to have a significant impact on the total performance and profitability of the production floor.

The translation of the Materials Chain rules into a Knowledge Base System
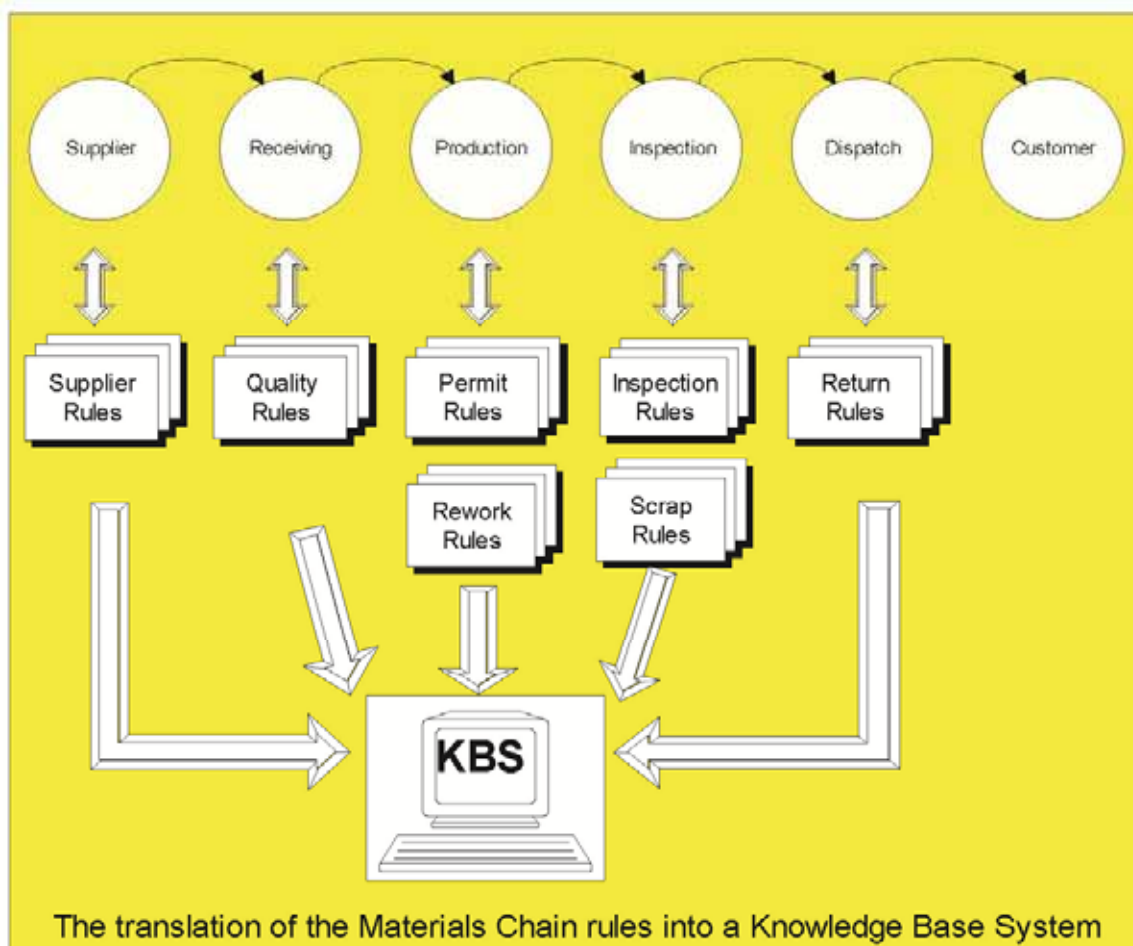
Figure 6. Illustration of a Knowledge Based System for material chain in a typical manufacturing setting.

PRODUCTIVITY INCREASE

There are many ways to measure productivity. One such method is to measure the number of scheduled orders completed on time. Another method is to measure the monetary volume of products shipped to customers against the required per sales order plan.

However for a typical production floor it can be shown that the most effective measure of productivity is the method of Value Added Efficiency *VAE* (Fogarty 1992). This is because the Manufacturing Cycle Efficiency ignores that Value has been added to the parts being processed, hence time estimates are not related to the Value Added, which is not realistic.

In the Value Added Efficiency method, the processing time is divided by total manufacturing Lead Times. Processing time incorporates the value added to parts. The Manufacturing Lead Times are influenced by a number of factors including the selection of vendors and parts and the number of non-conforming parts found in production. Data have been collected from the production floor showing that productivity has increased after the implementation of the KBS in a selected large electronic manufacturer, as shown in the following table (Table 1):

Table 1. Value Added Efficiency Factors before and after using the Sustainability Knowledge-Based System in three Work Centres.

Work Centre	VAE before using KBS	VAE after using KBS
5	9.28%	11.3%
7A	10.15%	16.05%
21-R	24.5%	56.6%
Average	14.64%	44.87%

SCRAP INDEX

Before it is possible to determine ways of reducing the level of scrap, it is necessary to be able to determine the status quo, i.e. the current situation of the scrap levels. The level of scrap for both rejects and excess materials can be used to gauge the efficiency of production as follows:

1. A three point moving average of the total scrap can be estimated continuously.
2. A plot of Scrap Index versus Time identifies any trends in the levels of scrap.
3. Control charts are also used to monitor and to detect when a significant change in scrap level has taken place.

CONCLUSIONS

The paper presents a method for incorporating sustainability in manufacturing plants. The method shown has been applied in a manufacturing setting where production processes yield considerable amount of material reject and non-conforming parts. The method shows that reduction in material waste could ultimately reduce manufacturing cost and in turn enhance the manufacture's strategic objectives. The method is applicable through the Supply Chains during: a) inspection of received goods from suppliers; b) production processing; and c) delivery of goods to Customers.

It has been shown in this paper that the reject materials or non-conforming parts could be grouped under three categories: a) materials that ought to be sent back to its source perhaps for refund; b) less useful materials that is distant to be scrapped; and c) materials that could reused after performing some rework. However, some of the completed products that contain some minor defects but still useable could be dispatched to Factory Seconds Outlets for sale at reduced price. This paper presents a method for incorporating sustainability in production decisions.

REFERENCES

Ardichvili, A., (2012), "Sustainability or limitless expansion: paradigm shift in HRD practice and teaching", *European Journal of Training and Development*, 36(9), 873-887.

Barton, R., Figge, C. and Routledge, L., (2000), ''Implementing strategic sustainability: lessons learned'', Final Report of EKOS Benchmarking Mission to Study Best Practices of Strategic Sustainability in Europe, EKOS International, available at: www.ekosi.com.

Bowersox. D.J.. Closs. D.J. and Cooper, M.B. (2013), *Supply Chain Logistics Management*, 4th Ed. Sydney: McGraw Hill. pp. 48, 403.

Elkington, J., (2004), ''The 'triple bottom' line for 21st century business'' in Starkey, R. and Welford, R. (Eds), The Earthscan Reader in Business and Sustainable Development, Earthscan, London, pp. 20-43.

Gaither, N., (2002), *Production and Operations Management*, 9th edition. South Western.

Gonzalez-Benito, J. and Gonzalez-Benito, O., (2005), 'Environmental proactivity and business performance: an empirical analysis', *Omega International Journal of Management Science*, 33, 1–15.

Gray, R. (2007), "Social, environmental and sustainability reporting and organisational value creation? Whose Value? Whose Creation?", *Accounting, Auditing & Accountability Journal*, 19(6), 793-819

Klettner, A., Clarke, T. & Boersma, M. (2014), "The Governance of Corporate Sustainability: Empirical Insights into the Development, Leadership and Implementation of Responsible Business Strategy", *Journal of Business Ethics*, 122(1), 145-165.

McLaughlin, S. (2009), Improving supply chain performance through the implementation of process related knowledge transfer mechanisms. *International Journal of Knowledge Management*. 5(2),64-86.

Perrott, B., (2014), "The sustainable organisation: blueprint for an integrated model", Journal of Business Strategy, 35(3), 26-37.

Piramuthu, S. (2005), Knowledge-based framework for automated dynamic supply chain configuration. *European Journal of Operation Research*. 165,219-230.

Lau, R S M; Hurley, Nicole M, (2001),'Creating agile supply chains for competitive advantage', *South Dakota Business Review*, 60(1), 1-10.

Soliman, F. (2015), Sustainable business transformation in supply chains in Fawzy Soliman Ed.: "Business Transformation and Sustainability through Cloud System Implementation", IGI Global, pp 16-31.

Soliman, F. (2014). Does the Cloud System Drive Supply Chain Sustainability? In Fawzy Soliman

(2014): Editor: "Cloud Systems in Supply Chains": Palgrave Macmillan Publishers, pp 224-245.

Soliman, F. (2011), "Globalisation as driver for transforming organisations from Knowledge to learning and then to innovation*", Business Competitiveness in the 21st Century,* Edited by Srivastava, R; Pandy, T; Kumar, N and Singhal*, R,* MacMillan Publishers India Ltd, pp 42-52.

Soliman, F. (1998), "Optimum Level of Process Mapping and Least Cost Business Process Re-Engineering", *International Journal of Operations and Production Management*, 18(5), 810-816.

Soliman, F. and Youssef, M. (2003a), "The role of critical information in enterprise knowledge management", *Industrial Management and Data Systems,* 103(7), 484-490.

Soliman, F. and Youssef, M. (2003b), Internet-based e-commerce and its impact on manufacturing and business operations, *Industrial Management and Data Systems,* 103(8), 546-552.

Soliman, F. and Youssef, M. (2001), **"**The Impact of Some Recent Developments in E-Business on the Management of Next Generation Manufacturing", *International Journal of Operations and Production Management*, 21(5/6), 538-564.

Soliman, F., Clegg, S. and Tantoush, T. (2001), **"**Critical Success Factors for integration of CAD/CAM Systems with ERP Systems**",** *International Journal of Operations and Production Management*, 21(5/6), 609-629.

Spooner, K. and Kaine, S., (2010), 'Defining Sustainability and Human Resource Management', *International Employment Relations Review,* 16(2), 70-81.

ACKNOWLEDGEMENT

Appraising E-Commerce Systems Performance in The Engineering And Information Technology Industry

Mais Al-Qudah, Middle East University, Amman, Jordan
Anas Al Bakri (Correspondent Author),Qatar University, Doha, Qatar

ABSTRACT

This research aimed to understand the factors influencing e-commerce systems performance in Jordan. Using previous literature, we developed a theoretical model of performance with four contributing factors: perceived benefits, IT infrastructure, trading partners and perceived risk. The model was tested using data from a survey of managerial perceptions of e-commerce in the Engineering, Electrical Industries and Information Technology sector in Jordan. Data were obtained from a total of 54 enterprises. The results showed that the perceived performance of e-commerce systems was affected by all four factors to a greater or lesser extent. The results of this research will help managers to understand where to focus their efforts to obtain the greatest benefit from e-commerce systems.

Keywords: e-Commerce systems, Performance, Infrastructure, Perceived Risk, Benefits

INTRODUCTION

Recently, Information Technology (IT) systems have changed our world, and more importantly, the way we do business. IT systems and networks have improved business processes and enabled companies to develop more agile, intelligent and efficient business functions [1]. Businesses now conduct many of their functions online [2]. Electronic business (e-business) has transformed the business environment, favoring more efficient, globally connected and IT-oriented businesses. Buying and selling online, that is, exchanging goods with the assistance of information media, otherwise known as e-commerce [3], is now integral to most organizations around the world [4]. E-commerce systems are now an essential part of e-business, and IT is used not just for buying, selling, and exchanging products and services, but also to serve customers and collaborate with business partners to achieve competitive advantages.

A major characteristic of e-commerce is that enterprises automate trading or communication processes to improve them [5]. Studies have reported several benefits from e-commerce systems, including reduced cost, need for fewer facilities, mass customization, efficient customer services and increasing opportunities for collaboration [5]. Al Bakri [6] discussed the adoption of e-commerce by small and medium enterprises in Amman, and perceptions of its influence on performance and efficiency. He noted that adoption and effective use of e-commerce systems has become a requirement for many large, small and medium enterprises (SMEs) around the world. It has also had an enormous effect on development of more flexible transaction methods for enterprises and their trading partners (TPs) and suppliers.

Although there is plenty of research on the factors that influence adoption of e-commerce, there is little on the factors that influence its performance [7], and particularly not in the Middle East. This research therefore attempted to examine the factors that influence e-commerce systems performance in the Engineering, Electrical Industries and Information Technology (EEIIT) sector in Amman, in Jordan.

LITERATURE REVIEW

The Internet has become an integral part of our lives, so much so that many people cannot imagine life without it. Very few new businesses start without at least a minimal online presence, and many more are exclusively online, and have no other way to interact with their customers. Some scholars have suggested that the Internet represents the best option for entrepreneurial success for small businesses [8].

The Development of E-Commerce

Commerce, the exchange of valuable goods or services for money or other reward, has been conducted for thousands of years. Traditionally, buyers and sellers came together in a physical marketplace to exchange information, products, services, and payments. In the 1970s, however, large corporations started to create private IT networks to share information with business partners

and suppliers [9]. This process, called Electronic Data Interchange (EDI), transmitted standardized data that streamlined the procurement process, making it more efficient and reducing human errors [9].

Today, many millions of business transactions occur across a telecommunications network where buyers, sellers and agents may be in different countries, and rarely see or know each other [10]. This process of buying and selling products and services across a telecommunications network is often called "electronic commerce" or "e-commerce". While there are many internet-only companies selling and buying via electronic channels, e-commerce is a much broader concept. Subramaniam & Shaw [11] defined e-commerce as a variety of market transactions, enabled by information technology and conducted over electronic networks.

Some researchers, however, have drawn a distinction between e-commerce and e-business. They suggest that e-commerce is the online selling component of a website [12]. E-business, by contrast, is the integration of a company's activities, including its products, procedures, and services, with the internet. Companies can be considered e-businesses when they integrate their sales, marketing, accounting, manufacturing, and operations with their website activities [12]. E-business therefore covers buying and selling and the associated information exchanges, but also providing services to customers and collaborating with business partners, distributors and suppliers [13]. E-business is also used to describe sophisticated business-to-business interactions and collaboration activities [13].

In this study, we use the term e-commerce in its broader sense, to include many activities that may also be covered by the term e-business.

There are many advantages to e-commerce, including the ability to access information, communicate, and buy or sell, at any time, and from anywhere. It can increase productivity for both customers and employees, saving time and money, and it also provides an inexpensive means to promote the firm and its products to current and potential customers [14]. Internet-based e-commerce also has several advantages over its EDI-based predecessors, notably cost. It is not limited to particular partners, but enables global reach [15]. To take advantage of e-commerce, however, the bulk of potential customers must have internet access. Systems also require specialized knowledge to run, and mistakes may result in loss of customers or sales if the online experience is unsatisfactory [14].

The internet has markedly changed the ways in which business operate. E-commerce is now mainstream, and used for functions as diverse as finding new streams of revenue, acquiring new customers, and managing the supply chain [16]. It enables businesses to sell products and services to consumers around the world and is therefore the platform upon which new methods to sell and distribute innovative products and services electronically is tested [16].

E-Commerce Systems

E-commerce systems are the systems within and between companies that support e-commerce. They have been defined as the systems that allow organizations to provide useful services, information, or products to their employees and/or customers [17].

E-commerce systems can be used across a range of functions, including [18]:
1. Improving business processes
2. Supporting the desire of government, firms, consumers, and management to cut the cost of providing good customer service, while also improving its quality and speed
3. Enabling online training and education in schools, universities and commercial organizations
4. Supporting inter- and intra-organizational collaboration
5. Supporting the development of communities within and between organizations, where members can learn, transact and collaborate

Such systems are often classified by the nature of the transaction, for example [19]:
1. Business-to-customer (B2C) systems allow businesses to sell to individual customers. These systems include websites like Amazon.
2. Customer-to-Business (C2B) systems allow individuals to sell products or services to organizations
3. Customer-to-customer (C2C) systems allow customers to sell directly to other customers. These systems are also described as peer-to-peer, and include eBay.
4. Mobile commerce (m-commerce) systems use smartphones and similar technology to allow transactions 'on the go'.
5. Location commerce (l-commerce) systems are m-commerce systems that also target individuals in specific locations at specific times, and include 'branch locator' services

on websites.

6. Business-to-business (B2B) systems allow businesses to sell to other businesses.

While e-commerce has been of interest to many researchers, there are very few models and frameworks to evaluate its success [20], and most of those seem to be in Business-to-Customer operations [7,20]. One early study [20] suggested that models of information systems success might be usable, and extended one such model. The researchers noted, however, that success is a multidimensional construct. It could, for example, be assessed at several levels, such as system, individual, and organizational. Success at one level would not necessarily lead to success at another. Researchers therefore, they suggested, needed to be careful to define the level at which they were measuring success.

Moller and Licker [20] proposed looking at customer satisfaction with e-commerce. This was an effective proxy for organizational e-commerce performance because it assessed the likelihood that customers would return and/or recommend the organization to others. Customer satisfaction might need to be differentiated into different facets, including satisfaction with content, design and service received, and there were also questions about the construct's cross-cultural applicability.

Brown and Jayakody [7] proposed a model of e-commerce success in a B2C context. They identified seven inter-related dimensions of B2C e-commerce success: service quality, system quality, information quality, trust, perceived usefulness, and user satisfaction and continuance intentions. There were also a number of relationships between variables. For example, user intentions to continue using a site were directly influenced by perceived usefulness, user satisfaction and system quality, and user satisfaction was affected by service quality and perceived usefulness.

Neither of these studies, however, relate to e-commerce systems performance, rather than organizational performance, or the B2B context. In its broadest sense, e-commerce is concerned with using the internet and related technologies to integrate and redesign an organization's internal activities and processes, and external relations, to create new ways of working that are significantly different from, and very often superior to what was possible in the past [21]. The term covers delivery of information, provision of customer services before and after a sale, and collaboration with business partners. All of these processes are designed to improve productivity within organizations [10], and a measure of e-commerce system performance could therefore be considered to be increased productivity and/or decreased costs.

Factors Affecting E-Commerce Systems Performance

It seems logical that a major contributor to systems performance would be the underlying IT infrastructure. This has been defined as the architecture of hardware, software, content and data used to deliver e-business services to employee, customers and partners [22]. The technical infrastructure ensures that organizations can create the applications and websites necessary to implement and sustain e-commerce. One study found that technical skills in the workforce were critical to e-commerce adoption, and all other elements of the technical infrastructure were considered very important [23].

Organizations that have adopted e-commerce systems report several perceived benefits from doing so [24]. These have been divided into three types: economic, relationship-related, and strategic. Perceived economic benefits are derived from direct savings in costs and time from new automated processes [25]. Perceived relationship-related benefits include the generation of increased trust among trading partners because of more open communications, better information-sharing and cooperation, and increased commitment. Perceived strategic benefits come from closer ties between trading partners, and improved reputation, which increases business continuity and improves organizational performance [26]. These benefits have been well-documented, and it seems likely that desire for these benefits drives increased commitment to adoption and improving the performance of e-commerce systems.

There are also a number of areas and factors which may negatively affect e-commerce systems performance. We refer to these as 'perceived risks', and they include potential weaknesses, barriers and losses [24]. These risks may be either internal or external, and be human- or technology-related, accidental or intentional. They could relate to disclosure, destruction, or modification of e-commerce transactions, or denial of service, for example because of attacks from hackers. Urbach [27] separated risks to performance into three different types [28,29,30]. Technology-related risks are linked to misuse of e-commerce technologies, incompatible infrastructure, and uncertainties of e-commerce operations. Perceived relational risks arise from trading partners' lack of knowledge, opportunistic behaviors, conflicting attitudes, and reluctance to change. General risks arise from poor business practices, environmental risks, and lack of standards and policies.

Pavlou [24] noted that trust in relation to e-commerce incorporates both trust in trading partners and also in the infrastructure and the underlying control mechanisms. This covers

transaction integrity, authentication, confidentiality, and non-repudiation. He argued that value creation in e-commerce is heavily dependent on this technology trust. Given the absence of adequate metrics to capture technology trust in e-commerce, research has focused on proxies, including perceived benefits. Empirical results strongly support the hypothesis that technology trust is essential for successful e-commerce.

This paper therefore controls for the effect of trading partner trust and perceived risks on perceived benefits and e-commerce performance [31].

Study Hypotheses and Model

The study hypotheses have therefore been developed as:

H1 The perceived benefits of e-commerce systems have a positive effect on e-commerce systems performance in firms in the EEIIT sector in Jordan.

H2 The IT infrastructure has a positive effect on e-commerce systems performance in firms in the EEIIT sector in Jordan

H3 Trust levels in the trading partners of an enterprise have an effect on e-commerce systems performance in firms in the EEIIT sector in Jordan

H4 The perceived risks have an effect on e-commerce systems performance in firms in the EEIIT sector in Jordan

Figure 1 shows the study model, with the four variables proposed to affect the performance of e-commerce systems: perceived benefits, enterprise IT infrastructure, trading partners (TPs), and perceived risk.
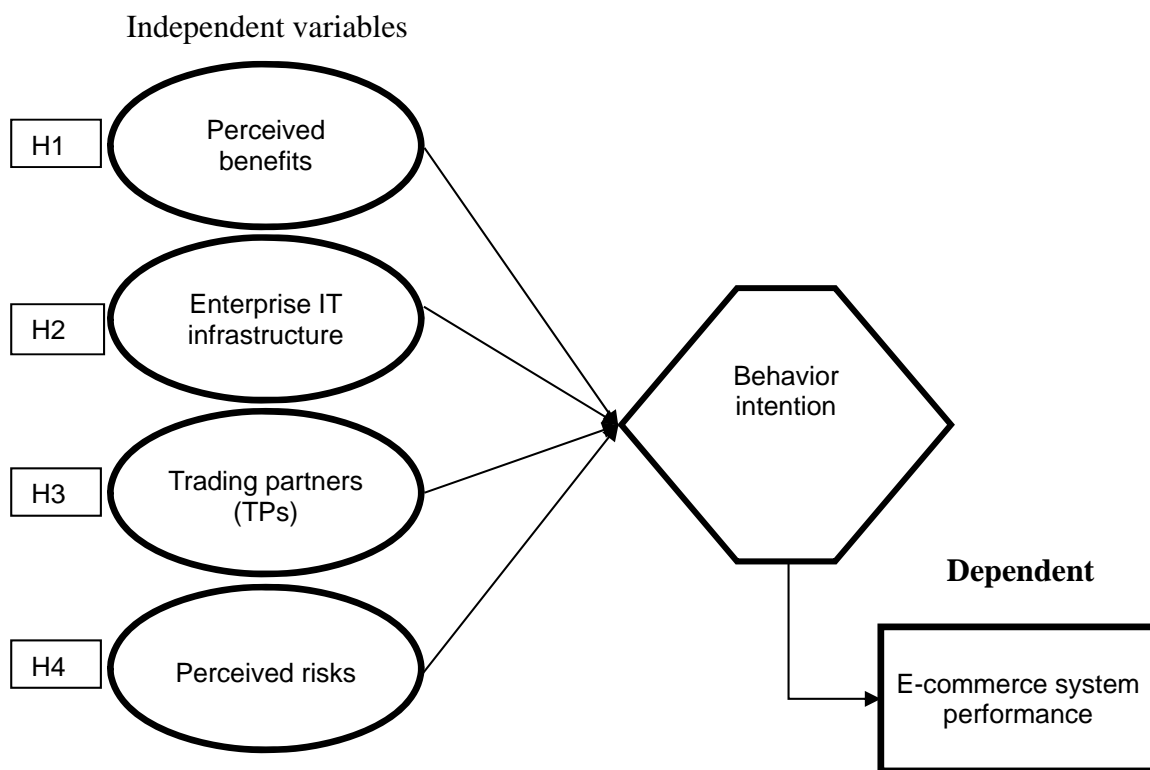

Figure 1. Study model

MATERIALS AND METHODS

Study Population and Sample

The population of the study consisted of managers in Engineering, Electronic Industries and Information Technology (EEIIT) companies in Amman, Jordan, identified using information compiled by the Jordanian Chamber of Commerce. Companies of this type operate in different sectors including trade, services, industrial and agricultural [32]. To enable more meaningful comparisons, and ensure that responses were not affected by sector or location, we chose to sample only companies located in Amman, and working in the industrial sector, a total of 54 companies.

Study Tools and Data Collection

Since there have been no previous studies on e-commerce systems performance in Amman, there was no suitable survey instrument. We therefore developed our own, based on the factors emerging from the literature. This survey was designed to explore the perceptions of managers about their company's e-commerce system and its performance, using Likert-type scales for

responses.

A total of 43 questions in an initial survey were piloted in ten companies out of the full sample. The piloting aimed to identify any questions where answers were not equally distributed, or which were consistently not completed by respondents, and any other aspects which could reduce the response rate. The responses were assessed for validity, reliability and any multi-collinearity. A copy of the survey is included as Appendix A.

▌ Data Analysis

Percentage, frequency, mean and standard deviation were used to describe the sample and basic responses.

The variables were measured by grouping factors from the questionnaire together (see Table 1)

Table 1. Grouping of factors for data analysis

Variable	Questions used to generate variable
E-commerce systems performance	36-43
Perceived benefits	1-7
IT infrastructure	8–20
Trading partners	21–29
Perceived risks	30–35

The data were examined for skew to assess whether they were normally distributed, and an appropriate correlation test was carried out to identify any relationships between the variables.

Confirmatory factor analysis was used on the measurement model to test convergent and divergent validity between factors. The five-factor CFA model was then used with the variance of all factors set at 1.0*, allowing all loadings and covariance to be freely estimated. The loadings were estimated while controlling for covariance between factors. Simple and multiple linear regression analysis with (F) test was used. SPSS (v20) was used to analyze all the data. Relative importance of individual factors was assigned using:

Class interval = (maximum class – minimum class) / number of levels = $(5-1)/3 = 4/3 = 1.33$

A low degree of importance was less than 2.33, median was 2.33–3.66 and high was 3.67 and above.

RESULTS AND DISCUSSION

▌ Survey Development

There were no missing data from the pilot study, suggesting that the respondents found all the questions comprehensible. The responses from the pilot study were grouped into factors, and a Pearson correlation was run. Although the pilot sample size was small, the results suggest that the variables within each factor showed a correlation of over 60%. Cronbach's alpha for the overall pilot study was 0.71, showing good reliability. No evidence of multi-collinearity was found in the pilot study.

Table 2. Cronbach's alpha (α) to test reliability.

Variables	Cronbach's alpha (α)
Perceived benefits	0.96
IT Infrastructure	0.95
Trading partners	0.96
Perceived risk	0.93
EC system performance	0.96
All survey	0.97

▌ Information about The Respondents

All 54 of the questionnaires were returned, a 100% response rate. Table 3 shows the demographic information of all those replying to the survey.

Table 3. Demographic information for respondents

Respondent Title	Number of respondents	Percentage (%) of sample
Owner	10	16.6
General manager	17	33.4
Purchasing Manager	12	25
IT Director	15	25
Total	54	100%

Correlations

Table 4 shows the results of the correlation analysis. While the relationships are both positive and negative, none are strong, suggesting that there are no correlations between any of the factors. This means that there is no overlap between factors, making the questionnaire valid for testing the relationship between each and e-commerce systems performance. It also means, however, that there is unlikely to be any direct causal relationship between any of the factors and systems performance.

Table 4. Correlation analysis

Factors	Perceived benefits	IT Infrastructure	Trading Partners	Perceived risks	E-commerce systems performance
Perceived benefits	1	-0.2	-0.1	0.46	0.45
IT Infrastructure	-0.2	1	0.36	-0.32	-0.25
Trading Partners	-0.1	0.36	1	-0.2	-0.08
Perceived risks	0.46	-0.32	-0.2	1	0.52
E-commerce systems performance	0.45	-0.25	-0.08	0.52	1

Confirmatory Factor Analysis

Table 5. Fit Indices and Statistics for Five-Factor (CFA) Measurement Model

Statistic	Five Factor Statistics Results
Chi-Squared	183.75
DF	54
Mardia's Normalised Estimate	8.10
Free Parameters	34
Fixed Parameters	25
CFI-ML	0.89
CFI-Robust	0.870
SRMR	0.064
RMSEA-ML	0.091
RMSEA-Robust	0.080

An RMSEA of less than 0.06 generally shows an acceptable model fit. This is higher, which suggests that the model is not a very good fit. Tables 6 and 7 show the pattern matrix and correlations between factors for the five-factor model.

Table 6. CFA Pattern Matrix - Five Factor (CFA) Measurement Model

Factors	F1	F2	F3	F4	E-commerce system performance	R-Squared (commonalities)
1	**0.601**	0	0	0	0.702	**0.533**
2	**0.692**	0	0	0	0.707	**0.515**
3	0	**0.803**	0	0	0.715	**0.320**
4	0	**0.821**	0	0	0.801	**0.299**
5	0	0	**0.702**	0	0.748	**0.685**
Eigenvalues	1.27	1.63	1.38	2.65	3.673	--------

Table 7. Factor Correlations – Five Factor (CFA) Measurement Model

Factor	F1	F2	F3	F4	F5
F1	1.00	**0.604**	**0.600**	**0.490**	**0.660**
F2	0.604	1.00	**0.656**	**0.556**	**0.676**
F3	0.600	0.656	1.00	**0.380**	**0.770**
F4	0.490	0.556	0.380	1.00	**0.720**
F5	0.660	0.676	0.770	0.720	1.00

Since none of the factor correlations were above 0.85, the model has sufficient divergent

validity. The chi-squared values suggested that each factor is measuring a different area of activity.

Table 8. Fit Indices and Statistics for Structural Equation Model (SEM)

Statistic	Structural Model
Chi-Square	180.50
DF	54
Mardia's Normalised Estimate	9.20
Free Parameters	30
Fixed Parameters	24
CFI-ML	0.920
CFI-Robust	0.920
SRMR	0.069
RMSEA-ML	0.087
RMSEA-Robust	0.084

Table 8 shows the data for the structural equation model. The comparative fit index of 0.920 and RMSEA of 0.087 suggest that the model has an acceptable fit. The low Mardia's Estimate and small difference between the ML and Robust estimate indicate that the results were not affected by non-normal data. This implies that the model is reliable and valid for partially explaining the relationships between factors.

■ **Linear Regression Analysis**

Table 9. R-squared for each element of the model

Factor	R	R-squared	Adjusted R-squared	Standard error of the estimate
Perceived benefits	0.478	0.228	0.214	0.83642
IT infrastructure	0.660	0.435	0.425	0.71547
Trading partners	0.616	0.380	0.368	0.74985
Perceived risk	0.674	0.454	0.433	0.70373

The R-squared value quantifies how much of the variation in e-commerce systems performance is due to each factor.

■ **Level of Importance of Each Factor**

Supplementary data file 1 show the level of perceived importance of each item in each variable. The perceived level of importance was high for perceived benefits, IT infrastructure, and system performance, medium for trading partners and low for perceived risks.

CONCLUSION

This study examined the factors that might contribute to the success of e-commerce systems, including perceived benefits and risks, readiness of trading partners, and quality of IT infrastructure. The results indicate that companies use e-commerce systems extensively, and their performance can be attributed to increase e-commerce systems performance. The main results are:

There is a significant statistical effect of e-commerce systems perceived benefits on e-commerce systems performance at level ($\alpha \leq 0.05$).This result indicates that the perceived benefits effect on the performance of the e-commerce systems by increasing sales, decreasing cost and errors, increasing the number efficiency of transaction by useful systems which have friendly user interfaces and friendly systems interfaces, get the communication more flexible between employee through the e-commerce systems and increasing the competitive advantages in the enterprises.

There is a significant statistical effect of e-commerce systems IT infrastructure on e-commerce systems performance at level ($\alpha \leq 0.05$).The IT infrastructure factor was the second most important and most effective factor affecting on e-commerce systems performance having a good IT infrastructure helping the enterprise to expand its e-commerce systems transactions consist of net lines and enough PCs and servers to employment e-commerce systems and databases to speed up the transaction.

There is a significant statistical effect of e-commerce systems trading partners TPs e-commerce systems performance at level ($\alpha \leq 0.05$).This result indicate that The TPs and suppliers trust using e-commerce systems and they apply e-commerce systems in daily and frequently transactions and sometimes using electronic payment tools to exchange payment and Local and global trading partner's infrastructure is reliable to practice e-commerce systems.

There is a significant statistical effect of e-commerce systems perceived risks e-commerce systems performance at level (α ≤ 0.05).The perceived risk factors was the first most important and effective factor that affect e-commerce systems performance such as the cost of running and system maintenance errors, and external pressure all those have to be avoided to reach the e-commerce systems performance

█ Limitations and Suggestions for Further Work

The study looked only at companies in one single sector, in one city in Jordan. The findings may therefore not be widely generalizable, and further studies should focus on different sectors or a wider geographical area. The study also only measured perceptions of improved performance, and did not use any objective measures of e-commerce systems performance, such as repeat custom, profit from e-commerce, or even productivity. Future studies should attempt to resolve this, by drawing on more objective measures of performance against perceived use of e-commerce systems.

ACKNOWLEDGEMENTS

REFERENCES

[1] A. Davison, S. Burgess, and A. Tatnall, Internet technologies and business. Melbourne, Australia: Data Publishing, 2003.

[2] C. Pedrinaci, J. Domingue, C. Brelage, T. van Lessen, D. Karastoyanova, and F. Leymann, Semantic Business Process Management: Scaling up the management of business processes, International Conference on Semantic Computing, 2008, pp.546-553.

[3] I. K. Ibrahim, Handbook of Research on Mobile Multimedia. Hershey, PA: Information Science Reference, 2008.

[4] L, Sugianto, & D, Tojib, Modeling user satisfaction with an employee portal, International Journal of Business and Information, 1, (2) pp. 239 – 255, 2006

[5] D, Tojib, L, Sugianto, & S, Sendjaya, User satisfaction with business to employee portals: conceptualization and scale development. European Journal of Information Systems, 8 (17), pp 649–667, 2008

[6] A, Al-Bakri, A, Cater-Steel, & J, Soar,. 'The influence of B2B e-commerce on SME's performance and efficiency: A review of the literature', *International Journal of Liability and Scientific Enquiry (IJLSE),* vol. 3, no. 3, pp. 213-224. 2010

[7] I. Brown, and R. Jayakody, B2C e-commerce success: a test and validation of a revised conceptual model, The Electronic Journal of Information Systems Evaluation, Vol 11 No. 3, pp. 167–184, 2008.

[8] N, Urbach, S, Smolnik, & G, Riempp,. A conceptual model for measuring the effectiveness of employee portals. AMCIS 2009 Proceedings. Paper 589, 2009

[9] S, Thatcher & W, Foster, , 'B2B e-commerce adoption decisions in Taiwan: the interaction of organisational, industrial, government and cultural factor', Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03), USA, 2002

[10] B, Wixom, & P, Todd, , 'A theoretical integration of user satisfaction and technology acceptance', Information Systems Research, vol. 16, no. 1, pp. 85-102, 2005

[11] C, Subramaniam, & M, Shaw, 'A study of the value and impact of B2B e-commerce: The case of web-based procurement', International Journal of Electronic Commerce, vol. 6, no. 4, pp. 19-40, 2002

[12] A. Rosen, The e-commerce question and answer book: a survival guide for business managers. New York: AMACOM, 2004.

[13] M. Papazoglou, and P. Ribbers, E-business: organizational and technical foundations. Chichester, England: Wiley, 2006.

[14] B. Canzer, E-business strategic thinking and practices. Boston, MA: Houghton Mifflin Company, 2006.

[15] J. Reynolds. The complete e-commerce book: design, build & maintain a successful Web-based business. San Francisco, CA: CMP Publications, 2004.

[16] E, Turban, D, King, J, Lee & D, Viehland, , Electronic commerce 2010, (6th ed). New Jersey: Pearson, 2010

[17] E, Turban, D, King, J, Lee & D, Viehland, , Electronic Commerce: A Managerial Perspective, 4th edn, Prentice Hall, Upper Saddle River, New Jersey, 2004

[18] F, Sultan, G, Urban, V, Shankar, and Y, Bart, Y. Determinants and Role of Trust in E-Business: A Large Scale Empirical Study. MIT Sloan Working Paper No. 4282-02, 2002

[19] T, Teo, & C, Ranganathan, Adopters and non-adopters of business-to-business electronic commerce in Singapore. Information & Management Vol. 42 , 89–102, 2004

[20] A. Moller and P.S. Licker, E-commerce systems success: an attempt to extend and re-specify the Delone and Maclean model of IS success, Journal of Electronic Commerce Research, Vol. 2, No. 4, pp. 131–141, 2001.

[21] R, Al-Zahrani, & M, Al-Otaibi, M. Evaluating e-business adoption: opportunities and threats, (Unpublished master thesis), King Saud University, KSA, 2005

[22] C, Ang, M, Davies, & P, Finlay, P 'Measures to assess the impact of Information Technology on quality management', International Journal and Quality Reliability Management, vol. 17, no.1, pp. 42-66, 2000

[23] C, Chun, & I, Philip, I Factors Affecting Business-to-Business Electronic Commerce Success: An Empirical Investigation, A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy In Information Systems, Graduate School of Computer and Information Sciences Nova Southeastern University, 2010

[24] P, Pavlou,. 'Integrating trust in electronic commerce with the technology acceptance model: model development and validation', *Proceedings of the 2001 Americas Conference in Information Systems,* Boston, MA. 2001

[25] N, Urbach, S, Smolnik, & G, Riempp,. A conceptual model for measuring the effectiveness of employee portals. AMCIS 2009 Proceedings. Paper 589, 2009

[26] N, Urbach, S, Smolnik, & G, Riempp, G.. An empirical investigation of employee portal success. Journal of Strategic Information Systems, Vol. 19 (3), pp. 184–206, 2010a

[27] N, Urbach, S, Smolnik, & G, Riempp,. Industry Specificity of Employee Portal Success A Multi-Group Comparison, Americas Conference on Information Systems, 16 (10), pp. 12-15, 2010b

[28] N, Venkatraman, , 'IT-enabled business transformation: from automation to business scope redefinition', Sloan Management Review, vol. 35, no. 2, pp. 73-87, 1994

[29] Webopedia. Compatible. [cited 2011 23/4/2014]; Available from: http://www.webopedia.com/ TERM/C/compatible.html, 2011

[30] X, Wei,. Availability & performance evaluating of e-business systems, (Unpublished doctoral dissertation), Duke University, USA , 2003

[31] M, Shaw, & C, Subramaniam, 'The effects of process characteristics on the value of B2B e-procurement', working paper presented at the CITEBM, Center for IT and e- Business Management, University of Illinois at Urbana/Champaign, 2002

[32] Department of Statistics in Jordan (DOS) *Trade and investment information systems*, viewed 12 October 2014, <http://www.dos.gov.jo>. 2012

Impact of Organizational Change on The Implementation of ISO14000 EMS towards Corporate Sustainability

Sreenivasan Jayashree, ChinnasamyAgamudainambi Malarvizhi, Rathimala Kannan,
Multimedia University, Malaysia.

ABSTRACT

This study aims to explore the effect of organizational change on the implementation of ISO 14000 EMS leading corporate sustainability and to investigate whether there is a relationship between organizational change, ISO 14000EMS implementation and corporate sustainability. The findings of this study aims to help Malaysian Manufacturing organizations by establishing the impact of organizational change on implementation towards corporate sustainability.
Keywords:Organizational Change, ISO 14000 EMS Implementation, Corporate Sustainability.

INTRODUCTION

Both "operational efficiency" and "strategic effectiveness" require change [1]. Although dramatic improvements are expected from operational changes, planned organizational change seems to be a significant change implementation with the aim of transforming the way an organization operates and offering its members with a future image on a whole new level [2]. According to [3] the organizational change may be either internally driven or required by obligatory external circumstances. No matter what causes the initiation, extreme efforts are taken to ensure organizational effectiveness and it reflects an intense effort to secure organizational effectiveness and, when "planned and implemented, calls for members to adopt It" [4]. Environmental management system (EMS) is defined as a tool for managing the effect of an organization's activities on the environment. EMS offers an organised approach to planning and implementing environment safety actions [5]-[7].

According to [8], ISO 14000 standards or also called the International Standard for Environment, was introduced in 1996 consists of two major parts: (i) instruction for use in details and (ii) overall guidelines or values, systems and backup techniques. Only ISO 14001 among other ISO 14000 series provides certifications for organizations which is the reason most organizations are interested in adopting it. "The whole ISO 14000 family provides management tools for organizations to control their environmental aspects and to improve their environmental performance". Noticeable tangible economic benefits can be granted by these tools such as "reduced raw material/resource use; reduced energy consumption; improved process efficiency; reduced waste generation and disposal costs, and utilization of recoverable resources". Each of these economic benefits are accompanied with separate environmental benefits as well. It is considered as the contribution of ISO 14000 series towards the environmental and economic constituents of sustainable development [9]. Recently, discussions regarding sustainability have increased focus and interest towards corporation and mostly the large one [10]-[12] due to their engagement in creating many negative environmental and social influences [13, 14]. However, corporations also have "the resources, technology, global reach, marketing skills, and sometimes, the motivation to work towards more sustainable societies" [15, 10, 16], also assistance in altering customer's attitude towards principles of sustainability [15]. In such circumstances, corporations along with their leaders are gradually identifying the relationship between the economic, environmental, and social constituents [17, 12] also their impacts "in the short, long and longer term" [18, 19].Several scholars mentioned the need for research to examine HR factors such as top management commitment, empowerment, teamwork and reward within the context of environmental management systems (Jabbour, 2013a; Daily et al., 2007; Ramus, 2001). Few of these studies explored the relationship between these factors and environmental performance (Daily et al., 2007; Wee and Quazi, 2005; Kaur, 2011). Therefore, this study aims to explore the relationship between HR factors and effective implementation towards corporate sustainability in Malaysian Manufacturing industriesto enrich the literature related to the impact of HR factors and ISO 14000 EMS.

BACKGROUND OF STUDY

With rapidly increasing importance of environmental and sustainability issues globally, Malaysia is also forced to pay attention to these issue which indeed enables it to enter foreign and global markets where noble environmental performance is assumed as a corporate competitive advantage [20]. Hence, studying the relationship and connection between environmental practices with ISO 14000 EMS seems very interesting and significant. Since it enables the organizations to better understand whether environmental management certification assists in market penetration programs or it simply is effective due to increasing environmental awareness and responsibility among corporations.

A study by [21] on Malaysian firms registered with ISO 14000, indicates that companies perceive benefits from adopting ISO 14000 standards. The costs and benefits of ISO 14000 certification have resulted in firms choosing this route as a tool for proactive environmental management. Several gaps were identified while reviewing previous research. There is a lack of research that explores how ISO 14000 EMS contributes to corporate sustainability [22].

There is also a need for further research on the impact of organizational change towards corporate sustainability with including larger sample of the firms [23]. Further research was suggested on the impact of organizational change in ISO 14000 EMS implementation as a driving force for sustainable development [24]. Such research will identify the mediating effect of ISO 14000 EMS between organizational change and corporate sustainability.

In the current global competition where all organizations are seeking for tools and strategies to gain competitive advantage and remain leader and successful, implementation of ISO 14000 EMS has proven to be significantly effective in achieving sustainability among manufacturing organizations.

According to [25, 26], significant changes are required for ISO 14000 EMS implementation in an organization. Only the management that is fully committed in enduring organizational changes connected to implementation, which can result in ongoing improvement in environmental performance, is likely to succeed in ISO 14000 EMS implementation [27, 28]. Therefore, it is necessary to study the impact of organizational change on ISO 14000 EMS to be able to make the implementation highly effective.

There are few studies that focus on the impact of organizational change on ISO14000 EMS implementation [29, 30], yet they lack to explore how the result of this impact can contribute to corporate sustainability.

Hence, this research explores how organizational change may ease and facilitate the effective implementation of ISO 14000 leading to corporate sustainability that enables the organizations to achieve their targets and long term objectives.

LITERATURE REVIEW

Organizations looking for sustainability should make "fundamental paradigm shifts" "towards a more integrative, eco-effective model" [31]. This has been supported by other researchers stating that organizations need to "undergo significant cultural change and transformation" to shift towards sustainability [32]. According to [33], this transformational change is called "deep change" that "... requires new ways of thinking and behaving."

▌ Organizational Change and Effective Implementation of ISO 14000 EMS

[34] Stated that many organizations are encouraged to get certified by ISO14001 Environmental Management Standards, particularly trading organizations that run cross-nationally or internationally. Organizations certified by ISO 14001 EMS are less likely to face barriers in international business trading [35, 36]. In spite of the advantages received by organizations with ISO 14001 EMS certification, changes in business processes in the organizations were observed through the implementation of EMS [37, 38]. Hence, it is expected from the employees to leave "their previous work pattern in which they are familiar with and adapt to new working pattern" [39]. However, "change can be very stressful. Adopting to the new conditions and changes is not simple for all the employees which makes it difficult for them to value the implementation of EMS and consider it as an opportunity to development. Many employees react to change with struggle, hindrance, anger, avoidance towards risks involved, distress to be innovative, fear of unknown and some may complain of increased responsibilities that EMS would produce [40]. Hence, organizations must identify these issues and try to tackle them with the right strategies to avoid the complications that EMS implementation will create to increase the effectiveness of the certification.

According to the studies of [30, 41], Organizational change was one of the critical success factors in implementation of ISO 14001 EMS

"Failure to change and respond to new opportunities, processes, or technologies can result in economic losses; thus making economic benefits a primary justification for organisational change" [10]. Organizations are forced to make External events force companies to make "moderate organisational changes at least once a year" due to external measures, and "main changes every four or five years" [42]. Changes in organisations is a complicated procedure [43], ongoing, and unclear [44].

▌ Effective Implementation of ISO 14000 EMS

Several studies have focused on benefits of ISO 14001 EMS implementation [45]. According to a study by [40], cost reduction is the most important benefit achieved through ISO 14001 EMS implementation among the organizations in Australia. Another study in Sweden revealed that improved corporate image was the most significant advantage received from the implementation [7]. [6] Also reported that morale building and satisfying customer's expectations are the most significant benefits gained by organizations in Australia and New Zealand that implemented ISO

14001 EMS. Therefore, it is clear that organizations in varied countries receive different kind of benefits due to their cultural differences and organizational expectations [46].

▍Corporate Sustainability

Recently, sustainability is recognized as a significant and important issue which has attracted an increased attention among researchers. However, number of studies focusing on facets of corporate sustainability and its effect on financial as well as non-financial performance of firm remain limited [47].

Due to the importance and the increased attention towards sustainability, there is the demand of evaluation of its performance. It has been indicated by many researchers that corporate sustainability is mostly concentrated on the social, environmental, and economic performance of "sustainable development" [48].

RESEARCH METHODOLOGY

Based on review of literature and the gaps mentioned, the conceptual framework is presented in Figure. 1 and aims to investigate the relationship between organizational change and effective implementation of ISO 14000 EMS and also to examine whether there is any relationship between effective ISO 14000 EMS implementation and corporate sustainability in Malaysian Manufacturing firms. Therefore, organizational change is the independent variable where the implementation of ISO 14000 EMS and corporate sustainability are dependent variables. Research questions are as follows; 1. How does organizational change influence the effective implementation of ISO14001 EMS towards corporate sustainability? 2. Is there any relationship between the effective ISO 14000 EMS implementation and corporate sustainability?

Hence, the proposed research framework is presented in Fig. 1

Fig.1 Conceptual Framework
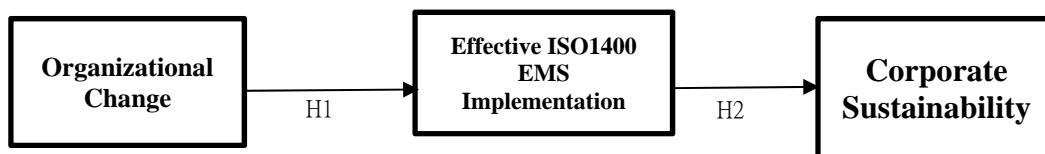
This research conducts a survey questionnaire to deal with the research questions appropriately and uses hypothesis testing to test the model and to explore the connection concerning organizational change, ISO 14000 EMS implementation and corporate sustainability in Malaysian Manufacturing firms.

Unit of analysis of this research is the organization. However, Managers are considered as the targeted respondents contacting by email. Malaysian Manufacturing firms are the targeted population of this research and samples will be provided from listed ISO 14000 EMS certified organizations of the Federation of Malaysian Manufacturer (FMM, 2013) and SME Corp. Probability sampling will be used in this study and samples will be selected from the population of sampling frame using a simple random sampling design where each unit has equal chance of being selected [50]. SPSS will be further used for the analysis.

Hypothesis for the study are developed namely;
  H1: There is a significant relationship between organizational change and IS0 14000EMS implementation.
  H2: There is a significant relationship between ISO 14000 EMS implementation and corporate sustainability.

CONCLUSION

This study creates new insights into the way organization should change in order to implement ISO 14000EMS effectively. Proper change in the organizations leads to effective implementation of ISO 14000 EMS which results in corporate sustainability. Planned and proper strategic organizational change will revolutionize the way corporations operate and enables them to effectively implement ISO 14000 EMS which leads to sustainability.

REFERENCES

Aligleri, L., Aligleri, L.A., Kruglianskas, I., 2009. Gestão socioambiental: responsabilidade e sustentabilidade do negócio. Atlas, São Paulo.

Anusingh, L. & Shikha, G., 2015. Impact of Green Human Resource Factors on Environmental Performance in Manufacturing Companies : , 6(1), pp.23–30.

Babakri, K. a., Bennett, R. a. & Franchetti, M., 2003. Critical factors for implementing ISO 14001

standard in United States industrial companies. Journal of Cleaner Production, 11, pp.749–752.

Coelho TM, Castro R, Gobbo JA. PET containers in Brazil: opportunities and challenges of a logistics model for post-consumer waste recycling. Resources, Conservation and Recycling 2011; 55(3):291–9.

Daily, B.F. and Huang, S., (2001). Achieving sustainability through attention to human resource factors in environmental management. International Journal of Operations and Production Management, 21(12), pp.1539.

Daily, B.F., Bishop, J.W. and Steiner, R., (2007). The Mediating Role of EMS Teamwork as it Pertains to HR Factors and Perceived Environmental Performance. Journal of Applied Business Research, 23(1), pp.95-110.

Goyal, P., Rahman, Z. & Kazmi, a. a., 2013. Corporate sustainability performance and firm performance research: Literature review and future research agenda. Management Decision, 51(2), pp.361–379

Govindan K, Cheng TC. Environmental supply chain management. *Resources, Conservation and Recycling* 2011;55(6):557–8.

Hair, J.F., Babin, B., Money, A.H. and Samouel, P. (2003), Essentials of Business Research Methods, Wiley, Hoboken, NJ.

Heras-Saizarbitoria, I. (2011), "Internalization of ISO 9000: an exploratory study", Industrial Management and Data Systems, Vol. 111 No. 8, pp. 1214-1237

Huang, B.F.D. and S., 2006. Achieving sustainability through attention to human resource factors in environmental management.

Jabbour, C.J.C. & Santos, F.C. a, 2008. Relationships between human resource dimensions and environmental management in companies: proposal of a model. Journal of Cleaner Production, 16, pp.51–58.

Jabbour, C.J.C. et al., 2013. Environmental management and operational performance in automotive companies in Brazil: The role of human resource management and lean manufacturing. Journal of Cleaner Production, 47, pp.129–140.

John Milliman. 2013. Leading-Edge Green Human Resource Practices: Vital Components to Advancing Environmental Sustainability. Environmental Quality Management 23:10.1002/tqem. 2013.23.issue-2, 31-45.

Kannan D, Diabat A, Alrefaei M, Govindan K, Geng Y. A carbon footprint based reverse logistics network design model. Resources, Conservation and Recycling 2012;67:75–9.

Kaur, H., 2011. Impact of Human Resource Factors on Perceived Environmental Performance : an Empirical Analysis of a Sample of ISO 14001 EMS Companies in Malaysia. Journal of Sustainable Development, 4(1), pp.211–224

Kitazawa, S. and Sarkis, J. (2000), "The relationship between ISO 14000 and continuous source reduction programs", International Journal of Operations and Production Management, Vol. 20 No. 2, pp. 225-248.

Labuschagne, C., Brent, A.C., van Erck, R.P.G., 2005. Assessing the sustainability performances of industries. Journal of Cleaner Production, 13, 373e385.

Lefebvre, E., Lefebvre, L. a. & Talbot, S., 2003. Determinants and Impacts of Environmental Performance in SMEs. R and D Management, 33(514), pp.263–283.

Lin, C.I. and Jang, W.Y. (2008), "Successful ISO 9000 implementation in Taiwan", International Journal of Productivity and Performance Management, Vol. 57 No. 8, pp. 600-622.

Massoud, M. a et al., 2010. Environmental Management System (ISO 14001) certification in developing countries: challenges and implementation strategies. Environmental science & technology, 44(6), pp.1884–1887.

Morrill, J. & Berthelot, S., 2013. The Purpose of ISO 14001 Certification : Independent Assurance or Improved Environmental Management System ? Social and Environmental Accounting, 6(3), pp.4–24.

Nee, G.Y., 2011. Determining Factors for ISO14001 EMS Implementation among SMEs in Malaysia : A. International Journal of Social, Management, Economics and Business Engineering, 5(11), pp.251–256.

Ooi, K.-B. et al., 2012. Does TQM support innovation performance in Malaysia's manufacturing industry? Journal of Business Economics and Management, 13(2), pp.366–393.

Pawliczek, A. & Piszczur, R., 2013. Consequence of QMS ISO 9000 and EMSISO 14000

Implementation on CZ/ SK Enterprise Performance with Respect to Sustainability. Journal of Eastern Europe Research in Business & Economics, 2013, pp.1–18.

Porter, M.E. (1985), Competitive Advantage: Creating and Sustaining Superior Performance, Free Press, New York, NY.

Psomas, E. L., C. V. Fotopoulos & Karetzopoulos, D.P. (2011) " Motives, Difficulties and Benefits in Implementing the ISO 14001 Environmental Management System", Management of Environmental Quality: An International Journal, Vol. 22, No. 4, pp. 502-521

RAHARDJO, H. et al. 2013. Factors that Determines the Success of Corporate Sustainability Management. Journal of Management Research, 5: 2.

Ramus, C. A. (2002). Encouraging innovative environmental actions: what companies and managers must do? Journal of World Business 37(2), 151-164.

Ramus, C.A. (2001). Organizational support for employees: encouraging creative ideas for environmental sustainability. California Management Review, 43(3), 85-105.

Renwick DWS, Redman T, Maguire S. Green human resource management: a review and a research agenda. International Journal of Management Reviews 2013; 15 (1):1–14.

Sammalisto, K., Brorson, T., 2008. Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gavle, Sweden. Journal of Cleaner Production 16, 299e309.

Savely, S.M., Carson, A.I., Delclos, G.L., 2007. An environmental management system implementation model for U.S colleges and universities. J. Clean. Prod. 15, 660e670.

Schaltegger S, Burritt R. 2005. Corporate sustainability. In The International Yearbook of Environmental and Resource Economics, Folmer H, Tietenberg T (eds). Edward Elgar: Cheltenham; 185–232.

Shrivastava P, Hart S. 1995. Creating sustainable corporations. Business Strategy and the Environment 4(3): 154–165.

Turk, A.M., 2009. ISO 14000 environmental management system in construction: An examination of its application in Turkey. Total Quality Management & Business Excellence, 20(7), pp.713–733.

Wee, Y.S. & Quazi, H. a., 2005. Development and validation of critical factors of environmental management. Industrial Management & Data Systems, 105, pp.96–114.

Vertical Price Transmission And Spillovers between Agri-Food Chains

L. Emilio Morales, Nam Hoang, Garry Griffith
UNE Business School, University of New England, Armidale, Australia
Salomon Salcedo
Food and Agriculture Organization of the United Nations (FAO), Rome, Italy

ABSTRACT

Price transmission has been used as an indicator of market integration to assess competitiveness of agri-food chains and margins captured in rural areas. However, spillovers between farmer prices have been neglected as a way to improve price transmission and revenue distribution in related agricultural products. This manuscript compares vertical price transmission, effects of marketing input prices and spillover effects between three agri-food chains in three countries, using asymmetric error correction models. Results identified spillover effects between farmer prices, differences between countries in the speed of price transmission and effects of marketing input prices on prices paid to farmers. Accordingly, agricultural policies should consider these spillovers between farmer prices when designing interventions to raise incomes in rural areas.

Keywords: Agri-food chains, Policy interventions, Vertical price transmission, Price spillovers, Asymmetric error correction model.

INTRODUCTION

High consumer food prices and sharp fluctuations in agricultural prices have raised questions about the magnitude, delay and asymmetry in vertical price transmissions in agri-food chains. According to Norwood and Lusk (2008), price incentives dictate the actions of each actor in the chain, but unfortunately market prices could be imperfect signals. Hence, price transmission along agri-food chains is a key indicator to assess the efficiency and degree of competition of the chains (Bunte 2006; Aramyan and Kuiper 2009; European Commission 2009; Swinnen and Vandeplas 2013). Even though price transmission and effects of variations in input prices on prices paid to farmers have been analysed in different agri-food chains and countries, little has been explored about potential contagion effects of price variations among commodities. Therefore, research that studies price transmission through value chains and the presence of cross-price elasticity of supply between agricultural products should be developed. Accordingly, this study is focused on identifying the factors affecting farmer-export/ wholesale price spreads along seemingly unrelated agri-food chains and between them in selected countries. These case studies are used to assess the performance of those chains and to provide relevant information for policy decisions aiming to improve competitiveness and revenue distribution along agri-food chains, especially for smallholders.

Governments have promoted a growth in trade increasing the number of Free Trade Agreements and controlling sharp fluctuations on the exchange rate, as a way to improve the economic welfare (Siriwardana and Sajeewani, 2013; Yang and Siriwardana, 2011). The transmission of shocks in world prices to domestic markets has been used as an indicator of market integration, considering that under a free market regime, domestic prices are expected to be affected by changes in supply and demand conditions in international markets (Rapsomanikis and Mugera 2011). Under these conditions, a rise in world agri-food prices could represent an opportunity for poverty reduction and improvements in food security in rural areas, subject to the condition that domestic markets receive price signals (Rapsomanikis *et al*. 2004; Kaspersen and Foyn 2010). Nevertheless, this assumption is not valid for the agricultural sector as there is a perception of asymmetries in price transmission, which according to Rapsomanikis *et al*. (2004), Frey and Manera (2007) and Sexton (2013), is explained by production and marketing contracts, oligopolistic behaviour and collusion among domestic traders to keep differences between international and domestic prices higher than transfer costs. Therefore, variations in prices may not be transmitted throughout value chains; they could be only transmitted with a lag; or the transmission might depend on the direction of the change (Aramyan and Kuiper 2009).

This article first discusses about previous studies on price transmission in the next section. Then, the third section describes the data used in this study and the fluctuations on marketing margins and correlations during the period under analysis. After that, the fourth section introduces the theoretical model used to test vertical price transmission. The fifth section provides empirical evidence that supports vertical price transmission and spillover effects between farmer prices among the products selected in the case study countries. Finally, the sixth section presents the main conclusions and policy implications.

PRICE TRANSMISSION IN AGRI-FOOD CHAINS

Price transmission is assessed in terms of the magnitude, speed and degree of asymmetry of the

price adjustment, which depends on the nature, structure and organization of the agri-food chain (Bakucs et al. 2014). Relevant factors that influence price transmission are: i) intrinsic specificities of the product such as storability, perishable nature and seasonality; ii) market structure determined by the number of intermediaries and intensity of competition at each level of the chain; and iii) public policies (Vavra and Goodwin 2005; European Commission 2009). Imperfect vertical price transmission has been considered as evidence of market failure, which requires policy interventions to raise welfare in specific groups of actors and the competitiveness of the whole agri-food chain. This argument is based on the fact that imperfect price transmissions may lead to decisions that achieve inefficient outcomes, and affect the performance and viability of the whole chain (Rapsomanikis *et al*. 2004). However, lags in price transmission in the short run could be positive for the performance of the whole chain as farmers are able to take more efficient production decisions, including resource allocation, as unanticipated variations in prices raise uncertainty, thus leading also to sub-optimal decision making (FAO and OECD 2011).

According to Bunte (2006), farmers and consumer associations have indicated that food-processing and retail companies increase their profit margins by exploiting their market power, paying low prices to farmers and charging high prices to consumers. Market power is considered the main reason to explain imperfect price transmission, but it may not be the only causal factor (Meyer and von Cramon-Taubadel 2004; Vavra and Goodwin 2005; Frey and Manera 2007; Sexton 2013). Conforti (2004), Aramyan and Kuiper (2009) and Swinnen and Vandeplas (2013) indicated that incomplete or lagged price transmission can also be due to transport and transaction costs, public interventions or policies, product differentiation, publicity, perishability of the product and vertical coordination, which includes risk mitigating contracts offered by some intermediaries. In several countries, asymmetries and lags in price transmission have been found in different agri-food chains, including beef, chicken and eggs in the United States (Vavra and Goodwin 2005), sorghum and coffee in Uganda (Kaspersen and Foyn 2010) and pork in Germany (von Cramon-Taubadel 1998). These results are supported by Griffith *et al*. (1991) and Griffith and Piggott (1994) who found distortions in short term price transmission in the Australian beef chain, comprising price levelling (wholesalers or retailers hold their selling prices relatively stable when farm prices vary) and price averaging (high spread prices of a set of meat type compensate other low price spread set on other types). These distortions smooth or reduce the price volatility in the short run to keep real prices relatively stable, but should not persist in longer periods.

Apart from the influence of variations in export/wholesale prices on farmer prices, and the effects of changes in oil price and other marketing input prices found by Wholgenant and Mullen (1987), among others; Harri *et al*. (2009) identified variations on prices paid to farmers for a particular product resulted from variations in farmer prices for other agricultural products. The latest relationships were supported by Griffith *et al*. (2001), who indicated that when the farmer price of a particular product varies, thus modifying the relative price and profitability with respect to a related product, a change is expected in the mix of products offered by farmers along the production frontier. Evidence of this effect is cross-price elasticities of supply found in different agri-food industries in several countries. However, according to Griffith *et al*. (2001) most agricultural industries require expensive capital infrastructure that prevents significant substitution between products. In this context, the present research aims to test if farmer prices in agri-food chains are responsive to variations in prices paid to farmers in related chains.

DATA AND MARKETING MARGINS

Australian, Colombian and South African data, including production, farmer prices and export prices of banana, beef cattle and sugar cane[4] from 1970 to 2011[5], was obtained from FAOSTAT (2014). The export prices per ton of sugar cane were estimated as equivalent to 12% of sugar raw centrifugal. In the case of live beef cattle, the yield per carcass weight per year and a ratio of 62.5% carcass to live animal were used to estimate export prices per ton. According to Asche *et al*. (2007), increases on farmer prices of substitutes in production are expected to raise prices paid to farmers in a specific agri-food chain, while a decrease in prices is expected when products are complements in production, such as cases when residues of production can be used as inputs by another farm production. In addition, a negative relationship between quantity of farm output produced and farmer prices is expected in a chain where a significant proportion of the final product is sold domestically, hence supply shocks will affect prices paid to farmers.

Banana, beef cattle and sugar cane chains were selected in Australia, Colombia and South Africa. These exporting agri-food chains, with high levels of investment and vertical coordination in the three countries analysed, are interesting case studies to examine how price variations are transmitted

---

4 Farmer prices correspond to prices paid at farm-gate or first point of sale, while export prices are FOB prices.
5 Colombian beef cattle export prices were adjusted during the period 1986 to 1988, as they were identified as outliers.

throughout and between chains that appear unrelated. This is due to the significant sunk costs present in these chains limiting the ability of farmers to negotiate, hence a low degree of relationship between them is assumed. Banana and sugar cane plantations are crops established for more than one period and beef cattle production could be considered as a different activity mainly affected by variations in farmer prices of other crops, such as cereals used to feed animals. In contrast, farmers can use wastage or residues of the crops included in this analysis to feed their animals, and vary the land used and intensity of production of each product according to prices paid, using more land and inputs to increase yields. Therefore, spillover effects are expected as there are relationships between the chains and input allocation would vary according to profitability of products, reducing land and intensity of production of those products with lower profits. Additionally, a comparison of price transmissions in these agri-food chains in Australia, Colombia and South Africa will highlight differences between countries, considering their particular socioeconomic and production conditions. International crude oil prices per barrel were collected from British Petroleum (BP) (2014) and GDP per capita of each country analysed were obtained from the Economic Research Services (ERS) of the United States Department of Agriculture (2014). Variations in international oil prices are assumed to be transmitted to domestic oil prices in Australia, Colombia and South Africa. Increases in oil prices are expected to raise prices across the agri-food chain, including farmer prices as it is a relevant input in the production process at farm level. GDP per capita has been used as a proxy variable of wage rate, as GDP per capita and labourer wage rate were highly correlated during the period from 2003 to 2012. The GDP per capita is expected to affect farmer prices as do variations in oil prices.

All prices and GDP were transformed into United States dollars and then they were deflated to the values of the year 2000 using the annual Consumer Price Index (CPI) of the United States, obtained from the Bureau of Labor Statistics of the United States Department of Labor (2014). In the three countries analysed, prices showed an increase in the period between 2006 and 2011 relative to the prices observed in the period from 2000 to 2005. In absolute values, Australian banana export prices and farmer prices were higher than those observed in Colombia and South Africa, while Colombian and South African beef cattle prices paid to farmers were higher than in Australia, and sugar cane prices were similar in the three countries. Fluctuations in marketing margins through the period under analysis could be associated with the potential presence of market power in the selected chains in the three countries studied. The percentages of marketing margins in respect to export prices decreased in the 1990s in comparison to 1980s and 1970s. They then rose in the period from 2000 to 2005, and finally decreased in banana and beef cattle chains during the last period between 2006 and 2011 relative to the percentages observed in the period from 2000 to 2005. In contrast to Colombia and South Africa, in Australia the share of the export price captured by the marketing margin, in the period 2006-2011, shows a lower variation relative to the previous five years. These variations reported in the percentages of marketing margins in respect to export prices suggest that fluctuations in export prices have been partially transmitted to farmer prices in the three countries. To identify potential relationships between quantity of farm output, farmer prices and export prices of the selected chains in Australia, Colombia and South Africa, in addition to GDP per capita and international oil price, selected correlation coefficients are presented in Table 1.

Table 1. Selected correlation coefficients for Australian, Colombian and South African agri-food chains[6].

		Farmer Prices Australia (USDb2000/Ton)			Farmer Prices Colombia (USDb2000/Ton)			Farmer Prices South Africa (USDb2000/Ton)		
		Banana	**Beef Cattle**	**Sugar Cane**	**Banana**	**Beef Cattle**	**Sugar Cane**	**Banana**	**Beef Cattle**	**Sugar Cane**
Farmer Prices (USDb2000/Ton)	**Banana**	1.00	-	-	1.00	-	-	1.00	-	-
	Beef Cattle	0.10	1.00	-	-0.09	1.00	-	0.65	1.00	-
	Sugar Cane	0.22	0.36	1.00	0.72	0.19	1.00	0.69	0.78	1.00
Export/Wholesale Prices (USDb2000/Ton)	**Banana**	0.31	-	-	0.54	-	-	0.34	-	-
	Beef Cattle	-	0.63	-	-	-0.02	-	-	0.40	-
	Sugar Cane	-	-	0.97	-	-	0.03	-	-	0.85
Quantity of Farm Output (Tonnes)	**Banana**	-0.20	-	-	0.40	-	-	-0.77	-	-
	Beef Cattle	-	-0.41	-	-	-0.33	-	-	-0.05	-
	Sugar Cane	-	-	-0.62	-	-	-0.10	-	-	-0.60
GDP per capita (USDb2000)	**GDP per capita**	0.14	-0.33	-0.69	0.29	-0.28	-0.09	-0.61	-0.33	-0.55
International Price (USDb2000/barrel)	**Oil Price**	0.35	0.30	0.17	-0.08	0.32	-0.02	0.03	0.44	0.30

---

[6] Prices in U.S. dollars base year 2000. Average exchange rates in year 2000: 1 United States Dollar (USD) = 1.72 Australian Dollars (AUD) = 2,087.91 Colombian Pesos (COP) = 6.94 South African Rand (ZAR).

In Australia, high positive correlations were found between farmer and export/wholesale prices in beef cattle and sugar cane, while a moderate positive correlation was found between farmer and export/wholesale prices in banana. In addition, a moderate positive correlation was found between farmer prices of beef cattle and sugar cane, and banana and sugar cane. Conversely, a moderate negative correlation was found between farmer prices and quantity of farm output in beef cattle and sugar cane. Moreover, a negative high correlation was found between sugar cane farmer prices and GDP per capita, but only a moderate negative correlation was found between beef cattle farmer prices and GDP. Finally, low correlation coefficients were found between farmer prices and oil prices. In Colombia, a moderate positive correlation between farmer and export/wholesale prices was found in banana, while low correlation coefficients between farmer and export/wholesale prices were found in beef cattle and sugar cane. Furthermore, a high positive correlation was found between farmer prices of banana and sugar cane. In contrast, a moderate negative correlation was found between the quantity of farm output and beef cattle farmer prices, while a moderate positive correlation was identified between quantity of farm output and banana farmer prices. Finally, moderate correlation coefficients were found between farmer prices and GDP per capita and oil prices. Finally, in South Africa, moderate positive correlations between farmer and export/wholesale prices were found in banana and beef cattle, while a high positive correlation coefficient was found between farmer and export/wholesale prices in sugar cane. Additionally, high positive correlations were found between farmer prices of banana, beef cattle and sugar cane. In contrast, high negative correlation was found between the quantity of farm output and banana farmer prices, while a moderate negative correlation was identified between quantity of farm output and banana farmer prices. Finally, moderate correlation coefficients were found between farmer prices and GDP per capita and oil prices.

Even though these results are in line with the expected effects suggested by the economic theory, they do not demonstrate any causality relationship between the variables. But, they do indicate that there is evidence that suggests that farmer and export/wholesale prices for the chains selected should move together in Australia, Colombia and South Africa, and that there are some relationships between farmer prices of the selected chains. These preliminary results can be further tested using time series modelling.

PRICE TRANSMISSION EMPIRICAL FRAMEWORK

Vertical price spread from wholesale to farm was modelled by Wohlgenant and Mullen (1987), based on the derived demand for farm output as shown in equation (1):

$$P_{ft} = f(P_{wt}, Q_{ft}, C_t) \tag{1}$$

where P_{ft} is farmer price of a specific commodity in time t; P_{wt} is export/wholesale price of a specific commodity in time t; Q_{ft} is the quantity of farm output of the commodity in time t; and C_t is a vector of marketing input prices in time t, comprising transport costs and wage rates, among others. Esposti and Listorti (2013) found price transmission across space and commodities using a generic reduced-form model of price formation and transmission, including three dimensions: commodity, space and time; as shown in equation (2):

$$P_{kit} = \alpha_{ki} + \sum_{s=1}^{S<T} \rho_s P_{kit-s} + \sum_{s=0}^{S<T} \sum_{j\neq i} \omega_{ij}^s P_{kjt-s} + \sum_{s=0}^{S<T} \sum_{i=1}^{N} \sum_{h\neq k} \varphi_{kh}^s P_{hit-s} + \varepsilon_{kit} \tag{2}$$

where P_{kit} is the price in a particular market place k of commodity i in time t; P_{kjt} is the price in a particular market place k of other commodity j in time t; P_{hit} is the price in another market place h of commodity i in time t; s is the maximum time lag and ε_{kit} is a normally distributed error term. Under perfect transmission of price movements along the agri-food chain, variations in prices at a given level of the value chain will be fully and instantaneously transmitted to other stages (Rapsomanikis *et al.* 2004; Kaspersen and Foyn 2010). These two price series could have a relationship depending on market characteristics, where prices could not adjust completely or slowly over the time (Rapsomanikis and Mugera 2011). According to this, the variations in domestic farmer prices for the agri-food chain i can be explained by the variations in export prices as described in equation (3):

$$P_{fit} = \alpha + \beta P_{wit} + v_{it} \tag{3}$$

The α coefficient is a constant term, and v_t represents an error term (Kaspersen and Foyn, 2010). Wolffram (1971) and Houck (1977) specified a method (W-H) to analyse asymmetry in price transmissions based on the variations of the explanatory price as shown in equation (4):

$$\sum_{t=1}^{n} \Delta P_{fit} = \alpha + \beta^+ \sum_{t=1}^{n} \Delta P_{wit}^+ + \beta^- \sum_{t=1}^{n} \Delta P_{wit}^- + v_{it} \tag{4}$$

where ΔP_{wit}^+ and ΔP_{wit}^- are the positive and negative first difference in P_{wit}, respectively. This specification is especially useful to analyse asymmetry in price transmission when a price series is

non-stationary. A stationary series is one that has a constant mean, constant variance and constant autocovariances for each given lag (Greene 2012; Enders 2014). When non-stationary series are regressed, the result could be a spurious regression, defined as when there appears to be a significant relationship among unrelated variables trending over time (Greene 2012; Enders 2014). If prices are non-stationary, but a linear combination of the series is found stationary, then it is possible to demonstrate that the prices are cointegrated. Therefore, the series have a relationship in the long run if the error of the cointegration equation is stationary as indicated in equation (5):

$$v_{it} = P_{fit} - \alpha - \beta P_{wit} \sim I(0) \tag{5}$$

In this framework, cointegrating variables may deviate in the short-run from their long-run relationship, but in the long-run commodity prices will tend to have co-movements (Kaspersen and Foyn 2010; Rapsomanikis and Mugera 2011; Byrne 2013; Enders 2014). According to von Cramon-Taubadel (1998), if the price series are cointegrated, then the W-H specification to test asymmetry, described in equation (4), could lead to incorrect results due to spurious regression. Alternatively, an Error Correction Model (ECM) as described by Engle and Ganger (1987) can be used to model the relationships for each chain i when prices are in the same integration order and cointegrated. The short run parameters can be interpreted as the measure of the effects and speed of transmission, while the long run parameters are the degree of price transmission along the agri-food chain (Kaspersen and Foyn 2010; Enders 2014). The ECM could be modified to incorporate asymmetric adjustment terms as proposed by Granger and Lee (1989) in their Asymmetric Error Correction Model (AECM), and include export prices, quantity produced, farmer prices of related chains, input prices and dummy variables, as presented in equation (6):

$$\Delta P_{fit} = \alpha + \gamma^+ v_{t-1}^+ + \gamma^- v_{t-1}^- + \sum_{s=0}^{S \leq T} \delta_s \Delta P_{wit-s} + \sum_{s=1}^{S \leq T} \theta_s \Delta P_{fit-s} + \sum_{s=1}^{S \leq T} \partial_s \Delta Q_{fit-s}$$

$$+ \sum_{s=1}^{S \leq T} \sum_{j=1}^{N} \tau_j \Delta P_{fjt-s} + \sum_{h=1}^{M} \omega_h \Delta C_{ht} + \varphi D_{1970-89} + u_{it} \tag{6}$$

where ΔP_{fit} is the first difference of the farmer price in the chain i in time t; ΔP_{wit-s} is the first difference of the wholesale/exporter price in the chain i in time t-s; ΔP_{fit-s} is the first difference of the farmer price in the chain i in time t-s; ΔQ_{fit-s} is the first difference of the quantity of farm output in the chain i in time t-s; ΔP_{fjt-s} is the first difference of the farmer price in the related chain j in time t-s; ΔC_{ht} is the first difference of the prices of marketing input h in time t; $D_{1970-89}$ is a dummy variable that captures the first two decades under analysis when countries had more protectionist policies in place to stimulate domestic production; v_{t-1}^+ represents the positive variations of the error correction term lagged one period, where v_{t-1} is specified in equation (5); and v_{t-1}^- represents the negative variations of the error correction lagged one period. In the case that $\gamma^+ = \gamma^-$, there is symmetry in the speed of price transmission adjustments in the long-run. In this case, positive and negative divergences from the long-run equilibrium, between the farmer and wholesaler/export prices, result in changes in farmer prices that have the same magnitude (Granger and Lee 1989; Rapsomanikis *et al.* 2004).

Contemporaneous export prices, GDP per capita and oil prices are included in the model, while lagged values of quantity of farm output and prices of related chains are included to avoid potential simultaneity that would invalidate the results of the model. Vector autoregressive (VAR) models, including cointegrated VAR models known as vector error correction models (VECM), have been used for the analysis of price transmission in several studies, including Vavra and Goodwin (2005), Kaspersen and Foyn (2010), and Rapsomanakis and Mugera (2011). These models were considered for the data analysis due to their potential to track down impulse responses of a price shock on other variables, and distinguish between permanent and transition shocks on prices. Given the data constraints in this study, the VAR estimations would be inefficient, while the AECM fit well the purpose of study price transmission and spillover effects between farmer prices.

ESTIMATION RESULTS

Firstly, Ng and Perron (2001) tests were conducted to identify if the series used in this study have unit roots, then they could be considered as non-stationary and when regressed they potentially could lead to spurious regression. This test was chosen due to its detrending data and size adjusted properties that avoid rejections of the non-stationary hypothesis due to size distortions (Rapach and Weber 2004). The results of the Ng-Perron (2001) unit root test for the series in levels and first difference are presented in Table 2.

Table 2. Ng and Perron (2001) unit root test results for selected variables.

		Ng-Perron (2001) MZα test statistic with variables in levels			Ng-Perron (2001) MZα test statistic with variables in first differences		
		Australia	Colombia	South Africa	Australia	Colombia	South Africa
Farmer Prices (USDb2000/Ton)	Banana	-16.6353*	-12.2284	-12.3067	-19.102**	-52.4302***	-18.9495**
	Beef Cattle	-13.7935	-4.5891	-8.9303	-19.9973**	-19.3922**	-19.1214**
	Sugar Cane	-9.8589	-6.6001	-10.2555	-18.0836**	-19.9667**	-19.7204**
Export/Wholesale Prices (USDb2000/Ton)	Banana	6.4850	-6.5648	-7.1621	-15.7044*	-19.2183**	-28.2672***
	Beef Cattle	-7.5299	-15.9177*	-13.3450	-16.7547*	-19.3706**	-19.208**
	Sugar Cane	-11.3002	-4.8213	-12.2179	-18.3628**	-41.9312***	-19.8164**
Quantity of Farm Output (Tonnes)	Banana	-13.0776	-12.7456	-8.5628	-19.9707**	-19.7982**	-19.7549**
	Beef Cattle	-6.9002	-37.1589***	-6.3147	-19.447**	-19.0277**	-19.7341**
	Sugar Cane	-6.4918	-14.8164*	-15.7005*	-18.9939**	-17.5894**	-17.9711**
GDP per capita (USDb2000)	GDP per capita	-1.2940	-9.0734	-3.9986	-19.6311**	-18.1422**	-17.5051**
International Price (USDb2000/barrel)	Oil Price		-5.0093			-39.9167***	

Null hypothesis: Series has unit root.

(***), (**) and (*) indicate that the parameter is significant at the 1%, 5% and 10% levels, respectively.

The results of the unit root tests reported in Table 3 indicate that it is not possible to reject the hypotheses that the series have unit root when they are in levels, but all tests reject the presence of unit root when the series are in first differences. Hence, they should be treated as non-stationary integrated order one I(1), which is the number of times the series need to be differenced to be stationary (Greene 2012; Enders 2014). Given this condition, Johansen (1991) trace cointegration tests were run to analyse the relationships between farmer price and export/wholesale price in each of the agri-food chains in the three countries analysed, and to identify if the prices tend to have co-movements. The results of the cointegration tests are shown in Table 3.

Table 3. Johansen (1991) trace cointegration test results between farmer and export/wholesale prices in selected countries.

		Johansen (1991) trace test statistic	
		None cointegrating equation	At most one cointegrating equation
Australia	Banana	14.45465*	5.820516**
	Beef Cattle	24.68615***	2.864761*
	Sugar Cane	34.29879***	4.801454**
Colombia	Banana	16.71557**	4.864901**
	Beef Cattle	17.6401**	3.920662**
	Sugar Cane	14.50635*	5.323721**
South Africa	Banana	12.95669	2.341139
	Beef Cattle	15.27264*	6.805709***
	Sugar Cane	21.1145***	3.774742*

Null hypothesis: Series are not cointegrated.

(***), (**) and (*) indicate that the parameter is significant at the 1%, 5% and 10% levels, respectively.

Table 4. Asymmetric error correction models for selected agri-food chains in Australia, Colombia and South Africa.

Variable	First Difference Farmer Prices Australia			First Difference Farmer Prices Colombia			First Difference Farmer Prices South Africa		
	Banana	Beef Cattle	Sugar Cane	Banana	Beef Cattle	Sugar Cane	Banana	Beef Cattle	Sugar Cane
Constant	226.9973*	-35.0036	-0.0883	-2.7816	-47.0594*	-1.2172	31.0746*	-118.4771**	1.9469
Positive residuals cointegration equation	-1.0469***	-0.3214**	-0.7557**	-0.6013***	-0.2465	-0.2102	-	-0.3872	-0.6203
Negative residuals cointegration equation	-0.0322	-0.1351	-0.7428*	-0.3049	-0.0093	0.0129	-	-0.3600**	-0.3571
First difference export price banana	-0.0022	-	-	0.5131	-	-	0.0405**	-	-
First difference export price beef cattle	-	0.0947	-	-	0.0106	-	-	0.1764	-
First difference export price sugar cane	-	-	0.5284***	-	-	-0.0199*	-	-	0.1862***
First difference export price banana lagged one period	-0.0218	-	-	-0.3971	-	-	0.0139	-	-
First difference export price beef cattle lagged one period	-	0.0761	-	-	-0.0253	-	-	0.0236	-
First difference export price sugar cane lagged one period	-	-	0.0098	-	-	0.0021	-	-	-0.0784
First difference farmer price banana lagged one period	-0.0003	-0.1450**	0.0006	0.0912	0.0161	0.0098	0.1015	-0.3441	-0.0198
First difference farmer price beef cattle lagged one period	-0.0044	-0.0054	0.0069***	0.0093	0.0812	0.0005	0.2578*	0.2124	0.0009
First difference farmer price sugar cane lagged one period	3.9234	-3.7316	-0.0369	-2.9109	-1.2433	0.0221	-1.0912	10.4212	0.1576
First difference quantity of farm output banana lagged one period	0.0007	-	-	7.18E-05	-	-	0.0004	-	-
First difference quantity of farm output beef cattle lagged one period	-	0.0003	-	-	0.0006*	-	-	-0.0003	-
First difference quantity of farm output sugar cane lagged one period	-	-	-3.03E-09	-	-	6.34E-07*	-	-	4.96E-09
First difference GDP per capita	-0.2300*	0.0606	-0.0012	0.5493	1.1544***	0.0199	-7.4698**	1.1916**	-0.4776*
First difference oil price	4.7814	7.2664**	-0.0646	-1.8958	0.0748	0.0108	1.1625	-0.8957	0.1388
Dummy 1970-1989	-87.2346	-7.8325	0.7184	-28.4534	1.7382	0.4264	-34.8161	158.9434*	0.9117
Dummy 1977	-	-	-	-	482.7229***	-	-	-	-
Dummy 1979	-	834.2957***	-	-	-	-	-	-	-
Dummy 1991	-	-	-	-	-	26.3322	-	-	-
Dummy 2007	1671.6460***	-	-	-	-	-	-	-	-
R-squared	0.8265	0.8661	0.9351	0.4887	0.5487	0.6213	0.4444	0.5240	0.6712
Adjusted R-squared	0.7273	0.7896	0.9065	0.2878	0.3481	0.4530	0.0598	0.3370	0.5420

(***), (**) and (*) indicate that the parameter is significant at the 1%, 5% and 10% levels, respectively.

According to the results of the Johansen cointegration tests presented in Table 3, farmer and export/wholesale prices of the selected agri-food chains in Australia, Colombia and South Africa are cointegrated. An exception to this is South African banana chain, which could be explained by variations in prices associated to differences in quality between banana production oriented to local markets and exports markets. In conclusion, there is evidence that farm and export prices of the selected agri-food chains tend to co-move in the three countries analysed. Hausman (1978) endogeneity tests were conducted to verify if export/wholesale prices are endogenous variables, with results supporting their use as exogenous variables. The rest of the variables included in the model were lagged one period, so they can be classified as predetermined; therefore, there are no problems of endogeneity in the estimations. Given the results obtained, an AECM was estimated for each chain in the three countries, with the exception of sugar cane in Colombia, where the residuals of the cointegration equation lagged one period were excluded. Table 4 presents the results of the regressions estimated using the Newey-West standard errors procedure[7].

The results shown in Table 4 indicate that variations in export prices are transmitted through the selected chains in the three countries, although the vertical price transmission could take several periods. Contemporaneous price transmission from exporter/wholesale price to farmer price was found to be significant only in sugar cane across the three countries. Hence, in banana and beef cattle chains in both countries, variations in export prices are not transmitted through the chain in the same period, thus reducing variations in prices paid to farmers in the short run. Most of the significant coefficients of the error correction terms are less than 1 in absolute value; therefore, price variations could take several periods to be transmitted in the selected agri-food chains in the three countries analysed. When comparing between countries, the error correction terms for Australian banana and beef cattle are higher than the ones for the Colombian and South African chains. Finally, the prices for the Australian and Colombian banana chains are cointegrated and the positive error correction terms are significant, while the prices are not cointegrated for the South African banana chain. In this context, it can be concluded that variations in export/wholesale prices are more quickly transmitted through the selected chains in Australia than they are in Colombia and South Africa. In regards to asymmetry in price transmission, sugar cane in Australia shows symmetric vertical price transmission, while banana in Australia and Colombia, and beef cattle in South Africa show asymmetry in vertical price transmission. The results indicated that positive shocks are more quickly transmitted to farmers than negative ones in Australian and Colombian banana and beef cattle chains. This suggests that exporters/wholesalers in those value chains absorb more risk of price fluctuations, as indicated by Norwood and Lusk (2008), since wholesalers tend to be large firms and have greater ability to recover from unfavorable market conditions.

The quantity of farm output lagged one period was only significant in Colombian beef cattle and sugar cane chains. This is explained by the high proportion of the production that is sold in the domestic market, where variations in quantity sold domestically will affect prices paid to farmers. Moreover, some spillover effects between farmer prices among the selected agri-food chains were found significant. Beef cattle farmer prices lagged one period affected positively the prices paid to farmers for sugar cane in Australia and banana in South Africa, as residues of these products are used to feed animals. In contrast, banana farmer prices lagged one period affected negatively the prices of beef cattle, as an increase in the amount of waste bananas would reduce the feeding costs for cattle, increasing the number of animals that farms could hold, which would have negative effects on beef farmer prices. Oil price only has a significant positive effect over beef cattle farmer prices paid in Australia, while GDP per capita used as a proxy variable of wage rate was found significant with a positive effect over beef cattle farmer prices paid in Colombia and South Africa. In contrast, a significant negative effect was found over banana farmer prices paid in Australia and South Africa, additionally a negative effect was found over sugar cane farmer prices paid in South Africa. These results suggest that production in Australian agri-food chains is more capital intensive in comparison to the Colombian and South African chains that are more labour intensive. Finally, the dummy variable for the first two decades under analysis was only significant at 10% for the South African beef cattle chain; therefore, there is some evidence of a structural change in price transmission since the 90s decade in that chain in South Africa.

CONCLUSIONS AND POLICY IMPLICATIONS

This study has confirmed that price variations are vertically transmitted in most of the selected agri-food chains. However, price transmission could take several periods and price variations are more quickly transmitted in the selected Australian chains than they are in the Colombian and South African

---

7 Newey-West or heteroskedasticity and autocorrelation consistent (HAC) estimator provide a consistent estimate of the variance-covariance matrix of the ordinary least square estimates for a linear regression model when heteroskedasticity and autocorrelation are present. Using decaying weights for the variance-covariance matrix, the correlation between the error terms decreases to zero as the time between error terms increases (Greene 2012).

chains. These results suggest a higher degree of imperfection in price transmission in the last two countries, which justify further studies to assess policy interventions aiming to improve the competitiveness of the chains through a higher efficiency in price transmission in the long run, considering that lags in price transmission in the short run could be beneficial for farmers as they reduce price uncertainty. Farmer and export prices for the selected agri-food chains are cointegrated in the three countries, with the exception of banana in South Africa. These results demonstrate a co-movement of most of the prices in the long run, so variations in export prices are ultimately transmitted to farmers in most of the chains. These outcomes are consistent with previous studies in agri-food chains in different countries, including those reported by Byrne (2013). The rejection of the Johansen (1991) trace cointegration test for the South African banana chain suggests that variations in export prices are not transmitted to farmers through the chain. In this scenario, policies should stimulate and support South African banana producers to meet the quality and volume requirements necessary to export their production.

Symmetric vertical price transmission from exporters to farmers was found only in the Australian sugar cane chain. In contrast, asymmetries in price transmission were identified in the banana chain in Australia and Colombia, and in beef cattle in Australia and South Africa. In the case of the South African beef cattle chain, negative shocks were more quickly transmitted to farmers, while in the Australian beef cattle and banana, and Colombian banana chains positive shocks were more quickly transmitted. These last results indicate that exporters/wholesalers in those value chains are more exposed to price fluctuations, which are coincident with the findings described by von Cramon-Taubadel (1998) in the German pork chain, where reductions in farmer prices were more quickly transmitted to wholesale prices. These findings could support the idea that wholesalers hold substantial margins that allow them to face higher levels of price risk, a hypothesis that should be tested in further research.

Some spillover effects between farmer prices among the selected agri-food chains were significant, as found by Harri et al. (2009) between corn and soybeans prices in the United States. Positive effects of prices paid to farmers for beef cattle lagged one period were found significant on farmer prices of sugar cane in Australia and banana in South Africa, while banana farmer prices lagged one period has a negative effect on Australian beef cattle prices. These results demonstrate that even though the selected chains appear unrelated, there is a certain degree of relationship between them, explained by the use of sugar cane and banana residues to feed cattle, and variations in land and intensity of production. These findings have positive implications for policy interventions, given that a particular agri-food chain with more efficient price transmission could stimulate more production, thus reducing the quantity produced in other chains where better farmer prices will need to be paid to remain competitive and meet required levels of production.

Variations in oil prices were found to be a significant explanatory variable for variations in beef cattle prices paid to farmers in Australia. This result is consistent with the findings reported by Harri et al. (2009) in corn prices in the United States. In contrast, GDP per capita was significant for the Colombian and South African chains, suggesting that the selected Australian agri-food chains are more intensive in capital than the Colombian and South African chains. Finally, further research combining vertical and spatial price transmission among different value chains could be conducted in different countries. These studies should include the analysis of contemporaneous spillover effects between farmer prices of related agri-food chains in specific rural areas to provide valuable insights for the design of future policy interventions.

REFERENCES

Aramyan, L. and M. Kuiper, 2009. 'Analyzing Price Transmission in Agri-food chains: An Overview'. *Measuring Business Excellence,* 13(3): 3-12.

Asche, F., S. Jaffry and J. Hartmann, 2007. 'Price Transmission and Market Integration: Vertical and Horizontal Price Linkages for Salmon'. *Applied Economics,* 39(19): 2535-2545.

Bakucs, Z., J. Falkowski and I. Ferto, 2014. 'Does Market Structure Influence Price Transmission in the Agro-Food Sector? A Meta-analysis Perspective'. *Journal of Agricultural Economics*, 65(1), 1-25.

British Petroleum (BP), 2014. 'Statistical Review of World Energy: Report 2012', http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy-2013/statistical-review-downloads.html (accessed February 20, 2014).

Bunte, F., 2006. 'Pricing and Performance in Agri-food Supply Chains'. In *Quantifying the Agri-Food Supply Chain*, eds C. J. M. Ondersteijn, J. H. M. Wijnands, R. B. M. Huirne and O. van Kooten. Dordrecht: Springer, 37-45.

Byrne, J., G. Fazio and N. Fiess, 2013. 'Primary Commodity Prices: Co-Movements, Common Factors and Fundamentals'. *Journal of Development Economics*, 101, 16-26.

Conforti, P., 2004. 'Price Transmission in Selected Agricultural Markets'. FAO Commodity and Trade Policy Research Working Paper No. 7, Basic Foodstuffs Service (ESCB), Commodities and Trade Division, Food and Agriculture Organisation of the United Nations (FAO), Rome, ftp://ftp.fao.org/docrep/fao/007/j2730e/j2730e00.pdf (accessed October 15, 2014).

Economic Research Services (ERS), 2014. 'International Macroeconomic Data Set', http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx#.Ua2rrdKnza4 (accessed February 20, 2014).

Enders, W., 2014. *Applied Econometric Time Series.* 4th Edition, Hoboken, New Jersey: John Wiley & Sons.

Esposti, R. and G. Listorti, 2013. 'Agricultural Price Transmission across Space and Commodities during Price Bubbles'. *Agricultural Economics,* 44(1): 125-139.

European Commission, 2009. 'Analysis of Price Transmission along the Food Supply Chain in the EU'. Commission Staff Working Document, Brussels, http://ec.europa.eu/economy_finance/publications/publication16067_en.pdf (accessed September 28, 2014).

Fackler, P. L. and B. K. Goodwin, 2002. 'Spatial Price Analysis'. In *Handbook of Agricultural Economics,* eds B. L. Gardner and G. C. Rausser. Amsterdam: Elsevier Science, 971-1024.

Food and Agriculture Organization (FAO) and Organization for Economic Co-operation and Development (OECD), 2011. 'The Price Volatility in Food and Agricultural Markets: Policy Responses', http://www.worldbank.org/foodcrisis/pdf/Interagency_Report_to_the_G20_on_Food_Price_Volatility.pdf, (accessed March 1, 2014).

FAOSTAT, 2014. 'FAO Statistical Database', http://faostat.fao.org, (accessed February 20, 2014).

Frey, F. and M. Manera, 2007. 'Econometric Models of Asymmetric Price Transmission'. *Journal of Economic Survey,* 21: 349-415.

Granger, C. W. J. and T. H. Lee, 1989. 'Investigation of Production, Sales and Inventory Relationships Using Multicointegration and Non-Symmetric Error Correction Models'. *Journal of Applied Econometrics,* 4: S145-S159.

Greene, W. H., 2012. *Econometric Analysis.* 7th Edition, New Jersey: Pearson, Prentice Hall.

Griffith, G. R., W. Green and G. L. Duff, 1991. 'Another Look at Price Levelling and Price Averaging in the Sydney Meat Market'. *Review of Marketing and Agricultural Economics,* 59(2): 97-109.

Griffith, G. R. and N. E. Piggott, 1994. 'Asymmetry in Beef, Lamb and Pork Farm-Retail Price Transmission in Australia'. *Agricultural Economics,* 10: 307-316.

Griffith, G.R., K. I'Anson, D. J. Hill and D. T. Vere, 2001. 'Previous Supply Elasticity Estimates for Australian Broadacre Agriculture'. Economic Research Report 6, NSW Agriculture, Orange, Australia, http://www.dpi.nsw.gov.au/research/economics-research/reports/err06 (accessed July 13, 2014).

Harri, A., L. Nalley and D. Hudson, 2009. 'The Relationship between Oil, Exchange Rates, and Commodity Prices'. *Journal of Agricultural and Applied Economics,* 41(2): 501-510.

Hausman, J. A., 1978. 'Specification Tests in Econometrics'. *Econometrica,* 46(6): 1251-1271.

Houck, J. P., 1977. 'An Approach to Specifying and Estimating Nonreversible Functions'. *American Journal of Agricultural Economics,* 59(3): 570-572.

Johansen, S., 1991. 'Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models'. *Econometrica,* 59(6): 1551-1580.

Kaspersen, L. L. and T. H. Y. Foyn. 2010. 'Price Transmission for Agricultural Commodities in Uganda: An Empirical Vector Autoregressive Analysis'. Uganda Strategy Support Program (USSP), Working Paper No. 6, International Food Policy Research Institute (IFPRI), Washington, http://www.ifpri.org/sites/default/files/publications/usspwp06.pdf (accessed October 18, 2014).

Meyer, J., and S. von Cramon-Taubadel. 2004. 'Asymmetric Price Transmission: A Survey'. *Journal of Agricultural Economics,* 55(3): 581-611.

Ng, S. and P. Perron, 2001. 'Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power'. *Econometrica*, 69(6): 1519-1554.

Norwood, F. B. and J. L. Lusk, 2008. *Agricultural Marketing and Price Analysis.* New Jersey: Pearson, Prentice Hall.

Rapach, D. E. and C. E. Weber, 2004. 'Are Real Interest Rates Really Nonstationary? New Evidence from Tests with Good Size and Power'. *Journal of Macroeconomics,* 26(3): 409-430.

Rapsomanikis, G., D. Hallam and P. Conforti, 2004. 'Market Integration and Price Transmission in Selected Food and Cash Crop Markets of Developing Countries: Review and Applications'. In Food and Agriculture Organization of the United Nations (FAO) (ed.), *Commodity Market Review 2003-2004*, Rome, 51-75. ftp://ftp.fao.org/docrep/FAO/006/y5117e/y5117e00.pdf (accessed October 28, 2014).

Rapsomanikis, G. and H. Mugera, 2011. 'Price Transmission and Volatility Spillovers in Food Markets of Developing Countries'. In *Methods to Analyse Agricultural Commodity Price Volatility*, edited by I. Piot-Lepetit, and R. M'Barek. Dordrecth: Springer, 165-179.

Sexton, R. J., 2013. 'Market Power, Misconceptions, and Modern Agricultural Markets'. *American Journal of Agricultural Economics,* 95(2): 209-219.

Siriwardana, M. and Sajeewani, D. 2013. 'Trade between Australia and South Asia: Prospects for a Bilateral Free Trade Agreement'. *Academy of Taiwan Business Management Review*, 9(3): 1-11.

Swinnen, J. and A. Vandeplas, 2013. 'Price Transmission and Market Power in Modern Agricultural Value Chains'. LICOS Centre for Institutions and Economic Performance, University of Leuven, Discussion Paper 347/2014, http://www.econ.kuleuven.be/licos/publications/dp/dp347 (accessed February 28, 2014).

United States Department of Labor, Bureau of Labor Statistics (BLS), 2014. 'Consumer Price Index: All Urban Consumers - (CPI-U)', ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt (accessed February 20, 2014).

Vavra, P. and B. Goodwin, 2005. *Analysis of Price Transmission along the Food Chain*. OECD Food, Agriculture and Fisheries Working Papers, No. 3, OECD Publishing, Paris, http://www.oecd.org/agriculture/agricultural-policies/40459642.pdf (accessed October 15, 2014).

Von Cramon-Taubadel, S., 1998. 'Estimating Asymmetric Price Transmission with the Error Correction Representation: An Application to the German Pork Market'. *European Review of Agricultural Economics,* 25, 1-18.

Wohlgenant, M., 2001. 'Marketing Margins: Empirical Analysis'. In *Handbook of Agricultural Economics*, eds. B. Gardner and G. Rausser. North-Holland Publishing Company, Amsterdam, 933-970.

Wohlgenant, M. and J. Mullen, 1987. 'Modeling the Farm-Retail Price Spread for Beef'. *Western Journal of Agricultural Economics,* 12(2): 119-125.

Wolffram, R., 1971. 'Positivistic Measures of Aggregate Supply Elasticities: Some New Approaches – Some Critical Notes'. *American Journal of Agricultural Economics,* 53(2): 356-359.

Yang, J. and Siriwardana, M. 2011. 'The Evolution of Australian Exchange Rate Strategies and Australia's Capacity to Maintain a Strong Floating-Currency Regime'. *Academy of Taiwan Business Management Review*, 7(2): 142-158

Is Underpricing A Signal of Firm Quality? An Empirical Investigation on Indian Companies

Manas Mayur, Goa Institute of Management, India

ABSTRACT

This work re-examines the original studies of Rock (1986), Jegadeesh et. al (1993)   and Jain and Kini (1994), aim to identify what has been demonstrated in these studies and to empirically examine in the Indian context, whether underpricing is a signalling mechanism or not? While theoretically Rock (1986) proposed strong reasons to prove that underpricing is a mechanism to deal with information asymmetry, but empirical studies in the past did not provide any strong relationship between underpricing and firm value.   The empirical results of past works left a puzzling question unanswered of why then IPOs are consistently underpriced. Though the present study do find evidence consistent with the signalling hypothesis, but when the evidence documented is viewed in totality, the support for the signalling hypothesis as a major determinant of IPO underpricing is weak.

INTRODUCTION

A share is said to be underpriced if its offer price at the time of Initial Public Offering (IPO) is lower than its first day closing price. This is same with the average first day return of a stock. However, literature discusses two types of underpricing: short term underpricing and long term underpricing. Short term underpricing is discussed as average return on the first day of trading whereas long run underpricing is discussed as average return on the long term basis. Most of the studies on underpricing, including present study, deal with short term underpricing only. Though one can argue that the time frame needed to conclude about underpricing should be long but what has left researchers puzzled is the short term underpricing which was found to be disappeared within weeks in the aftermarket. Short run underpricing is a well-documented phenomenon. Table 1 below presents the evidence of underpricing in India, as observed by some of the major studies on Indian market. Underpricing in Indian market seems to prevail in all the time periods. Whereas the main purpose of any IPO is to achieve the highest value for the issuer, the problem of underpricing clearly indicates some loss of value to the issuers.

Table 1. Underpricing: Indian Evidence

Study	Sample period	Number of firms	Short run returns (mean underpricing) (%)
Shah (1995)	1991-1995	2056	105.6
Madhusoodanan and Thiripalraju (1997)	1992-1995	1922	294.8
Shah and Thomas (1999)	1993-1996	500	36.6
Krishnamurti and Kumar (2002)	1992-1994	386	72.34
Ranjan and Madhusoodanan (2004)	1999-2003	92	78 (Fixed priced) -2 (Bookbuilt)
Kumar (2010)	1999-2006	156	26.35
Marisetty and Subrahmanyam (2010)	1990-2007	2811	92.7

Source: Various studies cited

Ibbotson (1975) found, on average, an 11.4% discount in the offer price which disappeared within weeks in aftermarket. Ibbotson and Jaffe (1975) found a 16.8% discount and were unable to account for their finding. Ibbotson termed this phenomenon a mystery. Starting from Logue (1973) and Ibbotson (1975), a vast number of studies investigated the reasons behind underpricing, both theoretically and empirically. The basic premise of the study is based on the argument given by Rock (1986) and Welch (1989) that imperfect information or information asymmetry exists between issuers and investors and firms underprice their issue to deal with this abnormal fact.

Even though Rock (1986) and Welch (1989) addressed the issue on same platform i.e. information asymmetry yet the explanation given by them are contrary to each other.   Rock (1986) explained that if investors are divided into informed and uninformed investors, on the basis of quantity and quality of information that an investor has, then the bad quality issuers, after understanding that no informed investors will subscribe their issue, try to discount their issue for the uninformed investors. Welch (1989) asserted that only high quality issuers can afford to underprice their issue. Allen and Faulhaber (1989) and Grinblatt and Hwang (1989) supported Welch (1989) that firms use

underpricing as a signalling mechanism to signal their high quality in the market when the information asymmetry prevailing in the market is too high. Welch (1989) further added that the loss that the issuers face by underpricing their issues at the time of IPO is compensated by doing follow on public offerings (FPO).

Jain and Kini (1994) empirically tested the relationship between signalling with the help of level of underpricing and post IPO performance. They could not find any significant relationship between the level of underpricing and post IPO performance. Michaely and Shaw (1994) failed to establish any relationship between underpricing and post IPO performance. Garfinkel (1993) considered that if the motive behind underpricing is to bring successful subsequent equity offerings then there should be a relationship between underpricing and likelihood of returning to the market with subsequent equity offerings. But overall he also could not find any relationship between underpricing and the probability of a subsequent equity offering.

Due to the relatively undeveloped market structure of emerging market, the degree of information asymmetry among participants is relatively high in emerging market. Therefore pricing of IPOs play a very challenging role for the issuers in emerging market countries, perhaps more so than in developed countries. In our paper; we study the relationship between underpricing and firm performance using Indian IPOs. Though a few similar studies done in context of developed economies provided some insight on the issue, yet we thought extrapolating the results of those studies directly onto Indian scene may not be correct.

The remaining of this paper is organized as follows. Section 2 provides a brief review of relevant literature. Section 3 describes the methodology used in this paper. Section 4 presents the results and Section 5 makes the concluding remarks.

LITERATURE REVIEW

In his seminal paper Rock (1986) explained that the Underpricing is a result of information asymmetry that exist among issuers and different groups of investors. He categorized investors into two categories informed investors and uninformed investors. He further explained that the informed investors due to their informational advantage place orders on the high value IPOs and uninformed are left with either low value IPOs or small portion of high value IPOs. Uninformed investors are therefore compensated by underpriced issues.

Allen and Faulhaber (1989) also argued that underpricing is a result of information asymmetry that exist between issuers and investors. Issuers, understanding the problem of information asymmetry, find it difficult to reveal their actual value to the outside investors. Therefore, high quality firms first sell a small fraction of issue through IPO, which is underpriced, keeping in mind the risk of insufficient response from the market. Later on when they find that their true value is established in the market they come up with subsequent public offering through FPO or insider's placement. A low value firm usually try to take advantage of its IPO by maximizing the proceeds at the time of IPO only and hence will seldom be underpriced.

Empirically a few studies have tested whether underpricing have been used as a signalling mechanism or not. One of the most cited studies is by Jegadeesh et. al. (1993). They conducted their study on 1985 US firms that went for IPO between 1980 and 1986. They hypothesized that firms that underprice more at the time of the IPO are (1) subsequently more likely to issue seasoned equity; (2) more likely to issue larger amounts of seasoned equity and (3) more likely to issue seasoned equity sooner after the IPO. They found a positive relationship between IPO underpricing and the probability and size of the subsequent seasoned offerings, consistent with the implications of the signalling models. However, they noted that the statistically significant relations were relatively weak. They argued that the share price returns should better explain whether a company subsequently raises equity rather than the degree of underpricing at the time of IPO.

Keloharju (1993) examined 91 Finnish firms. He found evidence of a positive relationship between underpricing and the probability of subsequent public offering, and a negative relationship between underpricing and the time span between the IPO and the secondary offering. Garfinkel (1993) supported Jegadeesh et. al. (1993) that share price returns in post IPO period should better explain whether a company subsequently raises equity than the degree of underpricing. He conducted logistic estimation on 549 US firms that came up with IPO between 1980 and 1983 and found a weak relationship between likelihood of a firm issuing seasoned equity offering and underpricing.

Michaely and Shaw (1994) examined 889 US firms that went public between 1984 and 1988. They researched whether firms going public underprice to compensate uninformed investors who end up with a disproportionate share of the weaker IPOs, or to send a signal of their underlying strength. Their result also did not support the signalling model theory as they also did not find any significant relationship between the decision on how much to underprice and reissue decision and vice versa. Instead they found that firms that underprice more have weaker future earnings performance. They further demonstrated that underwriter quality lessens the need to underprice.

Jain and Kini (1994) investigated the nature of relationship between the levels of underpricing

and post-IPO performance with a sample of 682 U.S. firms that went public between 1976 and 1988. They found that the median of most of the operating performance measures declined after IPO. Further, to investigate the nature of relationship between level of underpricing and performance of firms around their IPOs, they divided their sample firms into two groups on the basis of median underpricing as the cutoff point --- one with high underpricing and the other with low underpricing. Then the performance trend for both the group was determined. Overall they did not find any significant difference in the trend of post IPO performance for both the groups. They further estimated a cross-sectional regression by controlling the effect of change in the level of ownership as a signalling mechanism. The regression did not find any significant relationship between the level of underpricing and performance change around IPO. They concluded that either underpricing is not a signal of quality or other proxies for quality may provide better support for the signalling hypothesis.

METHODOLOGY

The research question that the paper is trying to address is, whether underpricing is a signal of firm quality in Indian capital market? Therefore the main explanatory variable used to test the signalling hypothesis is the stock return on the IPO date. The variable, Underpricing, is measured as the average first day return using the first offering closing stock price of the newly listed shares. The average return for each IPO is computed as in following equation:

$$AR_i = \left[\frac{P_i - P_0}{P_0} \right] X \ 100 \qquad \text{............... (1)}$$

Where:
Ar$_i$ = Average first day return of stock i
P$_i$ = the closing price of stock i, on the first day of trading
P$_0$ = the initial offering price of stock i

There is evidence (Jain and Kini 1994) that only good quality issuers (firms with better post IPO operating performance) can underprice their issue. To check whether the good quality issuers can be distinguished with bad quality issuers on account of their level of underpricing, the post IPO operating performance of firms is regressed against the following variables: (a) average first day return of stock (*UNDP*), (b) the log of the amount of capital raised in the IPO (*LSIZE*), (c) percentage of shares held by promoters (*ALPHA*), and (d) aftermarket standard deviation of returns (*RISK*). The standard deviation of returns is estimated over days 1 to 100 after the IPO. The operating performance is measured by following two ratios: (i) operating return on total assets (*PBDIT/TA*); and (ii) cash flow from operating activities divided by total assets (*CF/TA*). Initially following cross-sectional regression was run on the sample for the following time periods: One year after the IPO, two years after the IPO and three years after the IPO.

$$Performance_i = f(\beta_1 UNDP_i + \beta_2 LSIZE_i + \beta_3 ALPHA_i + \beta_4 RISK_i) \text{......... (2)}$$

While the above model can confirm whether good quality firms underprice their issue or not, but it cannot reveal if the same firm conducted follow on public offering to compensate the wealth loss in the IPO as reported by Allen and Faulhaber (1989) and Jegadeesh, Wesitein & Welch (1993). In order to investigate the relationship between underpricing and probability of issuing follow on public offering, following probit model was estimated.

$$\pi(FPO_i = 1) = f(\beta_1 UNDP_i + \beta_2 AFTRET1 + \beta_3 AFTRET2_i + \beta_3 LISSUE_i) \qquad ... (3)$$

The nomenclature of dependent variable is 'FPO,' a dummy variable, which equals 1 if the company issues follow on public offering and 0 if the company does not issue follow on public offering. The three explanatory variables of primary interests are the underpricing (*UNDP*) and the aftermarket returns in the two 20-days periods after the IPO (*AFTRET1* and *AFTRET2*). Since firms that raise relatively small amounts of fund at the IPO may be more likely to return with a follow on public offering, the natural logarithm of IPO size (*LISSUE*) is also included as an additional explanatory variable.

▌Data Sources and Sample

The sample for the study was derived from 447 firms that went public between 2000 and 2010. The time period chosen for the study has witnessed some of the most significant ups and downs in the Indian capital market. Starting from the dot com bubble burst in the early millennium, India's dream run between 2003 and 2008 when the economy grew at a rate close to 9% per year, and the financial crisis of 2008 made the decade a very interesting for the research. The sample was drawn from the Prowess database, created by the Centre for Monitoring Indian Economy (CMIE). This

database contains the detailed information on the financial performance of all public listed companies in all segments in India, compiled from various sources such as profit and loss accounts and balance sheets, stock price data and the annual reports. This is a reliable source of information and there are many researchers who have extensively used Prowess in financial economics empirical work.

RESULTS AND DISCUSSION

Table 2 (a) shows the characteristics of the sample examined in the study. The mean and median security amount raised by these firms is Rs. 171.77 crore and Rs. 37.16 crore, respectively. Whereas the mean and median offer price is Rs 115.97 and Rs. 50 resp. the mean and median first day closing price is Rs. 191.51 and Rs. 94.55. The initial impression is that overall IPOs are underpriced. The summary statistics for underpricing shows that the mean and median underpricing is 103.25 % and 25.13 % which appears to be very high.

Table 2 (a). Characteristics of IPO sample

Descriptive measures	Mean	Median	SD
Size of issue (crore)	171.77	37.16	659.20
Offer price (Rs.)	115.97	50	164.87
First day closing price (Rs.)	191.51	94.55	260.09
Underpricing (%)	103.25	25.13	425.38

Table 2 (b)

Description	Re issuers	Non-Re issuers	z-statistic (Wilcoxon)
Number of IPOs	22	425	
Underpricing	27.76 (24.61)	28.90 (14.88)	-1.64 (0.10)
Offer Size (Rs. Millions)	7977.4 (504)	2610.71 (713.2)	-1.19 (0.23)

Table 2 (b) highlights the descriptions of re-issuers, i.e. companies who came with a follow on public offerings, and non-re-issuers, i.e. companies who did not come with follow on public offering. There were total 22 companies from the sample who came with a follow on public offerings, whereas remaining 425 companies chose not to do the secondary offerings. Average level of underpricing was slightly lesser for re-issuers. The Wilcoxon sign rank test shows that the median underpricing by re-issuers are significantly different from that of non-re-issuers.

Table 3 below presents the results of the regression analysis of model 2. We can see that the underpricing variable is significant in all the time windows, and for both the performance variables. The relationship is positive for all the time windows showing that the firms with better performance tends to underprice more.

Table 3. Regression results: Underpricing and post IPO performance

	Panel A:Operating Return on Assets			Panel B: Operating Cash Flows Deflated by Total Assets		
	IPO+1	IPO+2	IPO+3	IPO+1	IPO+2	IPO+3
Underp	0.0002***	0.0002***	0.0002**	0.0001	0.0001**	0.0001
Lsize	-0.0038*	0.0007	0.0054**	-0.0019	-0.0033	-0.0016
Alpha	0.0014***	0.0009***	0.0012***	0.0014**	0.0006**	0.0004*
Risk	-0.0124	0.0918	0.1667**	0.2084**	0.1916**	0.1901**
Intercept	0.0582**	0.0381**	-0.0282	-0.0464	0.0292	0.0243
R-Sq	0.085	0.056	0.084	0.037	0.027	0.018

From the controlling variables, *ALPHA* appears to be a significant variable. The relationship of owners' stake measured by *ALPHA* is positive and significant in all the time windows and for both the variable. Jain and Kini (1994) stated that the owners' stake can also act as a signal to the quality of earnings in the future. A positive relationship proves that the better performers show less dilution of owners' stakes after the IPO.

Table 4 presents the probit regression estimates. The slope coefficient on the variable *UNDP* is 0.0006. The slope coefficients on the aftermarket return variables AFTRET1 and AFTRET2 are 0.024 and 0.0179. These point estimates suggest a stronger relation between the aftermarket price

appreciation in each of the 20 day time windows and the likelihood of follow on public offering than between *UNDP* and the latter. The slope coefficient on the size of the issue *LISSUE* is -0.121 (significant at 0.1 %) which suggest that the issuers with lesser IPO proceeds are more like to bring follow on public offerings. These result suggest that the aftermarket returns are more useful than IPO underpricing for predicting which firm will issue follow on public offering, which is contrary to what I expected.

Table 4. Probit model: Probability of subsequent equity offerings

Intercept	-0.4893
Underp	-0.0006
AftRet1	-0.024**
AftRet2	0.0179**
Lissue	-0.1215*
Log likelihood	-68.3933
Chi2	20.56***
Total n	447
n (Re issuers)	22

CONCLUSION

The study investigated whether underpricing was used as a signal of firm quality or not? Studies like Rock (1986), Allen and Faulhaber (1989), Jegadeesh et. al. (1993), Garnfinkel (1993), and Jain & Kini (1994) discussed signalling models in which issuers convey their private information about the value of their project by underpricing their IPOs. These models imply that firms with large IPO underpricing (a) have better post IPO performance, and (b) are more likely to issue follow on public offerings subsequently.

I find a positive and significant relationship between level of underpricing and post IPO performance indicating that the firms with better post IPO performance underpriced their issue more. The results are in support of the signalling model. I also find that the market returns in the two 20-day periods immediately following the IPOs are significantly positively related to the probabilities of follow on public offerings. These results indicate that the underpricing on the date of the IPO does not play a role in predicting future follow on public offerings. One of the implications of the study is that the issuers do not have to rely on the costly underpricing mechanism to signal to the market. Though the study do find evidence consistent with the signalling hypothesis, but when the evidence documented here is viewed in totality, the support for the signalling hypothesis as a major determinant of IPO underpricing is weak.

REFERENCES

Allen, F. and Faulhaber, G. (1989), 'Signalling by underpricing in the IPO market', *Journal of Financial Economics*, Vol. 23 No. 2, pp. 303-323.

Garfinkel, J. (1993), 'IPO Underpricing, Insider Selling and Subsequent Equity Offerings: Is Underpricing a Signal of Quality?', *Financial Management*, Vol. 22 No. 1, p. 74.

Grinblatt, M. and Hwang, C. (1989), 'Signalling and the Pricing of New Issues', *The Journal of Finance*, Vol. 44 No. 2, pp. 393-420.

Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, Vol. 2 No. 3, 235–272.

Ibbotson, R. and Jaffe, J. (1975), '"HOT ISSUE" MARKETS', *The Journal of Finance*, Vol. 30 No. 4, pp. 1027-1042

Jain, B. and Kini, O. (1994), 'The Post-Issue Operating Performance of IPO Firms', *The Journal of Finance*, Vol. 49 No. 5, p. 1699.

Jegadeesh, N., Weinstein, M. and Welch, I. (1993), 'An empirical investigation of IPO returns and subsequent equity offerings', *Journal of Financial Economics*, Vol. 34 No. 2, pp. 153-175.

Keloharju, M. (1993), 'The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland', *Journal of Financial Economics*, Vol. 34 No. 2, pp. 251-277.

Kim, K., Kitsabunnarat, P. and Nofsinger, J. (2004), 'Ownership and operating performance in an emerging market: evidence from Thai IPO firms', *Journal of Corporate Finance*, Vol. 10 No. 3, pp. 355-381.

Krishnamurti, C. and Kumar, P. (2002), 'The initial listing performance of Indian IPOs', *Managerial Finance*, Vol. 28 No. 2, pp. 39-51.

Kumar, S. (2010). 'Is Bookbuilding an Efficient IPO Pricing Mechanism? - The Indian Evidence', *SSRN Electronic Journal*, doi:10.2139/ssrn.1252982.

Logue, D. *(1973), 'On the Pricing of Unseasoned Equity Issues: 1965-1969', The Journal of Financial and Quantitative Analysis, Vol.* 8 No. 1, p. 91.

Madhusoonan, T. and Thiripalraju, M. (1997), 'Underpricing in IPOs: The Indian Evidence', *Vikalpa*, Vol. 22 No. 4, pp. 17-30.

Marisetty, V. and Subrahmanyam, M. (2010), 'Group affiliation and the performance of initial public offerings in the Indian stock market', *Journal of Financial Markets*, Vol. 13 No. 1, pp. 196-223.

Michaely, R. and Shaw, W. (1994), 'The Pricing of Initial Public Offerings: Tests of Adverse-Selection and Signaling Theories', *Review of Financial Studies*, Vol. 7 No. 2, pp. 279-319.

Rock, K. (1986), 'Why new issues are underpriced', *Journal of Financial Economics*, Vol. 15 No. 1-2, pp. 187-212.

Shah, A. (1994), 'The Indian IPO Market: Empirical Facts', Papers.ssrn.com, available at: http://*papers.ssrn.com*/sol3/papers.cfm?abstract_id=6530 (accessed 14 June 2015).

Shah, A. and Thomas, S. (1999), *Developing the Indian capital market. India: A financial sector for the Twenty–first century*, Oxford University Press, New Delhi.

Sinha, N. and Madhusoodanan, T. (n.d.). 'IPO Underpricing, Issue Mechanisms, and Size', *SSRN Electronic Journal*, doi:10.2139/ssrn.520744.

Welch, I. (1989), 'Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings', *The Journal of Finance*, Vol. 44 No. 2, pp. 421-449.

Towards An Intermediate State Theory of Dynamic Capabilities for Improving The Performance of, And Moderating Contemporary Challenges to, Australian Retailers

Alan Simon, Adrianne Renoux and Gary Stockport
The University of Western Australia, Perth,
Australia.

ABSTRACT

Purpose – The main purpose of our study was to attempt to advance the theory of dynamic capabilities from a nascent to intermediate stage by using mixed-methods research to confirm practical operationalised dynamic capabilities that can be used by retailers to help improve performance and mitigate exogenous challenges. Mixed-methods surveys are rarely used in dynamic capabilities studies. The first aim of our paper was to determine the dynamic capabilities that are perceived to be important for successful performance and mitigation of exogenous challenges by Australian retailers. The second aim was to test hypothesized relationships between specific dynamic capabilities and success factors relevant to the Australian retail industry and also between those dynamic capabilities and the extent to which they moderate current challenges to the sector.

Design/methodology/approach – A mixed-methods research design comprising of qualitative and quantitative techniques was used to collect the data. In the first phase of the study, fifteen managers of Australian retail stores were interviewed. In the second phase, a questionnaire survey was administered to senior managers, from whom sixty seven useable returns were obtained and analysed.

Findings – Six hypothesised relationships between practical dynamic capabilities and success

factors and challenge mitigation were tested. The results show that a flexible organisational culture that encourages learning was related to successful performance. Development of technology and a flexible organisational culture were both related to the mitigation of contemporary challenges to the Australian retail sector. Facilitating new product development was not related to successful performance and the amelioration of challenges.

Practical Implications – These results suggest that retailers need to implement a flexible learning organisational culture and implement updated technology in order to achieve success and help reduce the impact of exogenous challenges.

Originality/value – This paper is significant because it adds to the limited body of empirical research on dynamic capabilities, which has left the theory languishing in a nascent state. A rare mixed-methods study of operationalised dynamic capabilities has established how they relate to the successful organisational performance of the Australian retail sector and how they can moderate the impact of challenges to it. This goes part of the way towards advancing the theory of dynamic capabilities to an intermediate stage. It is believed that once the critical practical dynamic capabilities have been determined, retailers will have the potential to develop an improved understanding of the practical management strategies that can be implemented to improve the long-term success of their organisations in times of increased environmental turbulence.

Keywords: Intermediate State of Dynamic Capabilities, Retailers, Practical Dynamic Capabilities, Success Factors, Current Challenges

INTRODUCTION

The purpose of our research was to attempt to advance the current nascent state of dynamic capabilities to an intermediate stage by using mixed-methods research to establish the specific practical/concrete dynamic capabilities that are perceived to be important for the successful performance of the Australian retail sector and help assist the moderation of contemporary challenges to it. Our study also sought to identify the relevant organisational success factors that are adopted by Australian retailers to measure their performance. This was achieved through reviewing the relevant literature and conducting a series of in-depth interviews and a questionnaire survey. The specific practical dynamic capabilities that are perceived to improve the successful performance of, and mitigate challenges to, the Australian retail industry that are prominent in the literature are discussed in the first section of our paper. Firstly, a definition of dynamic capabilities is provided. Thereafter the three important dynamic capabilities of flexible organisational culture that enables fast reconfiguration of resources in the light of learning from contingent environmental flux; facilitation of new product development; and updated technology development; are discussed in detail. This is followed by a description of the indicators of organisational success, an account of the contemporary Australian retail sector and current challenges to it. The last part of our paper discusses the findings from our mixed-methods survey of a sample of Australian retailers.

■ Dynamic Capabilities

Whilst there is much literature on dynamic capabilities generally, there is very little clear categorisation of the concrete or practical dynamic capabilities that are specifically relevant to the Australian retail sector (Simon, 2010; Wu, 2010). Furthermore there is a paucity of research in the field, specifically using both qualitative and quantitative methods in one study, as will be discussed later. It is argued that clear cut dynamic capabilities need to be articulated and thoroughly researched to help advance the field of dynamic capabilities from a nascent to intermediate stage so as to add to the body of strategy literature apropos the Australian retail sector and provide it with the capability of navigating through turbulent economic environments (Pavlou and Sawy, 2011). The global financial crisis (GFC) and its aftermath have highlighted the importance of companies being able to acquire, develop and reconfigure resources and capabilities to deal with environmental contingencies and exigencies. The GFC began with the collapse of the sub-prime mortgage market in 2008 (Foster, 2010). It is further contended that dynamic capabilities can enable organisations in the Australian retail industry to "achieve new and innovative forms of competitive advantage, given path dependencies and market positions" (Teece *et al*., 1997, p. 520). McGuiness and Hutchinson (2013) have added that if retailers can reconfigure their resources and capabilities they could develop successful strategies for growth. Thus, our focus is on the specific dynamic capabilities that are perceived by our sample to improve the performance of, and moderate contemporary challenges to, the Australian retail industry. As aforementioned, there is very little literature that attempts to clearly articulate the specific dynamic capabilities relevant to the Australian retail industry. In addition, it is argued that the influence of dynamic capabilities on an organisation's ability to achieve superior performance is contingent on the firm's context (Wilden *et al*., 2013; Wu, 2010). That is, the characteristics of the turbulent environment within which they are required, dictate the development of specific dynamic capabilities (Ambrosini *et al*., 2009; Wilden *et al*., 2013). The Australian retail industry was chosen as the context for this research study due to the present, and well documented, challenges to retailing, and the high velocity nature of the industry (Brown and Eisenhardt, 1997). The aim of our research therefore is to firstly articulate the specific critical practical dynamic capabilities that are perceived to be important to Australian retailers for the success of their entities. Secondly, hypothesised relationships between these critical capabilities and the success factors relevant to the Australian retail industry and that help counter current challenges to it are tested in our mixed-methods research with a view to developing a more advanced state of dynamic capabilities and thereby providing retailers with a more effective 'playbook' for steering their firms through turbulent environments.

Generally what dynamic capabilities actually are, and their relationship to successful performance, remains generic and arguably even nebulous within conventional theory for some authors like Bharadwaj (2000) and Wu (2010) in one stream of thought which provided the initial impetus for our study. This is as a result of dynamic capabilities often being described as vague, tautological, endlessly recursive, and nonoperational (Eisenhardt and Martin, 2000). While this critique could be considered overly harsh, it is true that the definitions provided by several foremost authors in the field in Appendix A, are conceivably difficult to operationalise for empirical research purposes. This is despite the fact that Scopus citation counts indicate that there has been an increasing volume of published articles about dynamic capabilities. In the 22 years up to the end of 2009, the number of citations of *all* listed articles was 2,585. By October 2012, the number of citations had increased to 9,371 and by August 2014 to 16,020. This clearly shows that there has been a deepening interest in the field, yet one that remains by and large in an early nascent state because there has very little empirical research conducted as will be discussed. In a bibliometric analysis of most heavily cited articles we could only find only three papers, Pavlou and Sawy (2011), Wang *et al.,* (2012) and Protogerou *et al.,* (2011) that used triangulation of qualitative and quantitative methods. Thirty seven percent of the heavily cited articles generated new conceptual models of dynamic capabilities, 15 percent were literature reviews, 11 percent were industry reports, 15 percent discussed findings of case studies, 11 percent (3 papers as mentioned) of mixed-methods designs and 11 percent reported the results of quantitative surveys. We managed to find one further article (Caniato *et al*., 2013) that reported a study of dynamic capabilities in the retail sector but it was focused on innovation, arguably a strategic, rather than a dynamic, capability (Simon *et al*., 2011) and it was a case study. For this reason we used a mixed-methods study of Australian retailers *but* which drew upon Eisenhardt and Martin's (2000, p. 1107) and others, in a second strand of thought's attempt to operationalise dynamic capabilities as "a set of strategic and organisational processes like product development, alliancing, and strategic decision making that create value for firms" – see **Table I** below, which includes a list of dynamic capabilities that have been 'concretised' by them and other seminal authors in the field:

Table I. Dynamic Capabilities Identified from the Literature

Customer Retention	Landroguez *et al.* (2011); Luk *et al.* (2013); Zander and Zander (2005)
Flexible Leadership	Augier and Teece (2005), Eisenhardt and Sull (2001); Pablo *et al.* (2007)
Innovative Response Through Renewing Competencies	Bowman and Ambrosini, (2003); Harreld *et al.* (2007)
Knowledge Management	Chien and Tsai, (2012); Helfat, (1997); Helfat and Raubitschek, (2000); Nonaka *et al.* (2009)
Flexible Organisational Culture	Schreyogg and Kliesch-Eberl, (2007); Zollo and Winter, (2002)
Facilitating New Product Development	Daneels, (2011); Eisenhardt and Martin, (2000), Winter (2003)
Strategic Alliances	Anand *et al.* (2010); Helfat, (2007)
Redeployment of Assets	Anand *et al.* (2010); Bowman and Ambrosini, (2003)
Strategic Decision-making	Christenson, (2007); Harreld *et al.* (2007)

Therefore our contribution to the theory of dynamic capabilities is to attempt to establish specific concrete dynamic capabilities that assist the successfulness of retail organisations and help them meet contemporary challenges. We believe that we go part of the way to advancing the state of dynamic capabilities from nascent to intermediate by conducting mixed-methods research.

Following a review of the literature, in conjunction with the findings from the 15 depth interviews we conducted in the qualitative phase of our research which will be discussed further on in this paper, three critical practical dynamic capabilities were identified. These were technological development, new product development and flexible organisational culture. These can be described as the dynamic capabilities that are perceived to enable Australian retailers to adapt to a rapidly changing environment. It is at this point that some further discussion of these three critical dynamic capabilities is merited.

Flexible Organisational Culture

It is argued by Zollo and Winter (2002, p. 9) that "[flexible] organisations which are culturally able to handle change, or whose managements have successfully instilled an acceptance of continual change practices, are likely to obtain higher returns from learning as the organisation is more responsive and effective in shifting behaviour to exploit novel understandings" (see also Barreto, 2010 and Kuuluvainen, 2012, p. 382 who observes that dynamic capabilities "do not just appear from nothing, but instead they are typically the outcome of experience and learning within the organisations"). According to Goffee and Jones (1996, p. 135) this is due to "increased levels of teamwork, sharing of information, and openness to new ideas".

Development of Updated Technology

In recent times organisations have "increasingly sought to create enhanced value through the embodiment of technical advances or new technologies" (Adegbesan and Ricart, 2007, p. 3). However, this is not confined to high technology industries but is "as important to a bank, an insurance company or a retail store, as it is to a manufacturing or engineering business" (Adegbesan and Ricart, 2007, p. 3). The consumer of today is symbiotically related to technology. Many traditional retail services can now easily be provided over the Internet. Consumers can use their computers, smartphones, iPads and other mobile devices, even on the move for Yang and Kim, (2012) to compare prices and features of goods from retailers, both local and overseas, and arrange home delivery. As a result, there is a growing demand from consumers to be able to easily interface with digital technology. It could be argued that a firm's stock of technology is simply a resource or ordinary capability (Helfat and Winter, 2011). However following Danneels (2011), if a firm integrates new technologies (eg., e-commerce) with bricks-and-mortar retailing, then it has reconfigured existing resources to enable the mitigation of environmental challenges

Facilitating New Product Development

In order to remain competitive within high velocity markets, organisations are required to develop new products with increasing frequency (Danneels, 2011). Consumer products typically have a life cycle that decreases over time and require constant development, renewal and innovation so as to maintain competitiveness in the market. This is because, according to Brown and Eisenhardt (1997, p. 343) "new products are becoming the nexus of competition". Varley (2001, p. 73) argues that "having the best product range for your target customer is … one of the most effective ways of achieving competitive advantage". Winter (2003, p. 994) also stresses the importance of new product development but adds caveats that "product markets are saturated with rival innovations" and also R&D scientists command high salaries. While retailers are not directly involved in new product development, their suppliers are. They need to stay abreast of product development and for Larson (1992), writing specifically about the telephone equipment, clothing, computer hardware and environment support systems industries, recognising future trends, ie.,

market foresight, is a form of dynamic capability. She adds that if distributors, ie., retailers, use their value chain of suppliers and customers to good effect then this facilitates recognition of what new products are likely to sell successfully. "The key goal for resource-poor entrepreneurial organizations is to build network exchange structures with outsiders that are identified as critical resource suppliers…" (Larson, 1992, p. 100).

It is important to note that the list of dynamic capabilities in Table 1, and specifically the three considered most relevant to the Australian retail industry, is not exhaustive. Rather, these capabilities were identified as of particular significance for the context and were used to guide the study which this paper reports.

Organisational Performance

Many strategy research studies use simple outcome based financial indicators that are assumed to "reflect the fulfilment of the economic goals of the firm" (Yamin *et al*., 1999, p. 510). That is, they indicate whether the organisation's improvement strategy, implementation, and execution are contributing to bottom-line improvements (Yamin *et al*., 1999). Typical of this approach would be to examine indicators such as sales growth, profitability, earnings per share, and so on (Yamin *et al*., 1999). However, it is contended that a broader conceptualisation of organisational performance would also include an emphasis on indicators of operational performance, that is, non-financial, in addition to indicators of financial performance (Kaplan & Norton, 2005). Non-financial measures impact more indirectly on the bottom line and might be operationalised as increased customer and job satisfaction and improved teamwork (Simon, 2010). Luk *et al*. (2013, p. 227) indeed call "for heavy commitment to customer satisfaction and retention of regular customers'. In order to effectively measure organisational performance, it is necessary that the Australian retail industry adopt metrics that reflect the key value drivers of performance; revenue growth and efficiency (Deloitte, 2006; Thomas *et al*., 2013). Truly comparable measures would be beneficial to the Australian retail industry, so as to enable an assessment of the success of their improvement activities (Deloitte, 2006). It is with this thought in mind that Thomas *et al*. (2013) proposed a set of four performance measures that were approved by senior retail executives. In addition, each of these measures was assessed for relevancy during the qualitative phase of our study. Together these measures provide a balanced view of trading performance within the Australian retail industry, and include; gross margin return on inventory, operating profit margin, sales density (or sales per square metre), and customer retention, each of which is defined below (Thomas *et al*., 2013).

Gross Margin Return on Inventory

Gross margin return on inventory (GMROI) incorporates two important retailing variables together in a single statistic: the gross margin percentage is expressed as a percentage of sales and annual turnover rate of the inventory (Thomas *et al.,* 2013).

Operating profit margin

Operating profit margin equates to the ratio of net profit divided by net sales, which indicates how much a retailer is "making on each dollar of sales after all expenses have been considered" (Thomas *et al*., 2013, pp. 52-3). Costa *et al*. (2013) warn that paradoxically, costly development of unique resources can reduce profits. In other words the dynamic capability of reconfiguring resources to develop a unique product might not always lead to sustainable competitive advantage as is considered to be self-evident.

Sales density

Sales density or sales per square metre (or foot) ratios present the efficiency of retail specific capital, that is, the productivity of retail floor space, expressed as a return on sales. This permits the effective comparison of retail units (Thomas *et al*., 2013).

Customer retention

For Yavas and Babakus (2009, p. 477) "customer loyalty occupies the centre stage as a strategic business goal". Indeed, it has been noted that eighty percent of a firm's revenue is generated by existing customers (Mazzarol, 2007).

The abovementioned multiple measures were adopted to assess organisational performance in this study. In sum these are:
- Gross Margin Return on Inventory
- Operating profit margin
- Sales density
- Customer retention

The Australian Retail Industry

From the 1990s, 'big box' or megastore retailing emerged in Australia. These stores "typically occupy large floor space in single storey buildings … and derive profits from high turnover, low prices and low costs … focusing on high volumes and economies of scale rather than large

mark-ups" (Productivity Commission 2011, p. 16). Examples of 'big box' retailing in Australia include JB HI-FI, Dan Murphy's Liquor Stores, Bunnings Warehouses, and whitegoods retailer The Good Guys. The 'big box' retailing format is expected to experience significant growth in Australia in the future – "more than 300 big box retailers generating $24 billion a year by 2015" (IBISWorld, 2010) – accounting for 9 per cent of total retail industry revenue (IBIS World, 2010; Productivity Commission, 2011). At present, the retail industry is one of Australia largest employers, "employing 1.2 million people or 10.7 per cent of the total working population in 2009-10" (Productivity Commission 2011, p. 29). As such, in that year, retail workers earned approximately $32 billion in wages and salaries (6 per cent of the economy's total) whilst the industry made a significant contribution to economic output, generating 4.1 per cent of GDP ($53 billion) (Productivity Commission, 2011). However, the retail industry in Australia is currently experiencing poor sales compared to past years. While there is "considerable month-to-month volatility in retail sales, a pattern has emerged pointing to retail trade sales being particularly weak" (Productivity Commission 2011, p. 44; see also Deloitte, 2012). The growth in retail sales fell at the end of 2009 and nominal retail sales have averaged 1.8 per cent since 2011 (Productivity Commission, 2011). This was just over one fifth of the average of the nominal growth rate of the economy over the same period (7.6%) (ABS, 2011). Similarly, the industry's share of GDP has been declining in recent years, reflecting slower growth than other sectors of the economy (Deloitte, 2012; Productivity Commission, 2011). It is argued that this current decrease in sales and overall performance within the Australian retail industry can be attributed to a key number of external and internal contemporary challenges (Olde *et al*., 2011; Productivity Commission, 2011) that will be discussed in more detail in the next section. Five of the dynamic capabilities listed in Table 1, namely, customer retention, knowledge management, strategic alliances, redeployment of assets and strategic decision-making are arguably "internal" to a firm and are required to face structural changes in the Australian industry as a whole. The other five dynamic capabilities, namely, flexible leadership, innovative response through renewing competencies, a flexible learning organisational culture, new product and technology development can be considered "external" as they are used to respond to exogenous environmental challenges, such as international retailers entering the Australian market (see for example, Caniato et al., 2013) and online competitors. Their relative degree of importance will be separated and highlighted in the findings section of this paper.

Contemporary Challenges

Some new *overseas brands,* such as, Aldi and Costco in the staples sector, and Zara and Gap in the discretionary sector have recently entered the Australian market (Deloitte, 2012; Olde *et al*., 2011; Productivity Commission, 2011). Yu and Ramanathan (2012, p. 218) argue that "an increase in the internationalisation of retail companies and markets appears to be one of the most significant trends in today's business environment". One way of meeting this challenge is improved customer service. Javalgi and Reisenwitz (2001, p. 43) write that "it has been noted that logistics can help a company attain a sustained competitive advantage through the combined benefits of improved customer service and lower costs. Customer retention may result from building long-term relationships with customers". However Forslund (2013, p. 216) notes that while "logistics aspects are important components in retailer strategy towards competitive advantage … some problems, challenges and obstacles were indicated; lack of trust, difficulty developing a collaborative culture, difficulty relating metrics to customer value and a lack of IT support for data capturing and reporting". Rao and Kant (1994) add that other logistical strategies such as outsourcing, alliances and investment in technology are used by international firms.

Technological advancements and the virtual ease with which new online businesses can be established have also "substantially lowered barriers to entry and hence added considerably to the competitive environment for retailers" (Productivity Commission 2011, p. XIX). Many traditional retail services can now easily be carried out over the Internet. Furthermore, the competitive impact of *online shopping* is not confined to that of the market share of retailers; online retailers can, and do, have a more pervasive impact on the prices offered by traditional bricks-and-mortar retailers (Productivity Commission, 2011). As Bui and Kemp (2013, p. 155) have noted, "the novelty of online retailing within the past decade has gradually evolved into an everyday channel for shopping" because for Gehrt *et al*. (2012) it is convenient and provides greater choice. However, it should be noted that "the competitive pressure faced by domestic retailers from online shopping varies considerably depending on the nature of the goods sold" (Productivity Commission 2011, p. XIX).

The *high cost of doing business* in Australia has also placed enormous pressure on the retail sector, including some of the highest rents in the world and high labour costs. Australia's minimum wage is between $13.00 and $20.00 depending upon age – in the United States it is $7.25 (Olde *et al*., 2011). In addition, "import duty costs are high and with Australian product volume being considerably lower than other countries, freight costs are significant higher" (Olde *et al*., 2011, p. 1).

Thus, the literature presents several current economic challenges to the Australian retail

industry. However, from the qualitative phase of this study, three contemporary challenges were identified as the most prominent. These were online shopping, overseas brands emerging in the market and the high cost of doing business as highlighted above. The high cost of doing business (salaries and rents), is common for all companies in Australia but retailers face the added unique challenge of competing with big-ticket international retailers who have recently entered the Australia market. As will be shown later, the high cost of doing business in Australia was rated the most important challenge by interviewees and survey respondents while overseas brands competing in the domestic market was considered to be comparatively less important. It is important to note that this list of contemporary challenges to the Australian retail industry is not exhaustive. Rather, these challenges were identified as of particular significance from the qualitative phase of this study, and were used to help construct the questions in the questionnaire survey stage of our research.

RESEARCH OBJECTIVE

In order to attempt to develop a more advanced theory of dynamic capabilities, we conducted mixed-methods research of the dynamic capabilities considered important by retailers for successful performance and mitigation of challenges. Mixed-methods research conduces to more robust findings. We took the recurrent themes in the literature to our interview sample of retailers for confirmation and assessment of degree of relative importance. This provided the variables for constructing six hypotheses for testing in a questionnaire survey of members of the Australian Retail Association. The dependent variables were successful performance and challenge mitigation while the independent dynamic capabilities variables were deduced from the literature and the data obtained from the interviewees.

▐ *Hypotheses*

The Specific Dynamic Capabilities and Organisational Performance

H_1 – H_3: There is a significant positive correlation between flexible organisational culture (1); updated technology development (2); facilitating new product development (3); and performance in the Australian retail industry.

The Specific Dynamic Capabilities and Contemporary Challenges to the Australian Retail Industry

H_4 – H_6: There is a significant positive correlation between moderation of contemporary challenges to the Australian retail industry and flexible organisational culture (4); updated technology development (5); and facilitating new product development (6).

RESEARCH METHOD

We opted for an exploratory research design in which we used both a qualitative and a quantitative method for our research. The justification for using mixed-methods research is the likely current nascent state of dynamic capabilities, as outlined by Di Stefano et al (2010) and Edmondson and McManus (2007). In seeking justification for this mixed-methods design, Edmondson and McManus (2007) suggest that theory in management research falls along a continuum, from nascent to mature (see **Figure 1**). Intermediate theory, positioned between nascent and mature, "presents provisional explanations of phenomena, often introducing a new construct and proposing relationships between it and established constructs" (Edmondson & McManus 2007, p. 1158). Such studies frequently use both qualitative and quantitative data collection methods to help establish the external and construct validity of new measures through triangulation.
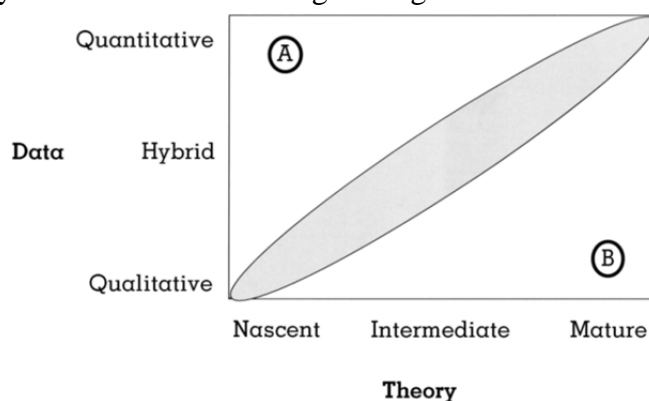
Figure 1. Methodological Fit as a Mean Tendency
(Source: Edmondson and McManus 2007, p. 1168)

For the purpose of the qualitative phase of this study, after gaining University ethics approval, 15 in-depth interviews were conducted with managers in the Australian retail industry. A snowball sample of interviewees, who currently occupy senior management positions in retail companies, like major department stores, was selected. Following this, a questionnaire survey was mailed to senior managers of all 214 listed retail companies and administered online to members of an Australian Retail Association. We obtained 67 usable responses from this strategy. While our response rate is arguably on the low side, we used correlation analysis to test the hypotheses after checking for reliability and validity. The Cronbach Alpha scores for similarly worded scales used in the quantitative phase of this study are presented in **Table II**.

"Insert Table II about here"

Table II. Cronbach Alpha Scores for Similar Scales

	Scale	**Cronbach Alpha**
Dynamic Capabilities	Organisational Culture	
	Technological Development	
	Product Development	.459
Performance (PER)	Gross Margin Return on Inventory	
	Operating Profit Margin	
	Sales Density	
	Customer Retention	.846
Contemporary Challenges (CHA)	Online Shopping	
	High Cost of Doing Business	
	Overseas Brands Emerging in the Market	.753

Note: While the Cronbach Alpha of 0.459 could be improved by removing organisational culture, we wish to retain it in the mix as it was correlated with one performance indicator and one challenge and our study was fundamentally exploratory.

Construct validity "testifies to how well the results obtained from the use of the measure fits the theories around which the test is designed" (Sekaran and Bougie 2009, p. 160). This is assessed through convergent and discriminant validity (Sekaran and Bougie 2009). With respect to convergent validity, we included both open and closed questions to explore the extent that the dynamic capabilities, challenges and performance indicators were relevant to the Australian retail context. In addition, we tested for differences between the responses obtained from the online sample and the ASX list of retailers. Based on the independent-samples t-test results the significance values of a Levene's test were found to be >0.05 and associated significance (2-tailed) values were also >0.05. It was therefore concluded with 95% confidence that there was no significant difference between the mean scores of the responses to the online survey and the responses to the postal survey. For this reason, the two sets of responses could be combined into a single data set of 67 respondents for further analysis. However, in terms of discriminant validity, it is intended that the findings of our research will be useful in providing the Australian retail industry with an improved understanding of the practical management strategies that can be implemented to improve long-term success during times of increased environmental economic turbulence.

RESULTS AND DISCUSSION

Findings from The Depth Interviews

As aforementioned, the interviewees were presented with both open and closed-ended questions about the 10 dynamic capabilities listed in Table I. This was done in order to confirm the relevance of the dynamic capabilities that had emerged from the literature review prior to this qualitative phase of the study. The use of closed questions allowed the researcher to articulate concrete, operationalisable dynamic capabilities important to the performance of Australian retailers. This, according to Wu (2010), has been a key limitation in the dynamic capabilities literature in which he argues much of the discourse is theoretical rather than practical. The interviewees observed that each of the dynamic capabilities presented to them was important for the success of the Australian retail industry. It was explained by Lewis that this is because, in truly successful Australian retail organisations, dynamic capabilities are perceived to operate in

conjunction as a means of facilitating successful performance:

"I think the hardest thing is trying to rate them, because they are all quite important. In fact, I think they work best when they're all operating together. You need to be able to perform in all areas in order to be successful" [Lewis].

However, following the thematic analysis of the data, three 'robust' dynamic capabilities were identified as they were the most frequently cited (See **Table III** below). These can be regarded as the dynamic capabilities that enable Australian retailers to transform in congruence with the rapidly changing environment thus conducing to successful performance (Simon *et al.*, 2011). The relevance of these dynamic capabilities did not appear to vary according to the product offering of the interviewee's respective organisation i.e. staple, discretionary or both.

Table III. Rating of Dynamic Capabilities (Interviews)

Dynamic Capability	**Listed in Top Five Dynamic Capabilities (No. of Interviewees)***
Strategic Decision-Making	8
Flexible Organisational Culture	11
Updated Technology Development	9
Flexible Leadership	7
Strategic Alliances	6
Knowledge Management	5
Facilitating New Product Development	9
Team Building	5
Reconfiguring Competencies	6
Redeployment of Assets	5

*Three interviewees listed less than five dynamic capabilities.

Seventy three percent of the interviewees rated organisational culture in the top five dynamic capabilities. Sixty percent considered technological and new product development to be top five dynamic capabilities. Thus, the analysis to follow focuses on these three 'robust' dynamic capabilities that were identified by the interviewees to be most important for the performance of Australian retailers, in light of contemporary challenges.

▌ Dynamic Capability: Flexible Organisational Culture

It was noted by eleven interviewees that a flexible organisational culture is a key dynamic capability within the Australian retail industry. In particular, it was reported to be a capability that has the potential to stimulate learning and continuous improvement in retail organisations. It was acknowledged also by eleven interviewees that organisational culture has the potential to determine the success or failure of organisations operating in the Australian retail industry. In particular, it was thought by Megan that successful organisations have a 'distinctive' culture – one that promotes flexibility and fosters innovation. Lucy added that;

"Organisational culture is an important capability because it determines how employees, and management I guess, interact in the workplace – it is those companies that have created the 'right' culture that [enables] individuals to learn from each other, to share their experiences and secrets, you know, their 'tricks of the trade'- that are able to handle change. That is important [in the retail industry] because things in this sector change very quickly so you need to be able to innovate and take advantage of opportunities and this requires learning from each other" [Lucy].

It was reported by seven interviewees that a flexible organisational culture is vitally important for overcoming contemporary challenges in the Australian retail industry – specifically, the threat of overseas brands emerging in the market.

"A number of international brands have entered the Australian market in the past few years; GAP, Costco, Aldi and Zara to name a few. These are massive brands that everyone knows even in Perth! They are significantly impacting on the sales volume of home grown retailers. So [Australian retailers] really need to start differentiating themselves if they want to stay afloat. I guess in terms of dynamic capabilities, at XXX we are attempting to leverage our [organisational] culture because you know, it affects the way our customers 'see' us – it works as a point of comparison – our customers compare our reputation with the perceived reputation of our new competition [Kate].

Dynamic Capability: Updated Technology Development

Nine of the interviewees considered technological development to be a key dynamic capability for the Australian retail industry. Specifically, it was considered by Mark to be a capability that is dependent on the generation of knowledge – both from the existing information assets within the organisation and the new technical assets external to it. It was felt by six of interviewees that organisations must integrate technological development into their everyday functioning should they wish to succeed in the Australian retail industry. From the interviews, it became evident that organisations looking to maintain a foothold within the Australian retail industry, must act to integrate and adopt a new model of retailing grounded in technological development. There was a consensus among the interviewees, in particular Lucy and Daniel, that online shopping, also known as 'clicks-and-mortar retailing', is now a major competitive risk to Australian retailers. Matthew believed that this is due to the growing demand among 'savvy' shoppers to be able to interact with digital technology across all mediums. Thus, organisations are required to invest in technological development in order to bring consumers back to 'traditional retail' through the development of an engaging and attractive in-store experience (see Alur and Schoormans, 2013). According to Simon this involves the use of 'innovative touchscreen and immersive technology' as a means of bringing customers back. In addition, ten interviewees commented that the high cost of doing business in Australia has placed enormous pressure on local retailers. It was noted by Kate that this is due to some of the highest rents in the world, and wages growth, which Australian retailers must absorb. However, it was posited by Daniel that these operating costs could be reduced through the assistance of online e-commerce.

"Technological development is a new one in the last few years. The [Australian] retail industry never really used to be so technology driven. But now we live in an era of mobile and e-commerce. That is just the reality of it. You can put your head in the sand and try to ignore it, but you will get left behind – you can see it as a threat and 'oh my god I'm losing all of my customers…' or you can get on board. Get out there and compete yourself. If an organisation can get a good grasp on the technological side of things you know, implement something really special that complements their business and industry – then market change is a breeze" [Megan].

Dynamic Capability: Facilitating New Product Development

It was felt by nine interviewees that new product development is a primary focus of Australian retailers as a means of maintaining performance. According to Joanne and Lewis, where either markets or customers are changing, and demands are uncertain, successful businesses within the Australian retail sector will respond by searching for unmet customer needs, and new concepts to meet them. The interviewees noted that evidence is mounting that new products have a significant impact on customer retention and competitive advantage. According to Emily this can be seen in the example of 'Revo' – a company that was described by one interviewee as having lost its loyal customer base because of a failure to develop new products.

"You need to keep changing and developing your product line. You need to keep innovating and adding to it. If you can't do that, well, then I think you're in the wrong industry" [Wayne].

"Given the current economic environment, [Australian] retail organisations can't afford to have a 'miss' in their product offering. So by gaining better insight into consumer wants and needs before final design decisions are made provides a brand with a golden opportunity to ensure [they] are on target. The balance of buying power has shifted to the consumer – so gathering market feedback is more critical than ever" [Dylan].

The themes relating to organisational performance and contemporary challenges were then analysed in conjunction with organisational culture, technological development, and product development (**Tables IV** and **V**). Technological development appeared to be the most strongly related to performance and mitigation of challenges.

Table IV. Dynamic Capabilities and Organisational Performance

	GMROI	OPM	SD	CR
Flexible Organisational Culture				*
Updated Technology Development		*	*	
Facilitating New Product Development	*			*

GMROI = Gross Margin Return on Inventory   OPM = Operating Profit Margin
SD = Sales Density   CR = Customer Retention

Table V. Dynamic Capabilities and Mitigation of Contemporary Challenges

	OS	HC	OB
Flexible Organisational Culture			*
Updated Technology Development	*	*	
Facilitating New Product Development			*

OS = Online Shopping HC = High Cost of Doing Business
OB = Overseas Brands Emerging in the Market

■ Findings from the questionnaire survey

As previously noted, the dynamic capabilities generated by the literature and by the interviewees perceived to enable Australian retailers to transform in concert with the rapidly changing environment were a flexible learning organisational culture (Schreyogg and Kliesch-Eberl, 2007; Zollo and Winter, 2002), updated technology development (Helfat, 1997; Helfat and Raubitschek, 2000) and facilitating new product development (Danneels, 2011; Eisenhardt and Martin, 2000). Before concentrating on these three variables which were consonant across the seminal literature in the field of dynamic capabilities and the interviews, we first assessed the degree of importance of all ten of the dynamic capabilities in Table I in the literature review section of this paper. **Table VI** below summarises the findings:

■ *Table VI Relative Importance of Dynamic Capabilities*

	VI + MI		N		SI + NAAI		Mean (x)
Dynamic Capability	#	%	#	%	#	%	
Strategic Decision-Making	60	89.6	3	4.5	3	6.0	1.58
Organisational Culture	58	86.6	4	6.0	5	7.5	1.66
Technology Development	48	71.6	4	6.0	15	22.4	2.03
Flexible Leadership	58	86.6	3	4.5	6	9.0	1.76
Strategic Alliances	54	80.6	3	4.5	10	14.9	1.96
Knowledge Management	42	62.7	10	14.9	15	22.4	2.22
New Product Development	54	80.6	3	4.5	10	14.9	2.03
Team Building	46	68.7	5	7.5	16	23.8	2.36
Reconfiguring Competencies	32	47.8	19	28.4	16	23.9	2.52
Redeployment of Assets	41	61.2	12	17.9	14	20.9	2.39

VI = Very Important (1)   MI = Moderately Important (2)   N = Neutral (3)
SI = Slightly Important (4)   NAAI = Not At All Important (5)

Strategic decision-making (89.6%), an "internal" dynamic capability, was considered to be important most often by questionnaire respondents, followed by flexible organisational culture and flexible leadership (86.6%), both "external" dynamic capabilities which are useful for responding to exogenous challenges, such as international competitors. These were followed by facilitating new product development and strategic alliances (80.6%). However, technological development, another external dynamic capability identified as crucial during the interviewing phase of this study, was only considered to be 'very important' and 'moderately important' by 71.6 per cent of the respondents.

The contemporary challenges perceived to most prominently impact upon the performance of the Australian retail industry include; online shopping, the high cost of doing business and overseas brands emerging in the market (as highlighted in **Table VII**). The high cost of doing business, one of the two challenges faced by all businesses in Australia, was considered to pose the most significant challenge to the success of the Australian retail industry by 94 per cent of the questionnaire respondents. This was followed by online shopping (76.1%), and resistance to change (71.7%). However, overseas brands emerging in the market, which was identified as a significant contemporary challenge, during the qualitative phase of this study, was only considered to have a 'high impact' and 'moderate impact' by 70.1% per cent of the respondents. This is despite the fact that this challenge was considered more specific to the retail sector as discussed earlier in this paper. **Table VII** summarises the findings:

Table VII. Relative Impacts of Challenges to the Australian Retail Industry

	HI + MI		N		LI + NI		Mean (x)
Challenges	**#**	**%**	**#**	**%**	**#**	**%**	
High Cost of Doing Business	63	94	4	6.0	0	0.0	1.25
Online Shopping	51	76.1	6	9.0	10	14.9	1.79
Overseas Brands Emerging in the Market	47	70.1	10	14.9	10	14.9	1.96
Resistance to Change	48	71.7	11	16.4	8	12.0	2.01
Interest Rate Increases	47	70.2	7	10.4	13	38.8	2.36
Laws and Regulations	26	38.8	12	17.9	29	43.3	2.99
Government Instability	28	41.8	13	19.4	26	38.8	2.88
Mismanagement of Inventory	29	43.3	9	13.4	29	43.3	2.85
Tightening Capital Markets	46	68.6	11	16.4	10	15.0	2.34

HI = High Impact (1)   MI = Moderate Impact (2)   N = Neutral (3)
LI = Limited Impact (4)   NI = No Impact (5)

As previously noted in the literature review, the indicators perceived to be key to measuring the Australian retail industry were gross margin return on inventory, operating profit margin, sales density and customer retention (Luk *et al*., 2013, Thomas *et al*., 2013). Customer retention (83.5%) was considered to be important most often by questionnaire respondents, followed by gross margin return on inventory (82.1%), and customer satisfaction (79.1%) However, operating profit margin and sales density, which were identified as critical performance indicators in the Australian retail industry during the interviews, were only considered to be 'very important' and 'moderately important' by 73.1 and 68.6 per cent of the respondents, respectively. **Table VIII** summarises these data:

Table VIII. Relative Importance of Organisational Performance Indicators

	VI + MI		N		SI + NAAI		Mean (x)
Performance Indicators	**#**	**%**	**#**	**%**	**#**	**%**	
Customer Retention	56	83.5	7	10.4	4	6.0	1.54
Customer Satisfaction	53	79.1	4	6.0	10	14.9	1.73
Gross Margin Return on Inventory	55	82.1	5	7.5	7	10.5	1.75
Operating Profit Margin	49	73.1	11	16.4	7	10.4	1.97
Capital Expenditure	52	77.7	10	14.9	5	7.5	1.88
Sales Density	46	68.6	10	14.9	11	16.4	2.15
Like-for-Like Sales	47	70.2	8	11.9	12	17.9	2.22
Average Customer Numbers	43	64.2	8	11.9	16	23.9	2.39
Average Customer Spend	39	58.2	15	22.4	13	19.4	2.43
Store Portfolio Changes	28	41.8	14	20.9	25	37.3	2.97

VI = Very Important (1)   MI = Moderately Important (2)   N = Neutral (3)
SI = Slightly Important (4)   NAAI = Not At All Important (5)

A series of correlational analyses were conducted as to test the six hypotheses developed after the initial qualitative phase of the study was conducted, during which the independent and dependent variables were established. Three of these hypotheses were found to be supported – H_1, H_4 and H_5 – while the remaining three were rejected – H_2, H_3 and H_6. Organisational culture (OC) was found to be positively correlated with performance (PER) and contemporary challenges (CHA), while technological development (TD) was only positively correlated with CHA. New product development (PD) and TD were found not to be correlated with PER, whilst PD was also not correlated with CHA (**Table IX**).

Table IX. Summary of Correlational Analyses

Dynamic Capability	Organisational Performance and Contemporary Challenges	
	PER Sig. (2-tailed)	CHA Sig. (2-tailed)
OC	.422** (p<.001)	.287* (p<.0.05)
TD	.204 (p=.098)	.300* (p<0.05)
PD	-.092 (p=.459)	-.103 (p=.406)

CONCLUSION

Our triangulated research, which this paper reports, was concerned with the dynamic capabilities, a major area of strategic management, that are believed to improve the performance of, and mitigate contemporary challenges to, the Australian retail industry. The vast academic literature on dynamic capabilities, including the most highly cited articles, has been criticised by one group of authors for being nebulous and vague. For this reason we attempted to operationalise the dynamic capabilities that are important to the Australian retail sector. There has also been a paucity of mixed-methods studies of dynamic capabilities which has left the domain languishing at the nascent stage in Edmondson and McManus' (2007) model of methodological fit. Our contribution to the field therefore has been to attempt to advance the state to the intermediate stage by conducting mixed-methods research of clear cut dynamic capabilities considered of major import to retailers. Our results show firstly that a flexible organisational culture is a key internal dynamic capability for improving the performance of the Australian retail industry. In particular, it is a capability that has the potential to stimulate learning and continuous improvement in retail organisations and to have significant impact upon organisational performance; with successful performance being associated with the 'correct' culture that promotes flexibility and fosters learning and innovation. Furthermore, despite being an internal dynamic capability, a flexible organisational culture is vitally important for overcoming contemporary challenges to the Australian retail industry; specifically, the threat of overseas brands emerging in the market. One of the reasons for this is its logistical relationship to customer retention. Secondly, the research shows that the external dynamic capability of updated technology development (investment in which is of logistical import), (as well as organisational culture) was positively correlated with the moderation of contemporary challenges to the Australian retail industry. Facilitating new product development, another external dynamic capability, was unexpectedly not related to performance and amelioration of the impact of challenges. These findings suggest that retail managers need to adopt a flexible learning culture when faced with changing environmental exigencies for example, in the form of exogenous economic shocks. Managers of retail firms need to implement a flexible and innovative organisational culture, one that continually enables learning from shifting environmental landscapes. In addition, they need to ensure that implement new digital technologies which coalesce with customers' needs embracing the opportunities offered by their everyday use of online technology, even on the move. This suggests continual monitoring and surveying of customers. A direction for future research is to canvass views on, and test hypotheses about, the additional concrete dynamic capabilities of strategic decision making, strategic alliances and flexible leadership. These were not focused upon in our study as they were not rated in the top three by the interviewees in the first stage of the research. However the results of the questionnaire survey suggest that they warrant attention in future studies while the literature also makes a case for strategic alliances being of logistical import.

REFERENCES

ABS (2011), "Trade at a glance", Accessed from http://www.dfat.gov.au/publications/trade/trade-at-a-glance-2011.html

Adegbesan, J.A. and Ricart, J.E. (2007), "What do we really know about when technological innovation improves performance (and when it does not?)", *IESE Business School Working Paper* no. 668.

Alur, S. and Schoormans, J. (2013), "Retailers and new product acceptance in India's base of pyramid (BoP) markets: propositions for research", *International Journal of Retail & Distribution Management*, Vol. 41 No. 3, pp. 189-200.

Ambrosini, V., Bowman, C. and Collier, N. (2009), "Dynamic capabilities: an exploration of how firms renew their resource base", *British Journal of Management*, Vol. 20 No. S1, pp. S9-S24.

Anand, J., Oriani, R. and Vassolo, R. (2010), "Alliance activity as a dynamic capability in the face of a discontinuous technological change", *Organization Science*, Vol. 21 No. 6, pp. 1213–1232.

Augier, M and Teece, D. (2005), "Reflections on (Schumpeterian) leadership: A report on a seminar on leadership and management education", *California Management Review*, Vol. 47 No. 2, pp. 114-136.

Barreto, I. (2010), "Dynamic capabilities: a review of past research and an agenda for the future", *Journal of Management*, Vol. 36 No. 1, pp. 256-280.

Bharadwaj, A.S. (2000), "A resource-based perspective on information technology capability and firm performance: an empirical investigation', *MIS Quarterly*, Vol. 24 No. 1, pp. 585-620.

Bowman, C. and Ambrosini, V. (2003), "How the resource-based and dynamic capability views of the firm inform competitive and corporate level strategy", *British Journal of Management*, Vol. 14 No. 4,

pp. 289-303.

Brown, S. and Eisenhardt, K. (1997), "The art of continuous change: linking complexity theory and time-paced evolutions in relentlessly shifting organisations", *Administrative Science Quarterly,* Vol. 42 No. 1, pp. 1-34.

Bui, M. and Kemp, E. (2013), "E-tail emotion regulation: examining online hedonic product purchases", *International Journal of Retail & Distribution Management*, Vol. 41 No. 2, pp. 155-170.

Caniato, F., Caridi, M. and Moretto, A. 2013, "Dynamic capabilities for fashion-luxury supply chain innovation", *International Journal of Retail & Distribution Management*, Vol. 41 No. 11/12, pp. 940-960.

Chien, S. and Tsai, C. (2012), "Dynamic capability, knowledge, learning, and firm performance", *Journal of Organizational Change Management*, Vol. 25 No. 3, pp. 433-444.

Christensen, C.M. (2010), "How will you measure your life?" *Harvard Business Review*, Vol. 88 No. 7, pp. 1–7.

Costa, L., Cool, K. and Dierickx, I. (2012), "The competitive implications of the deployment of unique resources", *Strategic Management Journal*, Vol. 34, pp. 445-463.

Danneels, E. (2011), "Trying to become a different type of company: dynamic capability at Smith Corona", *Strategic Management Journal*, 32 (1), p. 1-31.

Deloitte (2006), "Talking Shop: How Do Retailers' Trading Performance Measures Stack Up?" Accessed from https://www.deloitte.com/assets/Dcom-Croatia/Local%20Assets/Documents/HR_CB_ TalkingShop_06.pdf

Deloitte (2012), *Global Powers of Retailing 2013: Retail Beyond*, Consumer Business, Sydney, pp.1-44.

Di Stefano, G., Peteraf, M. and Verona, G. (2010), "Dynamic capabilities deconstructed: a bibliographic investigation into the origins, development, and future directions of the research domain", *Industrial and Corporate Change*, Vol. 19 No. 4, pp. 1187–1204.

Edmondson, A.C. and McManus, S.E. (2007), "Methodological Fit in Management Field Research", *Academy of Management Review*, Vol. 32 No. 4, pp. 1155-1179.

Eisenhardt, K.M. and Martin, J. (2000, "Dynamic capabilities: what are they?" *Strategic Management Journal*, Vol. 21 No. 10/11, pp. 1105-1121.

Forslund, H. (2013) "Exploring logistics performance management in supplier/retailer dyads", *International Journal of Retail & Distribution Management*, Vol. 42 No. 3, pp. 205-218.

Forster, J. (2010), *The Global Financial Crisis*, John Wiley & Sons, Queensland.

Gehrt, K., Rajan, N., Shainesh, G., Czerwinski, D. and O'Brien, M. (2012), "Emergence of online shopping in India: shopping orientation segments", *International Journal of Retail & Distribution Management*, Vol. 40 No. 10, pp. 742-758.

Goffee, R. and Jones G. (1996), "What holds the modern company together", *Harvard Business Review*, Vol. 74 No. 6, pp. 133-148.

Harreld, J., O'Reilly, C. and Tushman, M. (2007), "Dynamic capabilities at IBM: driving strategy into action", *California Management Review*, Vol. 49 No. 4, pp. 21–43.

Helfat, C.E. (1997), "Know-how and asset competitiveness and dynamic capability accumulation: the case of R&D", *Strategic Management Journal*, Vol. 18 No. 5, pp. 339-360.

Helfat, C. E. and Raubitschek, R. (2000), "Product sequencing: co-evolution of knowledge capabilities and products", *Strategic Management Journal*, Vol. 21 No. 10/11, pp. 961–979.

Helfat, C. and Winter, S. (2011), "Untangling dynamic and operational capabilities: strategy for the (n)ever-changing world", *Strategic Management Journal*, Vol. 32, pp. 1243-1250.

Hill, C.W.L., Jones, G.R. and Galvin, P. (2007) *Strategic Management: An Integrated Approach 2e*, John Wiley & Sons, Milton, Queensland.

IBIS World 2010 Accessed from http://clients1.ibisworld.com.au/

Javalgi, R. and Reisenwitz, T. (2001), "International logistics operations of MNCs: An exploration of the pharmaceutical industry", *Review of Business*, Vol. 22 No. 1/2, pp. 43-51.

Kaplan, R.S. and Norton, D.P. (2005), "The balanced scorecard: measures that drive performance", *Harvard Business Review*, Vol. 83 No. 7, pp. 172–181.

Kogut, B. and Zander, U. (1992), "Knowledge of the firm, combinative capabilities,, and the replication of technology", *Organization Science*, Vol. 3, No. 3, pp. 383-397.

Kuuluvainen, A. (2012), "How to concretize dynamic capabilities? Theory and examples", *Journal of Strategy and Management*, Vol. 5 No. 4, pp. 381-392.

Landroguez, S., Castro, C. and Cepeda-Carrion, G. (2011), "Creating dynamic capabilities to increase customer value", *Management Decision*, Vol. 49 No. 7, pp. 1141-1159.

Larson, A. (1992), "Network dyads in entrepreneurial settings: a study of the governance of exchange relationships", *Administrative Science Quarterly*, Vol. 37, No. 1, pp. 76-104.

Luk, S., Albaum, G. and Fullgrabe, L. (2013), "Trust in customer-salesperson relationship in China's retail sector", *International Journal of Retail & Distribution Management*, Vol. 41 No. 3, pp. 226-248.

Mazzarol, T.W. (2007), "Managing the global operation", p. 132-156 in Lloyd-Reason, L. and Sear, L. (eds), *Trading Places - SMEs in the Global Economy: A Critical Research Handbook*, Edward Elgar Publishing, Cheltenham, UK and Northampton M.A. US.

McGuiness, D. and Hutchinson, K. (2013), "Utilising product knowledge: competitive advantage for specialist independent grocery retailers", *International Journal of Retail & Distribution Management*, Vol. 41 No. 6, pp. 461-476.

Nonaka, I., Toyoma, R. and Hirata, T. (2009), "Managing flow: a process theory of the knowledge-based firm", *Journal of Product Innovation Management*, Vol. 26, pp. 594-596.

Olde, Q., Allen, P. and Holtzer, M. (2011), *Ten Issues Facing Australian Retail in 2011*, Australia's Retail Challenge, Melbourne.

Pablo, A.L., Reay, T., Dewald, J.R. and Casebeer, A.J. (2007), "Identifying, enabling and managing dynamic capabilities in the public sector", ***The Journal of Management Studies,*** Vol. 44 No. 5, pp. 687–708.

Pavlou, P. and Sawy, O. (2013), "Understanding the elusive black box of dynamic capabilities", *Decision Sciences*, Vol. 42 No. 1, pp. 239-273.

Protogerou, A., Caloghirou, Y. and Lioukas, S. (2011), "Dynamic capabilities and their indirect impact on firm performance", *Industrial and Corporate Change*, Vol. 21, pp. 615–647.

Productivity Commission (2011), *Economic Structure and Performance of the Australian Retail Industry*, Report no. 56, Canberra.

Rao, K. and Young, R. (1994), "Global supply chains: Factors influencing outsourcing of logistics functions", *International Journal of Physical Distribution & Logistics Management*, Vol. 24 No. 6, pp. 11-19.

Schreyogg, G. and Kliesch-Eberl, M. (2007), "How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization", *Strategic Management Journal*, Vol. 28, pp. 913-933.

Sekaran, U. and Bougie, R. (2009), *Research Methods for Business: A Skill Building Approach 5e*, John Wiley & Sons, Milton, Queensland.

Selznick, P. (1957), *Leadership in Administration*, Row Peterson, Evanston, Illinois,

Simon, A.M. (2010), "Resources, dynamic capabilities and Australian business success", *Journal of Global Business and Technology*, Vol. 6 No. 2, pp. 12-31.

Simon, A., Kumar, V., Schoeman, P., Moffat, P. and Power, D. (2011), "Capabilities and organisational success, some pointers from five Australian studies", *Management Decision*, Vol. 49 No. 8, pp. 1305–1326.

Singh, R., Mathiassen, L., Stachura, M. and Astapova, E. (2011), "Dynamic capabilities in home health: IT-enabled transformation of post-acute care", *Journal for the Association for Information Systems*, Vol. 12 No. 2, pp. 163-188.

Teece, D. (2000), "Strategies for managing knowledge assets: the role of firm structure and industrial context", *Long Range Planning*, Vol. 33 No. 1, pp. 35-54.

Teece, D. and Pisano, G. (1994), "The dynamic capabilities of firms: an introduction", *Industrial and Corporate Change*, Vol. 3 No. 3, pp. 537-556.

Teece, D. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management*, Vol. 28, pp. 1319-1350.

Teece, D., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management',

Strategic Management Journal, Vol. 18 No. 7, pp. 509-533.

Thomas, R., Gable, M. and Dickinson, R. (2013), "An application of the balanced scorecard in retailing", *The International Review of Retail, Distribution and Consumer Research'*, Vol. 9 No. 1, pp. 41-67 (published online 2013).

Varley, R. (2001), *Retail Product Management*, Routledge: London.

Wang, C., Jaw, B. and Tsai, C. (2012), "Building dynamic strategic capabilities: a human capital perspective", *International Journal of Human Resource Management*, Vol. 23 No. 6, pp. 1129–1157.

Wilden, R., Gundergan, S.P., Nielsen, B.B. and Lings, I. (2013), "Dynamic capabilities: strategy, structure and environment", *Long Range Planning*, Vol. 46 No. 1, pp. 72-96.

Winter, S.G. (2003), "Understanding dynamic capabilities", *Strategic Management Journal*, Vol. 24 No. 10, pp. 991–995.

Wu, L. (2010), "Applicability of the resource-based and dynamic-capability views under environmental volatility", *Journal of Business Research*, Vol. 63 No. 1, pp. 27-31.

Yamin, S., Gunnasekaran, A. and Mavondo, F. (1999), "Relationship between generic strategies, competitive advantage and organizational performance: an empirical analysis", *Technovation*, Vol. 19, pp. 507-518.

Yang, K. and Kim, H-Y. (2012), "Mobile shopping motivation: an application of multiple discriminant analysis", *International Journal of Retail & Distribution Management*, Vol. 40 No. 10, pp. 778-789.

Yavas, U. and Babakus, E. (2009), "Retail store loyalty: a comparison of two customer segments", *International Journal of Retail & Distribution Management*, Vol. 37 No. 6, pp. 477-492.

Yu, W. and Ramanathan, R. (2012), "Effects of business environment on international retail operations: case study evidence from China", *International Journal of Retail & Distribution Management*, Vol. 40 No. 3, pp. 218-234.

Zahra, S., Sapienza, H. and Davidsson, P. (2006), "Entrepreneurship and dynamic capabilities: a review, model and research agenda", *Journal of Management Studies*, Vol. 43 No. 4, pp. 917-955.

Zander, I. and Zander, U. (2005), "The inside track: on the important (but neglected) role of customers in the resource-based view of strategy and firm growth", *Journal of Management Studies*, Vol. 42 No. 8, pp. 1519–1548.

Zollo, M. and Winter, S.G. (2002), "Deliberate learning and the evolution of dynamic capabilities", *Organisation Science*, Vol. 13 No. 3, pp. 339-351.

Appendix A: Definitions of dynamic capabilities provided by a number of seminal authors

Arguably, the term 'distinctive capabilities' was first mentioned by Selznick (1957, p.53) 'The assessment of industrial firms also requires study of distinctive capabilities and limitations. For example, a commitment to quality of product may be an important determinant of organisational character of institutionalisation'.
Teece and Pisano (1994, p.538) 'The term 'dynamic' refers to the shifting character of the environment; certain strategic responses are required when time-to-market and timing is critical, the pace of innovation is accelerating, and the nature of future competition and markets is difficult to determine'.
Teece, Pisano and Shuen (1997, p.516) 'The firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments'.
Eisenhardt and Martin (2000, p.1107) 'The firm's processes that use resources – specifically the processes to integrate, reconfigure, gain, and release resources – to match and even create market change. Dynamic capabilities thus are the organisational and strategic routines by which firms achieve new resource configuration as markets emerge, collide, split, evolve and die'.
Teece (2000, p.47) 'The ability to sense and seize opportunity'.

Zollo and Winter (2002, p.340) 'A dynamic capability is a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness'.

Winter (2003, p.991) 'Defining ordinary or 'zero-level capabilities as those that permit a firm to 'make a living' in the short term, one can define dynamic capabilities as those that operate to extend, modify or create ordinary capabilities'.

Zahra, Sapienza and Davidsson (2006, p.924) 'Abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by the firm's principal decision-maker(s)'.

Teece (2007, p.1319) ' Dynamic capabilities can be disaggregated into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfigure the business enterprises's intangible and tangible assets'.

Barreto (2010, p.271) 'A dynamic capability is the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base'.

Impact of IS Service Quality on Business Performance in A Service-Oriented Economy

Dinesh A. Mirchandani, College of Business Administration, University of Missouri - St. Louis,USA
Yunus A. Kathawala, College of Business Administration, Gulf University for Science and Technology,Kuwait
John P. Hayes, College of Business Administration, Gulf University for Science and Technology,Kuwait
Julius H. Johnson, Jr., College of Business Administration, University of Missouri - St. Louis,USA
Sudhir Chawla, College of Business Administration, Gulf University for Science and Technology,Kuwait

ABSTRACT

This research proposes that concomitant improvement of Information Systems (IS) service quality may help an organization realize increased utilization of its systems, engage employees in its mission, and make them more customer-oriented, thereby improving business performance. This research found that higher levels of IS service quality led to greater employee satisfaction with the IS staff, which in turn increased their intention to use IS services. The results of this paper suggest that when IS staff are properly prepared, the organization performs well even in a highly competitive service-oriented economy. Several implications for research and practice are discussed based on these results.

INTRODUCTION

Kuwait has partnered with large global information technology companies to expand its use of information and communication technologies (ICT) (Al-Eisa and Alhemoud, 2009). Kuwait enjoys a high level of PC and Internet penetration and is ranked highly amongst Arab countries in term of its overall usage of ICT (Rouihbah, 2008). Kuwait's businesses are focused around customer-oriented products and services, with research and development activities being minimal. Given these characteristics, it is helpful to examine how Kuwaiti enterprises utilize their IS departments to seek a competitive advantage in their markets.

IS Service Quality

IS service quality is an important indicator of the effectiveness of an organization's IS department (DeLone and McLean, 2003), and therefore is often used as a proxy for IS success (Carr, 2002). However, unlike manufactured products whose quality can be measured and controlled, service quality depends on the delivery of the needed service and the performance of the service provider (Glushko and Tabas, 2009).

Researchers have verified that five dimensions underlie IS service quality including user perceptions of the IS department's responsiveness, assurance, reliability, empathy and tangibles (Carr, 2002). Responsiveness refers to the willingness of the IS department's employees to help users and provide prompt service. Assurance refers to the knowledge and courtesy demonstrated by the IS department's employees and their ability to inspire trust and confidence. Reliability refers to the IS department's ability to perform the promised tasks dependably and accurately. Empathy refers to the caring and individualized attention provided to end users by the IS department, and finally, tangibles refers to the appearance of physical facilities, equipment, and personnel of the IS department (Parasuraman *et al.*, 1985; Jiang *et al.*, 2000). The current study utilizes user perceptions of these five dimensions to measure IS service quality in Kuwaiti organizations.

Based on the conception of service quality as a comparison of the service experienced by the customer versus the service expected by the customer (Grönroos, 1984), an influential stream of prior research (Parasuraman *et al.*, 1985; Pitt, Watson, and Kavan, 1995, 1997; Pitt, Berthon, and Lane, 1998) has measured the expected level of service separate from the experienced level of service, and calculated the gap or discrepancy between these measures to represent service quality. Such a model is however considered to be better suited for a "more goods and less service" environment (Mehta *et al.*, 2000). Other researchers have cited conceptual and empirical problems with the gap or discrepancy approach and suggested utilizing only the experienced level of service to measure service quality (Van Dyke *et al.*, 1997; Cronin and Taylor, 1992). The current research, similar to other recent research (Benlian, 2013) endorses the latter view and measures the user's experienced level of service.

Customer-Orientation

Managers of successful public and private organizations in countries around the world endeavor to create organizations that are responsive and close to customers by constantly seeking to

understand and respond to customer needs (Slater and Narver, 1999; Papaioannou *et al.*, 2013). Such organizations prioritize the interests of customers, generate and use customer information, and create systems to act on such information (Day, 1994; 2004). Being customer-oriented positively impacts employee performance, work attitudes, and motivation because it is consistent with employees' affective and normative values of public service (Paarlberg, 2007). Through customer interactions, employees learn about the desires and preferences of customers as well as their own service performance. This feedback can be both rewarding and informative (Rafaeli, 1989).

Information systems enable employees to become more customer-oriented by providing decision aids that empower them to customize service delivery and respond promptly in unpredictable service situations (Mohammed and Ahmed, 1998), identifying high value customers, providing sales insights from customer profiles, enabling personal relationships from details of past interactions, and improving communication (Kassim *et al.*, 2012). This customer-orientation can create competitive advantage and impact the organization's market performance (Day, 2004; Narver and Slater, 1990; Hammami and Triki, 2011).

Most organizations rely on their IS staff to support their technology infrastructure. The quality of service provided by the IS staff in terms of reliability, assurance, timeliness, empathy, and tangibles can help cultivate the trust of end-users, thus increasing the impact of these systems (Nakata, et. al., 2008; Petter *et al.*, 2013; Turel, *et. al.*, 2008). However, there are relatively few empirical studies that have tested these propositions in the context of an environment that is highly service-oriented. Also, research results have not been consistent, showing that customer-orientation has positive, neutral, and sometimes negative relationships with profitability, sales growth, customer retention, and other indicators of business performance (Appiah-Adu and Singh,1998; Balakrishnan, 1996; Zhu and Nakata, 2007).

Thus this research seeks to answer the research question "Does IS service quality influence an organization's customer-orientation and thereby market performance in a service-oriented economy such as Kuwait?" The following sections describe the theoretical background, research model, methodology, and results. The paper concludes with implications for researchers and practitioners.

THEORETICAL FRAMEWORK

IS management failure in organizations can lead to runaway projects, misaligned business solutions, and missed market opportunities (Zhu and Nakata, 2007). Information systems are also an enabler of employee empowerment in organizations, allowing firms to differentiate their services (Ellinger *et al.*, 2007) through faster customer response, customized service delivery, and streamlined complaint resolution (Mohammed and Ahmed, 1998; Hammami and Triki, 2011). Such differentiation builds superior customer-relating capability, thereby building a willingness amongst them to satisfy customers (Hammami and Triki, 2011).

◼ Hypotheses

Employees of Kuwaiti organizations who perceive greater levels of service quality from their IS department in terms of responsiveness, assurance, reliability, empathy and tangibles will also be more satisfied with the IS staff who provide the services (DeLone and McLean, 2003). Moreover, Kuwait's society values personalization of relationships, politeness in communication, and group loyalty (Rouibah and Hamdy, 2009) all of which would lead to higher levels of user satisfaction. Thus we hypothesize:

> *H1. The greater the perception of IS service quality, the greater will be the employee satisfaction with the IS staff.*

Kuwaiti employees who have confidence that they will get the assistance they need in using IS on their jobs from the IS department's staff will not hesitate to seek their help, and therefore will be more likely to use available information systems, make fewer errors, and be willing to share their positive and negative experiences with the IS staff to enable future improvements of the systems. This relationship is derived from DeLone and McLean's (2003) IS success model wherein user satisfaction predicts usage intention. Intention to use the IS department's services can be considered a reliable proxy for actual usage because prior research has confirmed that a strong relationship exists between intention and usage (Jackson *et al.*, 1997). In a survey of 291 employees of Kuwaiti public organizations, Almutairi (2007) identified that the support provided by the IS technical staff enabled these employees to utilize IS in a wider variety of work tasks such as record keeping, planning, budgeting, finding solutions, and communication among others. Such support also increased their frequency or volume of IS usage. Thus we hypothesize:

> *H2. The greater the employee satisfaction with the IS staff, the greater will be their intention to use the IS department's services.*

Information systems can empower employees to respond faster to customers, tailor services to customer needs, and satisfactorily resolve complaints (Mohammed and Ahmed, 1998; Hammami

and Triki, 2011). Because technology and IS provide the foundation for many services, IS personnel are key members of service design teams which enable the organization to maximize the value of customer encounters (Glushko and Tabas, 2009). Technologies such as customer relationship management (CRM) software can help provide a comprehensive and coherent picture of customers, reduce service costs, speedup deal closings, and improve targeted marketing (Day, 2004). Intention to use the IS department's services can be considered a reliable proxy for actual usage because prior research has confirmed the link between intention and usage (Jackson *et al.*, 1997). Access to relevant information can help employees better understand the perceptions of customers as well as empathize with them (Julien and Tsoni, 2013). Even those employees who do not directly interact with customers will likely be more customer-oriented when provided information about successful customer experiences, data on customer satisfaction, and the organization's intent to maintain high levels of customer satisfaction. They will be more willing to work diligently to help the organization attract and retain customers, and take pride in doing so (Hammami and Triki, 2011). Thus:

> H3. *The greater the intention of employees to use IS services, the greater will be their customer-orientation.*

Organizations that meet and even exceed their customers' expectations can be expected to reap the rewards of customer loyalty, endorsements, new product success, and higher sales (Day; 2004; Zhu and Nakata, 2007). These rewards correspond with the "net benefits" dependent variable in DeLone and McLean's (2003) IS success model. Thus we hypothesize:

> H4. *The greater the customer-orientation of its employees, the greater will be the organization's market performance.*

Figure 1 shows the research model. Its thesis echoes Barney, Wright, and Ketchen's (2001) view that information systems by themselves do not improve market performance or create competitive advantage unless driven by knowledgeable IS staff who can understand and leverage the systems' benefits.
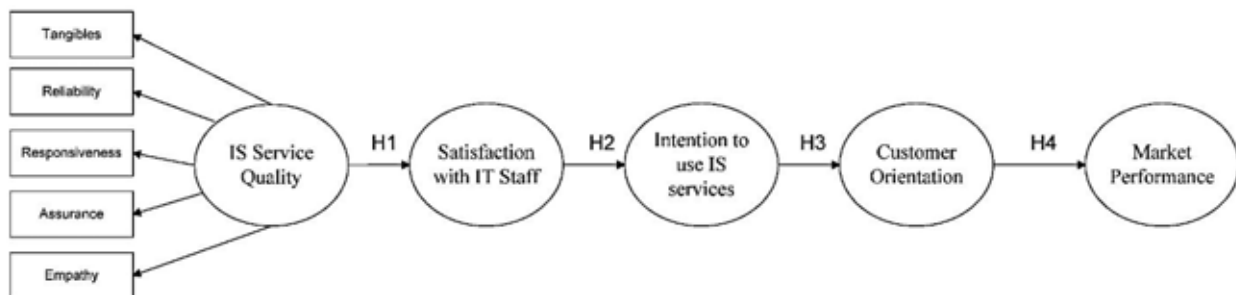
Figure 1. The Research Model

METHODOLOGY

Instrument

The current study utilized a field survey of employees of Kuwaiti organizations operating in various industries. The survey contained demographic questions as well as 5 point Likert scale items to measure the nine primary constructs of the study i.e., tangibles, reliability, responsiveness, assurance, empathy, IS staff satisfaction, intention to use IS services, customer orientation, and market performance. Measures of the first seven constructs were obtained from Carr (2002; 2007) and of the last two from Zhu and Nakata (2007). Surveys were distributed to students enrolled in the business school of a premier Kuwaiti university. A total of 300 surveys were distributed of which 136 complete surveys were returned and used for the data analysis. Thus the effective response rate was 45.3%.

Pilot Test

The instrument was pilot tested with 12 respondents from two U.S. companies based in the service-oriented hospitality management and healthcare industries. The pilot tests resulted in minor revisions to the instrument and the directions to respondents. Since English is the language of instruction at the university in Kuwait, translation of the instrument was not necessary.

Demographics

The respondents had worked in their organizations for an average of 4.6 years. The average number of employees in these organizations was 4,990, with the average number of IT staff being 55. Overall in the sample, there were 27 companies from the manufacturing sector (primarily in oil

refining and petrochemicals) and 109 from the service sector. Distribution was fairly representative of the largest service industries in Kuwait as seen in Table 1 below.

Table 1. Kuwait's Gross Domestic Product by Economic Activity in 2012

Economic Sector	Percentage of GDP
Oil a Oil and Gas	64%6
Services	
Public administration and defense	7%
Financial services	6%
Transportation	5%
Education	3%
Trade and hospitality	3%
Real estate and business services	3%
Other services	4%
Industry	
Manufacturing	4%
Construction	2%
Utilities	1%

■ Common Method Variance

Common method variance (CMV) refers to the likelihood of subjects providing socially desirable answers rather than objective ones. It is of concern to researchers who correlate responses for both independent and dependent variables from the same subject in self-report methodology (Campbell and Fiske, 1959). The current study followed an approach recommended by Podsakoff *et al.* (2003), and illustrated by Saraf *et al.* (2007) and others to test for the presence of common method variance. A method factor was added to the measurement model with paths leading to all the indicators in the model. The presence of this method factor led to a decrease in model chi-square of 34.78 although this was not significant. This result however indicated that CMV was a potential concern in our model and thus we retained the method factor in the subsequent structural equation model.

■ Data Analysis

The data analysis technique used in this study was the structural equation modeling (SEM) using AMOS 21. SEM is a powerful and comprehensive statistical approach for testing relations among observed and latent variables (Hoyle, 1995). The technique is useful in simultaneously assessing the overall fit of a hypothesized model and testing individual hypotheses. It also incorporates means of controlling measurement error (Byrne, 1998; Hoyle, 1995). The equations are summarized below:

$$SAT = aISQ + D1$$
$$INT = bSAT + D2$$
$$CO = cINT + D3$$
$$MP = dCO + D4$$

Where:
ISQ: IS Service Quality
SAT: Satisfaction with IS staff
INT: Intention to use IS services
CO: Customer orientation
MP: Market performance, and
D1 – D4: Disturbances

■ Measurement Model

To assess the reliability and validity of the research constructs, a two-step approach consisting of measurement model analysis (i.e., confirmatory factor analysis (CFA)) followed by structural equation modeling (SEM) was conducted as recommended by Anderson and Gerbing (1988). Several indices were used to assess the overall fit of the measurement model including the ratio of the $\chi2$ to the degrees of freedom, which should be below 3 to indicate a good fit for the hypothesized model (Jöreskog, 1978), the comparative fit index (CFI), and the non-normed fit index (NNFI). The latter two indices indicate improvements in the fit of the hypothesized model over the null model in which all observed variables are specified as uncorrelated (Bentler, 1990). Values above 0.90 indicate better fit. Another fit index reported in the current study is the root mean square error of approximation (RMSEA), which measures the average differences between the

elements in the sample and the hypothesized covariance matrices (Browne and Cudeck, 1993). Values below 0.05 indicate good fit, though values as high as 0.08 represent reasonable errors of approximation in the population (Byrne, 1998). For the current study, the measurement model fit was good with $\chi2/df = 1.80$, RMSEA = 0.078, NNFI = 0.90, and CFI = 0.92.

▌ Reliability and Validity

For every construct, both measures of reliability were above the recommended minimum of 0.70 (Nunnally, 1978). Table 2 summarizes the results for reliabilities and discriminant validities for the study's constructs.

Table 2. Reliability and Discriminant Validity

	CR(alpha)	AVE[1]	MP	INT	ISS	CO	ISQ
Market Performance (MP)	.88 (.89)	.72	**.85**				
Intent to use IS services (INT)	.91 (.93)	.73	.50***	**.85**			
IS Staff Satisfaction (ISS)	.94 (.95)	.80	.46***	.80***	**.90**		
Customer Orientation (CO)	.89 (.92)	.61	.70***	.62***	.52***	**.78**	
IS Service Quality (ISQ)	1.00 (1.0)	1.00	.46***	.84***	.86***	.66***	**1.00**

Square-root of the AVE is shown in bold on the diagonal. Construct correlations are in the off-diagonal.

Discriminant Validity was assessed using the variance-extracted test. In the test, for each latent construct, the square root of the variance extracted for that construct should exceed its correlation with any other construct (Fornell and Larcker, 1981). As seen in Table 2, this condition was satisfied for all the constructs.

Convergent Validity was assessed using the t-statistics for the path coefficients from the latent constructs to their corresponding items. Convergent validity is supported when factor loadings for the indicators measuring the same construct are all statistically significant. As seen in Table 3, all t-values for item loadings were significant (except for four items as indicated in the Table), thereby demonstrating that the items were effectively measuring their constructs (Anderson and Gerbing, 1988). The t-values of the construct items ranged from 6.32 to 19.05.

Table 3. Items and their Construct Loadings

Construct (Source of items)	Loading
Tangibles (Carr, 2007)	
The IS department has up-to-date equipment[1]	na
The physical facilities of the IS department are visually appealing	.62***
Service providers in the IS department are neat appearing	.60***
Materials associated with the IS service are visually appealing	.63***
The IS department has operating hours convenient to all users	.66***
Reliability (Carr, 2007)	
When the IS department promises to do something by a certain time, it does so	.69***
When you have a problem, the IS department shows a sincere interest in solving it	.66***
The IS department performs the service right the first time	.73***
The IS department provides their services at the time they promise to do so	.72***
Employees in the IS department tell IS users exactly when services will be performed[1]	na
Responsiveness (Carr, 2007)	
Employees in the IS department give prompt service to IS users	.79***
Employees in the IS department are always willing to help IS users	.75***
Employees in the IS department are never too busy to respond to IS users' requests[1]	na
Assurance (Carr, 2007)	
The behavior of employees in the IS department instills confidence in IS users	.86***
IS users feel safe in their transactions with the IS department	.78***
Employees in the IS department are consistently courteous with IS users	.82***
Employees in the IS department have the knowledge to answer IS users' questions	.76***
Empathy (Carr, 2007)	
The IS department gives IS users individual attention	.76***
The IS department has employees who give IS users personal attention	.68***
The employees of the IS department understand the specific needs of IS users	.79***
The IS department has IS users' best interests at heart	.82***
Intention to Use IS Services (Carr, 2007)	
In the future, I would definitely ask IT staff for technical help	.74***

| Construct (Source of items)	Loading
The next time I need IT assistance I would ask IT staff for it	.84***
I would ask IT staff if I need help with IT in the future	.86***
I would definitely ask for technical solutions from IT staff	.89***
IS Staff Satisfaction (Carr, 2007)	
Overall, I am satisfied with my interactions with IT staff	.86***
My encounters with IT staff have satisfied me	.88***
I am satisfied with assistance I have received from IT staff	.92***
The level of support I receive from IT staff is satisfactory to me	.90***
Customer Orientation (Zhu and Nakata, 2007)	
My organization's business objectives are driven primarily by customer satisfaction	.65***
My organization's strategy for competitive advantage is based on customers' needs	.73***
My organization has routine or regular measures of customer satisfaction	.84***
My organization is more customer focused than its competitors	.87***
Data on customer satisfaction is disseminated on a regular basis within my organization	.87***
We freely communicate information about successful customer experiences across units	.81***
Market Performance (Zhu and Nakata, 2007)	
How does your company's product or service quality compare with major competitors?	.82***
How does your company's new product or service success compare with major competitors?	.91***
How does your company's sales level compare with major competitors?	.82***
How does your company's customer retention rate compare with major competitors?[1]	na

Item dropped during validation   ***p < .001

▌ Second Order IS Service Quality Construct

IS service quality is often treated as a second order factor (Kettinger and Lee, 1994) reflecting the five first order factors of tangibles, reliability, responsiveness, assurance and empathy. In the current research, reflective paths were modeled from the theoretical second order construct to the measured first order constructs in the structural equation model.

▌ *Structural Model*

Paths were added to the measurement model to represent the hypothesized relationships. The fit of the structural model was good with $\chi2/df = 1.88$, RMSEA = 0.08, NNFI = 0.90, and CFI = 0.91. Significant paths were found from IS service quality (second order) to IS staff satisfaction (β=.88, t=7.62, p < .001); from IS staff satisfaction to intention to use IS department services (β=.90, t=11.93, p < .001); from intention to customer orientation (β=.61, t=5.84, p < .001), and from customer orientation to market performance (β=.70, t=6.33, p < .001). Thus all four hypotheses (H1 – H4) were supported. The structural model including the path coefficients and variance explained for each of the endogenous constructs is shown in Figure 2.
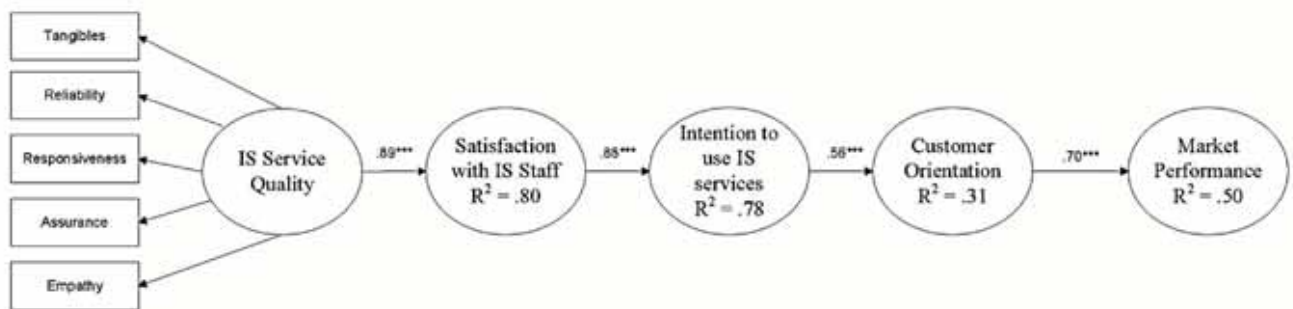
***p < .001   **Figue 2**. The Structural Model

DISCUSSION

The current study found that higher levels of IS service quality led to greater employee satisfaction with the IS staff, which in turn increased their intention to use IS services. The results suggest that in addition to the traditional tasks of designing, constructing, and maintaining information systems, when the IS staff are professional, courteous, knowledgeable, helpful, prompt in service delivery, reliable, empathetic, and train, support, and share knowledge with users about how IS can improve their decision-making and customer responsiveness, the organization performs well even in a highly competitive service-oriented economy such as Kuwait (Salih, *et al.*, 1990; Shaw, *et al.*, 2002; Ray, *et al.*, 2005). Evidently such service quality affects the ability of the organization and its employees to deliver customer value. Thus while large investments in information systems may not lead to improved business performance (Nakata, Zhu and Kraimer, 2008), concomitant improvement

of IS service quality may help an organization realize increased utilization of its systems, engage employees in its mission, and make them more customer-oriented, thereby impacting business performance. The current research provides empirical evidence in support of this thesis.

IMPLICATIONS FOR RESEARCH

This research hypothesized a model wherein higher levels of IS service quality in an organization lead to greater employee satisfaction with the IS staff (H1) and thereby greater intention to use the IS department's services (H2). Greater usage of IS services increases user customer orientation (H3) and this in turn impacts the organization's market performance (H4). The results confirmed all four hypotheses suggesting that IS service quality is indeed a complementary asset to an organization's information systems and can help an organization gain competitive advantage, even in the face of high service competition in a service-oriented economy.

Kuwait was chosen as the site for this study because of its highly service-oriented economy (Salih, *et al.*, 1990). However, we recommend that the model be tested in other countries as well as in industry sectors that are more production-oriented than service-oriented.

The current study measured service quality as being the experienced level of service (Benlian, 2013; Cronin and Taylor, 1992; Van Dyke *et al.*, 1997) but an alternative stream of research suggests that service quality be measured by comparing the service experienced by the customer versus the service expected by the customer (Grönroos, 1984). Thus future research could test the model using the gap or discrepancy approach in measuring service quality.

Lastly, the current study assessed all the research constructs as perceptual variables. Future research might use more objective measures of the same.

IMPLICATIONS FOR PRACTICE

Understanding and satisfying customers results in superior business performance (Zhu and Nakata, 2007). These examples suggest that customer-orientation reaps large rewards for organizations. A goal of our study was to better understand the existence and nature of this relationship and thereby propose broad guidelines for managers.

First, when planning their information systems, organizations should concomitantly plan for delivering improved IS service quality. Managers need to pay heed to this long-term objective because far too often their focus is on short-term objectives like cost reduction, capacity utilization, and efficiency, which they might deem easier to measure (Pitt et al., 1998). Therefore, setting and measuring service quality goals, might go a long way towards improving the organization's IS service quality.

Second, IS managers should take to heart the recommendation that IS staff be trained to be professional, courteous, helpful, prompt in service delivery, reliable, empathetic, and to share knowledge with users about how IS can improve their decision-making and customer responsiveness.

Third, too often, IS departments project a perception to users that their requests for service are either infeasible, implausible, or unreasonable (Pitt et al., 1998). Perhaps being empowered to think out-of-the-box and look for unconventional solutions to give users exactly what they want, might lead to breakthrough innovations (Watson et al., 1993).

Fourth, using information systems, organizations should regularly disseminate their business objectives, competitive strategy, and customer focus to the employees. Doing so can create a shared belief and attitude within the organization that prioritizes customer retention and gives employees wide latitude in treating customers specially so as to satisfy and retain them. Creating a sense of shared values and providing employees incentives to act as customer advocates can contribute to lower turnover rates, improved service delivery, and lower costs (Day, 2004).

CONCLUSION

The current research shows how important it is for organizations to concentrate their energy towards improving IS service quality. Being "of service" literally means understanding the needs of users, and being involved in helping them, giving advice, and sharing knowledge. Chief Information Officers (CIOs) who can cultivate such a service mentality among their staff will help their organizations realize greater value from IS investments. Improved service quality can also dispel negative notions held by end users about the IS department and its services besides actively engaging them in promoting the organization's mission and values.

REFERENCES

Al-Eisa, A., and Alhemoud, A., (2009), "Using a multiple attribute approach for measuring customer satisfaction with retail banking services in Kuwait," *International Journal of Bank Marketing*, 27(4), 294-314.

Almutairi, H. (2007), "Determinants of information systems usage in public service organizations: A structural equation investigation," *International Journal of Management*, 24(3), 436-453.

Anderson, J., and Gerbing, D. (1988), "Structural equation modeling in practice: A review and recommended two-step approach," *Psychological Bulletin*, 103 (3), 411-423

Appiah-Adu, K., and Singh, S., (1998), "Customer orientation and performance: A study of SMSs," *Management Decision*, 36(6), 485-394.

Bentler, P., (1990), "Comparative fit indexes in structural models," *Psychological Bulletin*, 107, 238–246.

Balakrishnan, S., (1996) "Benefits of customer and competitive orientation in industrial markets," *Industrial Marketing Management,* 25(4), 257-269.

Barney, J., Wright, M., and Ketchen Jr., D. (2001), "The resource-based view of the firm: Ten years after 1991," *Journal of Management*, 27 (6), 625–641.

Benlian A., (2013), "Effect mechanisms of perceptual congruence between information systems professionals and users on satisfaction with service," *Journal of Management Information Systems*, 29(4), 63-96.

Browne, M. , and Cudeck, R., (1993), "Alternative ways of assessing model fit," in Bollen, K. and Long, J. (Eds.) **Testing Structural Equation Models**, 136–162. Beverly Hills, CA: Sage.

Byrne, B., (1998), *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basic applications and programs*, Lawrence Erlbaum, New Jersey.

Campbell, D., and Fiske, D., (1959), "Convergent and discriminant validation by the multitrait-multimethod matrix," *Psychological Bulletin*, 56(2), 81-105

Carr, C., (2002) "A psychometric evaluation of the expectations, perceptions, and difference-scores generated by the IS-Adapted SERVQUAL instrument", *Decision Sciences*, 33(2), 281-296.

Cronin, J. J., and Taylor, S. A. "Measuring service quality: A reexamination and extension," *Journal of Marketing*, 56(3), 1992, 55-68.

Day, G., (1994), "The capabilities of market-driven organizations," *Journal of Marketing*, 58(4), 37-52.

Day, G., (2004), "Creating a superior customer-relating capability," *MIT Sloan Management Review*, 44(3), 77-82.

DeLone, W., and McLean, E., (2003), "The DeLone and McLean model of information systems success: A   ten-year update," *Journal of Management Information Systems*, 19(4), 9-30.

Ellinger, A., Elmadag, A., and Ellinger, A., (2007), "An examination of organizations'

frontline service employee development practices,. *Human Resource Development Quarterly*, 18(3), 293–314.

Fornell, C., and Larcker, D., (1981), "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Marketing Research*, 18(1), 39-50.

Glushko, R., and Tabas, L., (2009), "Designing Service Systems by Bridging the "Front Stage" and "Back Stage"." *Information Systems and eBusiness Management*, 7(4), 407-427.

Grönroos, C., (1984), "A service quality model and its marketing implications", *European Journal of Marketing*, 18(4), pp.36-44.

Hammami, S. M., & Triki, A. (2011). Exploring the information technology contribution to service recovery performance through knowledge based resources. *VINE, 41*(3), 296-314.

Hoyle, R. (1995), "The structural equation modeling approach: Basic concepts and fundament al issues," in *Structural equation modeling: Concepts, issues, and applications*, R. H. Hoyle (editor). Thousand Oaks, CA: Sage Publications, Inc., 1-15.

Jackson, C., Chow, S., and Leitch, R., (1997), "Toward an understanding of the behavioral intention to use an information system," *Decision Sciences*, 28(2), 357-389.

Jiang, J., Klein, G., Crampton, S. (2000) "A note on SERVQUAL reliability and validity in information system service quality measurement," *Decision Sciences*, 31(3), 725-744.

Jöreskog, K., (1978), "Structural analysis of covariance and correlation matrices," *Psychometrika*, 43(4), 443-477.

Julien, A., and Tsoni, C., (2013), "Front-line employee versus customer perceptions of quality attributes," *The Quality Management Journal, 20*(2), 48-59.

Kassim, Z. A., Yusoff, I. Y. M., & Fong, N. L., (2012), "Job empowerment and customer orientation of

bank employees in Kuching, Malaysia," *Contemporary Management Research, 8*(2), 131-140.

Mehta, S., Lalwani, A., and Han, S., (2000), "Service quality in retailing: relative efficiency of alternative measurement scales for different product-service environments, *International Journal of Retail & Distribution Management*, 28(2), 62-72

Nakata, C., Zhu, Z., and Kraimer, M. L. (2008), "The complex contribution of information technology capability to business performance," *Journal of Managerial Issues, 20*(4), 485-506, 422-423.

Narver, J., and Slater, S., (1990) "The effect of a market orientation on business profitability," *Journal of Marketing*, 54, 20-35

Nunnally, J., (1978) *Psychometric theory* (2nd ed.), New York: McGraw-Hill.

Paarlberg, L. E. (2007), "The impact of customer orientation on government employee performance," *International Public Management Journal,* 10(2), 201-231.

Papaioannou, E., Assimakopoulos, C., Sarmaniotis, C, and Georgiadis, C., (2013), "Investigating Customer Satisfaction Dimensions with Service Quality of Online Auctions: An Empirical Investigation of e-Bay," *Information Systems and eBusiness Management*, 11(2), 313-30

Parasuraman, A., Zeithaml, V., and Berry, L., (1985) "A conceptual model of service quality and its implications for future research," *Journal of Marketing*, 49, 41-50.

Petter, S., DeLone, W., and McLean, E., (2013), "Information systems success: The quest for the independent variables," *Journal of Management Information Systems*, 29(4), 7-61.

Pitt, L., Watson, R., and Kavan, C., (1995), "Service quality: A measure of information systems effectiveness," *MIS Quarterly*, 19(2), 173-182.

Pitt, L., Watson, R., and Kavan, C., (1997), "Measuring information systems service quality: Concerns for a complete canvas," *MIS Quarterly*, 21(2), 209-221.

Pitt, L., Berthon, P., and Lane, N., (1998), "Gaps within the IS department: Barriers to service quality," *Journal of Information Technology,* 13(3), 191-200.

Podsakoff, P., MacKenzie, S., Lee, J.-Y., and Podsakoff, N. (2003), "Common method biases in behavioral research: A critical review of the literature and recommended remedies," *Journal of Applied Psychology*, 88(5), 879–903.

Ray, G., Muhanna, W., and Barney, J., (2005), "Information technology and the performance

of the customer service process: A resource-based analysis," *MIS Quarterly*, 29(4), 625-642.

Rafaeli, A., (1989), "When cashiers meet customers: An analysis of the role of supermarket cashiers," *Academy of Management Journal*, 32, 245–273.

Rouihbah, K., (2008), "Social usage of instant messaging by individuals outside the workplace in Kuwait: A structural equation model," *Information Technology & People*, 21(1), 34-68.

Rouibah, K., and Hamdy, H., (2009), "Factors affecting information communication technologies usage and satisfaction: Perspectives from instant messaging in Kuwait," *Journal of Global Information Management*, 17(2), 1-29.

Salih, S., Branson, W., and Ebraheem, Y., (1990), "Oil driven macroecononomic model of Kuwait," *Proceedings of the 6th Word Conference of the Econometric Society*, Barcelona, August 22-28.

Saraf, N., Langdon, C., and Gosain, S., (2007). "IS application capabilities and relational value in interfirm partnerships," *Information Systems Research*, 18(3), 320-339.

Shaw, N., DeLone, W., and Niederman, F., (2002), "Sources of dissatisfaction in end user support: An empirical study," *The DataBase for Advances in Information Systems*, 33(2), 41-56.

Slater, S. and Narver, J., (1999) "Market oriented is more than being customer-led," *Strategic Management Journal*, 20, 1165-1168.

Turel, O., Yuan, Y., and Connely, C., (2008), "In justice we trust: Predicting user acceptance of e-customer services," *Journal of Management Information Systems*, 24(4), 123-151.

Van Dyke, T., Kappelman, L., and Prybutok, V., (1997), "Measuring information systems service quality: Concerns on the use of the SERVQUAL questionnaire," *MIS Quarterly*, 21(2), 195-208.

Watson, R. T., Pitt, L. F., Cunningham, C. J., and Nel, D. (1993), "User satisfaction and service quality of the IS department: Closing the gaps," *Journal of Information Technology,* 8(4), 257-265.

Zhu, Z., and Nakata, C., (2007), "Reexamining the link between customer orientation and business performance: The role of information systems," *Journal of Marketing Theory and Practice,* 15(3), 187-203.

Heterogeneous Bank Offerings against Homogeneous Customer Reflection

Arasu Raman, INTI International University, Malaysia

ABSTRACT

While having the term "Islamic" banking, Malaysian banks operates their businesses using the rules and principles of Sharia'h. Due to the increase in housing development projects in Malaysia as a whole, the application of housing loan increases as well. As both conventional banks and Islamic banks offer housing loan products, some researchers pointed out those customers in Malaysia are satisfied with the housing loan provided by the Islamic banks while a few researchers commented that customers in Malaysia are not happy with the Islamic housing financing provided by the local banks. Therefore, this study aimed at discovering the influences of customer delight on Islamic housing loan in Malaysia. In this quantitative study, 250 questionnaires distributed to the respondents in the bank space. Out of which 220 valid feedbacks were collected hence factor analysis with reliability tests were conducted before using multiple regression for data analysis. The results pointed out that the service quality, product quality, and trusts are all delighting customers of Islamic housing loan in Malaysia in general context. The study validates the fact that customer satisfaction in general is homogeneous regardless to Islamic or conventional mode of offerings by the banks. Therefore, Malaysian banks when it comes to property financing should blend their marketing offering and keep the "Islamic" term of financing as a brand or mode as optional rather the only means.
Key words: customer delight, Islamic offerings, bank product quality, bank service quality

INTRODUCTION

Islamic banking referred as banks operates their businesses using the rules and principles of Sharia'h (Dusuki and Abdullah, 2007). Meanwhile, Crane (2014), Sharia'h is also known as Islamic Law. Any form of payment in interest is strictly not allowed which means it practices the profit sharing method. In spite of Sharia'h principles, banks also provide similar offerings as in the conventional banks such as savings and current accounts, housing loans, investments, and credit cards. Based on Haque (2010), currently there are 300 over Islamic banks and financial institutions around the world with total estimated assets of around USD 300 billion. Previously, Pollard and Samers (2007) also stated in their study that 25 per cent of the Islamic institutions are now operating in Muslim minorities countries.

Islamic banking concept nowadays is no longer about a business that strive to fulfill the needs of Muslim customers but rather a business that strive to serve both the Muslim and non-Muslim customers while attracting new customers and maintaining the old ones. Bley and Kuehn (2005), business competition is no longer about the products that a company can provides to its customers but it is more to the services and the ability to drive extra miles in satisfying customers and building customer loyalty subsequently. The strategic location enables Malaysia becoming the fastest emerging and growing economy in South East Asia. The concept of Islamic banking in Malaysia was commenced way back in 1963 when Malaysian government establishes the Pilgrims' Management and Fund Board. The first Islamic bank consequently was established in 1983 and it is stated with accordance to the Sharia'h principles. In 1992, Bank Islam which is one of the most respectable Islamic financial institutions in Malaysia was listed in the Kuala Lumpur Stock Exchange (KLSE) (Bashir, 2012). The Islamic banking according to a report by the Ministry of Finance had continued to grow up to RM469.5 billion of its total assets indicating 24.2 per cent of the banking system's assets. Malaysia now has a total of 18 Islamic banks which have annual growth of 18-20 per cent (Haque, 2010). As there were numerous incomplete studies on the influences of customer satisfaction in Islamic housing loan in Malaysia, this study possibly will advance its body knowledge.

LITERATURE REVIEW

Boosted by tax incentives and flexible payments, Malaysia's Islamic housing loan keeps improving at 3 times better than conventional housing loans (Wahito, 2011). In line with the data from the central bank, residential loans conform to Islamic principles increased typically 37 per cent before 5 years as in contrast to 11 per cent for non-Islamic financing. Furthermore, Malaysian government provides a discount on stamp duty for Islamic housing loan, means seeking to grow Sharia'h banking assets.

According to the report of Ministry of Finance Malaysia (2013), the housing market had increased as starts and sales of new houses had grown 35.6 per cent and 20.7 per cent respectively in the first quarter of 2013 as compared to 33.6 per cent and 17.1 per cent respectively in the fourth

quarter of 2012. Furthermore, building permits recorded 27.4 per cent in the first quarter of 2013 while it previously recorded at 28.9 per cent in fourth quarter of 2012. Besides, due to the high end development residential projects in Klang Valley and Johor, the residential subsector also grew by 9.8 per cent in the first quarter of 2013. This shows that housing development projects are of high demand and continue to boom in Malaysia. Due to the growing housing development, the housing loans being approved by the banks are also growing at the same trend.

According to Bank Negara Malaysia's report (2014), as of November 2013, the loans approved for housing loan had already reached up to 29.9 per cent of the total loans that approved by Bank Negara Malaysia. This percentage is higher than the previous year of 2012 where it only recorded 27.24 per cent. With the rise in housing development and demand for financing in terms of both Commercial and Islamic Banking getting intense. According to the Bank Negara Malaysia report previously, as at December 2012, Islamic Housing Financing had recorded 25.8 per cent while 74.2 per cent of the total market share is captured by Conventional Banking.

While many studies had been done in determining the stimuli of customer satisfaction with the products of Conventional banking, least had been done in determining the factors that influence the customer satisfaction with Islamic Banking products. According to Amin et al. (2013), in their research on the customer satisfaction and loyalty on Islamic Banking, they found that customers in Malaysia are satisfied, loyal, and trust the Islamic products, but also indicating that customers may tend to switch to other banks if they found that the bank is distrustful. This means there is no difference of the customer satisfaction in the products between the Conventional and Islamic banking. The research question formed in this study is whether the Malaysian customers are really satisfied with the housing loan provided by the Islamic banking or the customers in Malaysia are not satisfied with the Islamic housing financing as the product is still immature and unstable as compared to the conventional housing financing.

According to Khan and Ahmad (2013), satisfaction could be achieved by meeting the demands that influence the customers toward. Hanif (2011) commented that a high level customer satisfaction will create positive word of mouth communication that is beneficial to the company. According to the research done by Bashir (2012), the choice of customers choosing the Islamic housing loan highly depends on the services that they received from the bank. According to Yoo and Park (2007), service quality for many companies is the edge over their competitors. Shin and Kim (2008) also mentioned that the higher the service quality that the customers received, this will increase the satisfaction as well as loyalty thereafter. In addition, Tsoukatos and Rand (2006) stated that a good service quality will trigger positive customer satisfaction that will hence create positive word of mouth from the customers to their family members and friends. According to Saduman (2005) and Dusuki et al. (2007), customer choice of Islamic banks is based on the quality of service be offered to them as well as the banks financial reputation. Shin and Kim (2008) further stated that customers will be satisfied with the bank's products if they receive adequate quality from their services. Thus, the hypothesis developed for this study is: H1: Quality of Service provided by banks has positive impact on Satisfaction of Islamic Housing Loan.

On the other hand, Siddique (2006) commented that product quality in banking industry could means that the features of the products that were offered by the bank as well as the concept behind it. While some researchers argued that the product quality offered by the banks are actually the same as the service quality offered by the banks, Cohen and Mazzeo (2004) argued that there is a huge different between the two as product quality focuses more on the features of the products while service quality involves people that actually providing it. This argument is supported by Jahanshashi et al. (2011) where they found that the offer and benefits of Islamic housing loan offered by the banks will influence the customer satisfaction in applying for the loan. Thus, the hypothesis is: H2: Product Quality has positive impact on Satisfaction of Islamic Housing Loan.

In the banking industry, trust is a very important element as customers belief that the bank is reliable and able to safeguard and manage their money. High level of trust will therefore increase the customer's confidence level with the banks. This is vital for both conventional and Islamic banking as trust is the factor that keeps the relationship going with their customers. Kuusik and Varblane (2009), commented that Trust is something that the customers need to have before they step into the bank and deal transactions with them. According to Ndubisi (2007), trust is a very important element that Islamic banks would need to build in their customers so that they would take on their banking products such as Islamic housing loan and build long term relationship with the customers. Thus, the hypothesis is as follows: H3: Trust has positive impact on Satisfaction of Islamic Housing Loan.

METHODOLOGY

This research primarily aimed at examining the customers' delight on Islamic housing loan provided by the banks in the state of Negeri Sembilan in Malaysia. The secondary objective is to investigate the relationship between quality of service, product quality, and trust and customer satisfaction of Islamic housing loan in the state. The first section of the survey questionnaire consist 7

questions unfolding respondents' demographic profile. Meanwhile, the second section intended to measure respondents' opinion towards Islamic housing loan in Malaysia as well as questions using a 5-point likert scale measuring the research constructs were included in the questionnaire. The scales used are 5 (strongly agree), 4 (agree), 3 (neutral), 2 (disagree), and 1 (strongly disagree) as recommended in Arasu and Viswanathan (2011).

The study population is Malaysian respondents who secures housing loan in Islamic banks. The state of Negeri Sembilan is considered as a strategic site as it is located between Kuala Lumpur and Malacca of Malaysia. The study environment is Nilai and Seremban cities which located in the state of Negeri Sembilan. These two cities are connected to Kuala Lumpur, Kuala Lumpur International Airport, Putrajaya, and Seremban through express rail link service. Due to its strategic location and the increase in property prices in Kuala Lumpur, many Malaysians that are from other states had chosen to reside in Nilai and Seremban. Therefore, these cities are suitable place and feasible to carry out the study.

Based on Kishada and Wahab (2013), Amin, et al. (2013), Hoq and Amin (2010), Razak et.al (2008), and Arasu and Viswanathan (2010) the range of sample sizes proposed are from 150 to 660. Accordingly, a selection of 250 sample size in this study considered acceptable as it falls within the range of the sample sizes done by these researchers. Lists of banks in the study environment were selected based on a simple random sampling method while systematic sampling was employed for questionnaire distribution. Systematic sampling that conducted in the banks is measure by selecting the '3rd' person that walks out from the bank entrance.

DATA ANALYSIS

All 250 questionnaires that were distributed were collected while only 220 questionnaires were valid to be used in this study. The reason for the remaining 30 questionnaires not valid is because the questionnaires were not filled up completely. The response rate for this study is 88 per cent. The study demanded demographic characteristics include gender, age, marital status, race, religion with the type of Islamic banking services used, and the period for using the Islamic banking services.

Table 1 summarizes the demographic profile obtained in this study. Table 1 further depicts that the frequency of male captured at 116 (52.7 per cent) while the frequency of female is 104 (47.3 per cent). This shows that the response from the gender towards this study is considered to be approximately equal. In addition to that, the respondents' age of 31 to 40 years (64.5 per cent) recorded highest while the age range of 21 to 30 years recorded lowest percentage of 3.6 per cent. The age range from 41 to 50 years recorded 26.4 per cent while the range above 50 years old recorded at a percentage of 5.5 per cent. From the age demographic characteristic it can be seen that most customers are clustered in the middle age between 31 to 50 years old. While this study is focuses on respondents that had experienced or currently using any of the Islamic housing loan, it is not surprised that the age group is clustered in 31 to 50 years old as this is the group where majority of the respondents sought for end financing for their housing needs.

Table 1. Summary of demographic profile

Demographics	Classification	Frequency	Per cent
Gender	Female	104	47.3
	Male	116	52.7
Religion	Muslim	133	60.5
	Buddhist	46	20.9
	Hindu	17	7.7
	Christian	10	4.5
	Others	14	6.4
Race	Malay	133	60.5
	Chinese	51	23.2
	Indian	20	9.1
	Other	16	7.3
Marital	Married	119	54.1
	Single	94	42.7
	Divorced	7	3.2
Age	21-30	8	3.6
	31-40	142	64.5
	41-50	58	26.4
	51 and above	12	5.5

The study has met the sampling requirement as it focuses on the respondents who have had or currently having Islamic housing loans. This can be seen from Table 2 below, whereby housing loans recorded a full frequency of the total 220 respondents. This is followed by the savings product that the bank provided with a total of 189 (85.9 per cent) respondents. The investment products recorded at 41 frequencies (18.6 per cent) while other Islamic banking services recorded at 17 (7.7 per cent). Furthermore, it can be seen that the highest frequency for the period in using the Islamic Banking products is from the period of 4 to 6 years, capturing frequencies of 68 (30.9 per cent). This is followed by the period of 1 to 3 years where it captured 66 (30 per cent). The period of more than 6 years captured frequencies at 45 (20.5 per cent) while the period of less than 1 year recorded frequencies at 41 (18.6 per cent).

Table 2. Summary of Islamic Banking products used

Demographics	Classification	Frequency	Per cent
Savings	Yes	189	85.9
	No	31	14.1
Housing Loans	Yes	220	100
	No	0	0
Investments	Yes	41	18.6
	No	179	81.4
Others	Yes	17	7.7
	No	203	92.3
Period Using Islamic Products	Less than 1 year	41	18.6
	1-3 years	66	30.0
	4-6 years	68	30.9
	More than 6 years	45	20.5

Table 3 below depicts that the service quality factor which consist of nine questions is reliable and good as the factor recorded a Cronbach's alpha of 0.702. Besides, the product quality factor that consists of 4 questions is considered to be reliable and good as well whereby its Cronbach's alpha is 0.701. Where else Trust factor consists of 3 questions are also reliable as it recorded Cronbach's alpha of 0.728. Furthermore, Table 3 also shows the result of reliability testing on the dependent variable i.e., customer satisfaction which has a total of three questions and recorded a Cronbach's alpha of 0.922.

Table 3. Summary of Cronbach's alpha for all variables

Factors	Values	Nu. of items
Service Quality	0.702	9
Product Quality	0.701	4
Trust	0.728	3
Customer Satisfaction	0.922	3

The Kaiser-Meyer-Olkin (KMO) value for the independent variable, service quality is recorded at 0.668. The value of 0.668 is greater than the minimum requirement of KMO value of 0.50 thus indicating that the service quality (independent variable) can be labeled as mediocre in the factor analysis. In addition, the Bartlett test recorded a value of 0.000 which is lower than the significance level of 0.01 per cent. This shows that the result is significance thus rejecting the null hypothesis that the correlation matrix is identify.

In this case, the nine questions that indicate the service quality independent variable is understood to be valid and correlated with each other. Moreover, the entire communalities values are also above the minimum standard of 0.50 as well. The minimum standard of component matrix is 0.4 while the entire component matrix recorded in the factor analysis of service quality is more than 0.4. Besides, the total variance explained from the service quality is recorded at 62.611 per cent where it means that the nine questions can explain 62.611 per cent of the variance in one factor. According to the standards in social science study, the variance of 62.611 per cent is acceptable as it is higher than the standard of 60 per cent. The nine questions are then grouped together to form the factor of service quality.

Similar to service quality factor, it is noted that the KMO value for the independent variable, product quality is recorded at 0.576. In addition, the Bartlett test recorded a value of 0.000 which is lower than the significance level of 0.01 per cent. In this case, the four questions that indicate the product quality independent variable is said to be valid and correlated with each other. Furthermore, the overall Measures of Sampling Adequacy (MSA) is recorded at 0.576 which is close to the minimum requirement of 0.6 while the entire individual MSA are above 0.50. Moreover, the entire communalities values are also higher than the minimum standard of 0.50 as well. The minimum

standard of component matrix is 0.4 while the entire component matrixes recorded in the factor analysis of product quality are more than 0.4. Besides, the total variance explained from the product quality is recorded at 80.927 per cent where it means that the four questions can explain 80.927 per cent of the variance in one factor. As a result, all four questions are then grouped together to form the factor of product quality.

The third independent variable, trust is recorded at 0.586. The Bartlett test recorded a value of 0.000 which is lower than the significance level of 0.01 per cent. Furthermore, the overall MSA is recorded at 0.586 while the entire individual MSA are above 0.50. Moreover, the entire communalities values are above 0.50 as well. Besides, the total variance explained from trust is recorded at 65.174 per cent where it means that the three questions can explain 65.174 per cent of the variance in one factor. The three questions are then grouped together to form the factor of trust. Based on these results from the factor analysis, it is proven that all independent variables are valid and it is appropriate to further analyze the answers that were obtained from the questionnaires.

For customer satisfaction, it is noted that the KMO value for this dependent variable is recorded at 0.759. In addition, the Bartlett test recorded a value of 0.000 which is lower than the significance level of 0.01 per cent. Furthermore, the overall MSA is recorded at 0.759 while the entire individual MSA are above 0.50. Moreover, the entire communalities values are also above 0.50 as well. The minimum standard of component matrix is 0.4 while the entire component matrixes recorded in the factor analysis of customer satisfaction are more than 0.4. Besides, the total variance explained from the customer satisfaction is recorded at 86.507 per cent where it means that the three questions can explain 86.507 per cent of the variance in one factor. Based on these results it is proven that all three questions are valid and it is appropriate to further analyze the answers that were obtained from the questions. The three questions are then grouped together to form the factor of customer satisfaction.

The Table 4 below confirms there is a moderate positive relationship between quality of service quality provided by the banks and customer satisfaction as correlation value is 0.543. The R-squared value is 0.295 indicating that only 29.5 per cent of the variation in Customer Satisfaction can be explained by Service Quality which means the fit of the regression is weak. The adjusted R-Squared value is 29.2 per cent while Durbin Watson value is considered acceptable as it recorded at 1.909 which is close to 2. It is noted that the F value is recoded at 91.340 while the P value of the test is 0.000 thus indicating that the result is significant at 1 per cent. The results show that quality of service is a significant variable that have an impact on the Customer Satisfaction.

Table 4. Correlation of Service Quality with Customer Satisfaction

		Customer Satisfaction	Service Quality
Customer Satisfaction	Pearson Correlation	1	.543**
	Sig. (2-tailed)		.000
	N	220	220
Service Quality	Pearson Correlation	.543**	1
	Sig. (2-tailed)	.000	
	N	220	220

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

With reference to Table 5, the P value of Service Quality is 0.000 which is less than the significance level of 0.01 thus indicating that the variable is significant at 1 per cent level. Besides, the t-value is 9.557 which also suggest that the variable is a significant predictor. Based on above, the equation of the regression can be derived as:

Customer Satisfaction = 2.121 + 0.479 Service Quality

The equation means for every unit increase in quality service received, Customer Satisfaction will increase by 0.479 units. Besides, the 95 per cent confidence interval (CI) for Service Quality is (0.381, 0.578) where the value of zero did not falls within the intervals, indicating that Service Quality is significant predictors. Furthermore, the VIF value of 1.000 indicating that there is no problem of multi collinearity. Based on the results, it can be suggested that Hypotheses 1, is accepted.

Table 5. Coefficient of Service Quality on Customer Satisfaction

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	2.121	.179		11.818	.000	1.767	2.474		
1 Service Quality	.479	.050	.543	9.557	.000	.381	.578	1.000	1.000

a. Dependent Variable: Customer Satisfaction

From the Table 6, it is noted that the value of 0.505 indicates a moderate positive relationship between the product quality and customer satisfaction. The R value is 0.505 suggesting that there is an association between the independent and dependent variable. Besides, R-squared value is 0.255 indicating that 25.5 per cent of the variation in Customer Satisfaction can be explained by Product Quality. However, the R-squared value of 25.5 per cent indicates that the fit of the regression is weak. The adjusted R-Squared value is 25.1 per cent while Durbin Watson value is considered acceptable as it recorded at 2.113 which are more than 2.

Table 6. Correlation of Product Quality with Customer Satisfaction

		Customer Satisfaction	Product Quality
Customer Satisfaction	Pearson Correlation	1	.505[**]
	Sig. (2-tailed)		.000
	N	220	220
Product Quality	Pearson Correlation	.505[**]	1
	Sig. (2-tailed)	.000	
	N	220	220

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

It is noted that the F value is 74.500 while the P value of the test is 0.000 thus indicating that the result is significant at 1 per cent. It can be concluded that Product Quality is a significant variable that have a direct effect on the Customer Satisfaction. Table 7, depicts the P value of Product Quality is 0.000 which is less than the significance level of 0.01 thus indicating the variable is significant at 1 per cent level. Besides, the t-value recorded at 8.631 which suggest that the variable is a significant predictor. Hence, the equation of the regression can be derived as:

Customer Satisfaction = 2.153 + 0.451 Product Quality

For every unit increase in Product Quality, Customer Satisfaction will increase by 0.451 units. Besides, the 95 per cent CI for Product Quality is (0.348, 0.553) where the value of zero did not falls within the intervals, indicating that Product Quality is a significant predictor. Furthermore, the VIF value of 1.000 indicating that there is no problem of multi collinearity. Based on the results, it is confirmed that Hypotheses 2 is also accepted.

Table 7. Coefficient of Product Quality on Customer Satisfaction

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	2.153	.194		11.081	.000	1.770	2.536		
Product Quality	.451	.052	.505	8.631	.000	.348	.553	1.000	1.000

a. Dependent Variable: Customer Satisfaction

Table 8 confirms that there is a positive relationship between trust and customer satisfaction as the correlation value is 0.486. The R value is 0.486 suggesting an association of the independent variable with the dependent variable. The R-squared value is 0.236 indicating that 23.6 per cent of the variation in Customer Satisfaction can be explained by Trust. This indicates the fit of the regression is weak. The adjusted R-Squared value is 23.2 per cent while Durbin Watson value is considered acceptable as it recorded at 1.990 which is close to 2. The F value is recoded at 67.248 while the P value of the test is 0.000 thus indicating that the result is significant at 1 per cent. From the result above, it clearly shows that Trust is a significant variable that have an impact on the Customer Satisfaction.

Table 8. Correlation of Trust with Customer Satisfaction

		Customer Satisfaction	Trust
Customer Satisfaction	Pearson Correlation	1	.486[**]
	Sig. (2-tailed)		.000
	N	220	220
Trust	Pearson Correlation	.486[**]	1
	Sig. (2-tailed)	.000	
	N	220	220

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

With the reference from the Table 9, it can be seen that the P value of Trust is 0.000 which is less than the significance level of 0.01 thus indicating that the variable is significant at 1 per cent level. Besides, the t-value also recorded at 8.201 which suggesting the variable is a significant predictor. Based on table results, the equation of the regression can be derived as:

Customer Satisfaction = 2.119 + 0.468 Trust

Table 9. Coefficient of Trust on Customer Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.119	.208		10.177	.000	1.709	2.529		
	Trust	.468	.057	.486	8.201	.000	.355	.580	1.000	1.000

a. Dependent Variable: Customer Satisfaction

The equation suggests that for every unit increase in Trust, Customer Satisfaction will increase by 0.468 units. Besides, the 95 per cent confidence interval for Trust is (0.355, 0.580) where the value of zero did not falls within the intervals, indicating that Trust too is significant predictor. Furthermore, the VIF value of 1.000 is below 5, thus indicating that there is no problem of multi collinearity. Based on the results, it can be suggested that Hypotheses 3 too is accepted.

Based on the Table 10, the R value is 0.600 suggesting that there is an association of the independent variables and the dependent variable. Besides, it can be seen that the R-squared value is recorded at 0.360 indicating that 36.0 per cent of the variation in Customer Satisfaction can be explained by Service Quality, Product Quality, and, Trust. The R-squared value of 36.0 per cent indicates that the fit of the regression is moderate. The adjusted R-Squared value is 35.1 per cent while Durbin Watson value is considered acceptable as it is recorded at 1.934 which is close to 2.

Table 10. Model Summary of Service Quality, Product Quality, and Trust on Customer Satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.600[a]	0.360	0.351	0.58723	1.934

a. Predictors: (Constant), Trust, Product Quality, Service Quality
b. Dependent Variable: Customer Satisfaction

Based on the Table 11 below, it is noted that these independent variables can be used to model the Customer Satisfaction. Therefore, it is proven that the overall regression is significant.

Table 11. Anova test of Service Quality, Product Quality, and Trust on Customer Satisfaction

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.867	3	13.956	40.470	.000[b]
	Residual	74.486	216	.345		
	Total	116.353	219			

a. Dependent Variable: Customer Satisfaction
b. Predictors: (Constant), Trust, Product Quality, Service Quality

Table 12 shows the result of multiple regression of Service Quality, Product Quality, and Trust on Customers Satisfaction. It can be seen that the p value of all the independent variables are less than the significance level of 0.05 thus indicating that the variables are significant at 5 per cent level. Besides, the t-value for all the independent variables is within the range of 2.978 to 3.297 suggesting that these variables are significant predictors. Based on Table 12, the equation of the multiple regression can be derived as:

SC = 1.521 + 0.235 QS + 0.197 QP + 0.206 T

Where, SC = Customer Satisfaction, QS = Service Quality, QP = Product Quality, T = Trust

Table 12. Coefficient of Service Quality, Product Quality, and Trust on Customer Satisfaction

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.521	.215		7.073	.000	1.097	1.945		
	Product_Quality	.197	.066	.220	2.978	.003	.067	.327	.541	1.848
	Service_Quality	.235	.071	.266	3.297	.001	.095	.375	.454	2.202
	Trust	.206	.067	.214	3.082	.002	.074	.338	.615	1.625

a. Dependent Variable: Customer_Satisfaction

The multiple regression equation suggests that for every unit increase in Service Quality, Customer Satisfaction will increase by 0.235 units provided the Product Quality and Trust remains unchanged. Similarly, for every unit increase in Product Quality, Customer Satisfaction will increase by 0.197 holding other variables constant. In addition, Customer Satisfaction will increase 0.206 for every unit increase in Trust ceteris paribus. Overall, from the correlation and multiple regression analysis, it is clearly shown that Quality of Service has a greater influence on the customer satisfaction as compared to other variables. This is due to the reason that in today's world, services are unavoidable contributor that will differentiate the competitive advantage among banks. Customers may not re-visit a bank because of their products but they will definitely re- visit a bank if they found that the services provided in the bank is excellent (Saduman, 2005).

CONCLUSION

This study is proven that Service Quality, Product Quality, and Trust are important factors that will influence the customer satisfaction of Islamic housing loan in the chosen study environment. These are in line with the results done by previous researchers such as Shin and Kim (2008), Jahanshashi et al. (2011), and Ndubisi (2007). This study will indeed provide valuable information to the extended research work on this Sharia'h. The study further improves our understanding on customer satisfaction which in general influenced by quality of service experienced by customers, superiority of bank offerings, and as a result of these two, the level of trusts is being raised with the bank. Customer satisfaction on bank offerings as a result is homogeneous regardless to Islamic or non-Islamic practices. Therefore, banks when comes to housing property financing should blend their marketing offering and keep the marketing efforts opened rather promoting "Islamic financing" as a brand or mode as the only means. Besides, this research also calls for enhancement to customer service provided by the Islamic banks as they would know what the key area they needed to focus in increases the customer satisfaction on Islamic housing loan.

REFERENCES

Amin, M., Isa, Z., and Fontaine, R. (2013). "Islamic banks Contrasting the drivers of customer satisfaction on image, trust, and loyalty of Muslim and non-Muslim customers in Malaysia," International Journal of Bank Marketing. 31(2), pp. 79-97, [Online]. Retrieved from www. emeraldinsight.com/0265-2323.htm >

Arasu, R., and Viswanathan, A., (2010). "Web as new advertising media among the net generation: A study on university students in Malaysia," Journal of Business and Policy Research 5(1), pp. 79-86.

Arasu, R., and Viswanathan, A., (2011). "Web services and e-shopping decisions: A study on malaysian e-consumer," International Journal of Computer Applications: Wireless Information Networks & Business Information System 2, pp. 54-60.

Bank Negara Malaysia., (2014). Bank Negara Report 2012, [Online]. Retrieved from http://www. bnm.gov.my/

Bashir, M. S., (2012). "Analysis of Customer Satisfaction with the Islamic Banking Sector: Case of Brunei Darussalam," Asian Journal of Business and Management Sciences, 2(10). Retrieved from <http://www.ajbms.org/articlepdf/3ajbms20132102740.pdf >

Bley, J., and Kuehn, K., (2005). "Conventional Versus Islamic Finance: Student Knowledge and Perception in the United Arab Emirates," International Journal of Islamic Financial Services, 5(4), pp. 1-13.

Cohen, A., and Mazzeo, M. J., (2004). "Competition, Product Differentiation and Quality Provision: An Empirical Equilibrium Analysis of Bank Branching Decisions," Retrieved from http://www. federalreserve.gov/pubs/feds/2004/200446/200446pap.pdf

Crane, R. D., (2014). "Muslim Americans and Shariah," Retrieved from http://www.islamicity.com/ politics/shariah.htm

Dusuki, A. W., and Abdullah, N. I., (2007). "Why do Malaysian Customers Patronise Islamic Banks?". International Journal of Bank Marketing, 25(3), pp. 142-160.

Hanif, M., (2011). "Differences and Similarities in Islamic and Conventional Banking," International Journal of Business and Social Science, 2(2). Retrieved from http://www.ijbssnet.com/journals/ Vol._2_No._2per cent3B_February_2011/20.pdf

Haque, A., (2010). "Islamic Banking in Malaysia: A Study of Attitudinal Differences of Malaysian Customers," European Journal of Economics, Finance and Administrative Sciences, 18, Retrieved from http://irep.iium.edu.my/3867/1/ejefas_18_01_(Islamic_Bank).pdf

Hoq, M.Z. and Amin, M., (2010). "The role of customer satisfaction to enhance customer loyalty," African Journal of Business Management, 4(12), pp. 2385-2392

Jahanshashi, A. A., Gashti, M. A. H., Mirdamadi, S. A., Nawaser, K., and Khaksar, S. M. S., (2011). "Study the Effects of Customer Service and Product Quality on Customer Satisfaction and Loyalty," International Journal of Humanities and Social Science, 1 Retrieved from http://www.ijhssnet.com/journals/Vol._1_No._7_[Special_Issue_June_2011]/33.pdf

Khan, M., and Ahmad, S., (2013). "Customer Satisfaction Level of Islamic Bank and Conventional Bank in Pakistan," Journal of Business and Management, 11(1), pp. 31-40. Retrieved from http://www.academia.edu/4858153/Customer_Satisfaction_Level_of_Islamic_Bank_and_Conventional_Bank_in_Pakistan

Kishada, Z. M. E., and Wahab, N. A., (2013). "Factors Affecting Customer Loyalty in Islamic Banking: Evidence from Malaysian Banks," International Journal of Business and Social Science 4(7). Retrieved from http://ijbssnet.com/journals/Vol_4_No_7_July_2013/29.pdf

Kuusik, A, and Varblane, U., (2009). "How to avoid customers leaving: the case of the Estonian telecommunication industry," Baltic Journal of Management, 4(1), pp. 66-79.

Ministry of Finance., (2013). "First Quarter 2013 report," Retrieved from http://www.treasury.gov.my/

Ndubisi, N.O., (2007). "Relationship marketing and customer satisfaction," Marketing Intelligence & Planning, 25(1): pp. 98-106.

Pollard, J., and Samers, M., (2007). "Islamic Banking and Finance: Postcolonial Political Economy and the decentring of Economic Geography," Trans Inst Br Geogr NS, 32, pp. 313-330.

Razak, D. A., and Mohammed, M. O., (2008). "Consumers' Acceptance on Islamic Home Financing: Empirical Evidence on Bai Bithaman Ajil (BBA) in Malaysia," Retrieved from http://www.kantakji.com/media/9504/file713.pdf

Saduman, H. O. (2005). "Interest free banking in Turkey: A study of customer satisfaction and bank selection criteria," Journal of Economic Cooperation, 26(4), pp. 51-86.

Shin, D.-H., and Kim, W.-Y., (2008). "Forecasting customer switching intention in mobile service: An exploratory study of predictive factors in mobile number portability," Technological Forecasting & Social Change, 75(6), pp. 854–874.

Siddique, A. S., (2006). "A Relational Study on Banks Overall Service Quality, Overall Product Quality, Corporate Social Performance, and Bank Reputation in Context of Private Commercial Banks in Bangladesh," Retrieved from http://www.sb.iub.edu.bd/internship/spring2006/0120086.pdf

Tsoukatos, E., and Rand, G.K., (2006). "Path analysis of perceived service quality, satisfaction and loyalty in Greek insurance," Managing Service Quality, 16(5).

Wahito, N. M., (2011). "Product Differentiation and performance of commercial banks: A case study of DFCU bank," Retrieved from http://cees.mak.ac.ug/sites/default/files/ publications/NDUGU MARYANNE_WAHIT.pdf

Yoo, D. K., and Park, J. A., (2007). "Perceived service quality: Analyzing relationships among employees, customers, and financial performance," International Journal of Quality & Reliability Management, 24(9), pp. 908–926.

Green Intraprenurial Flexibility towards Sustaining Competitive Advantage:A Case of South Asian Context

G.D. Samarasinghe
Department of Management of Technology,
University of Moratuwa, Katubedda, Sri Lanka
A. Wickramasinghe
Sydney Business School and School of Management, Operations and Marketing, Faculty of Business
University of Wollongong, Australia
Helan R. Gamage
James Cook University Australia, Singapore Campus
Nalin Abeysekera
Department of Management Studies
The Open University of Sri Lanka,Sri Lanka

ABSTRACT

This study explores how green based intrapreneurial flexibility affects sustainable business performance of the Sri Lankan hotel industry. A survey was administered to a random sample of senior managers of hotels in Sri Lanka. Linear regression analysis revealed a significant path coefficient which explained green based intrapreneurial flexibility positively influenced sustainable competitive advantage. The findings suggest that hotel industry policy makers develop green specific intrapreneurial capabilities so that they can quickly adapt their green based product and service offerings in responding to changes of the green market requirements by focusing on green based new venture creation, green innovation, green related self-renewal exercises, and eco-friendly proactive decision making in order to sustain their competitive advantage from green initiatives.

Keywords: Green based Intrapreneurship, Dynamic Capabilities, Strategic Flexibility, Sustainable Competitive Advantage

INTRODUCTION: FROM THEORY TO CONTEXT

There is a growing interest among top managers, stakeholders and academics regarding green marketing strategies and the potential impact on the triple-bottom line. Firms are increasingly adhering to a triple-bottom line performance evaluation, a concept coined to reflect the growing tendency of stakeholders to evaluate organizational performance on the basis of economic prosperity (i.e., profits), environmental quality (i.e., the planet), and social justice (i.e., people). In addition, improved environmental performance has been linked to greater financial performance, competitiveness, and innovation benefits (Kassinis and Vafeas 2006, King and Lenox 2002, Klassen and Whybark 1999, Majumdar and Marcus 2001).

The present study's scope revolves around on the corporate sustainability exercises undertaken in the hospitality industry in Sri Lanka due to its increasing strategic importance to the Sri Lankan economy as a foreign exchange earner at present as well as in future. In 2012 Sri Lanka passed two milestones in its tourism history by emerging as a 'Million Tourist Destination' and a 'Billion Dollar Export Income Earner' (Sri Lanka Tourism Development Authority, 2013). Tourist arrivals have increased by 31 % 2011 when compared to 2010. The tourist arrivals have increased by 98 % in 2011, when compared with the before-the-end-of-war situation in 2008.

In order to reap the benefits of the tourism industry upsurge, the government has set targets to attract 2.5 million tourists by 2016 (Sri Lanka Tourism Development Authority, 2013). Several initiatives are in place to cater to the increasing demand for hotel accommodation to the targeted number of tourist arrivals by means of new investments and expansions of existing accommodation facilities. Accordingly, the number of hotels rooms is expected to increase to 50, 000 by 2016, as opposed to the present number of rooms of 14,653. However, beyond the quantitative targets for the tourism industry, the industry needs to ensure the environmental sustainability of the industry due its increased consumption of resources (Wickramasinghe, 2013).

Tourism and hospitality industry which consumes significant quantities of water and energy and generates waste. In Sri Lanka, the hospitality sector ranks as the most energy intensive and therefore incurs high energy costs. Also, the electricity demand of the hotel sector constitutes 4-5 % of the national electricity demand. The energy costs constitute 18 % of the total operational costs of the hotels (Miththapala, 2011).   Empirical studies found that water consumption, per guest, in a hotel can be around three times that of the average consumption of a person staying at home (Barberán et al., 2013). With the increasing number of tourist arrivals, there is a tendency to use enormous amounts of energy and water and generate high amounts of waste. Considering both economic and environmental factors, it is important that the hotel sector undertakes investments on energy and water efficient

management practices and effective waste management approaches as a greening industry.

Adoption of environmental management practices promotes sustainable utilization of water and energy resources and minimizes the probable negative impacts on the environment through waste management. Moreover, based on past data and industry sources, it is readily observable that, hospitality and tourism industry experience up and down demand patterns(tourists arrivals), pressures from suppliers, tourists, stakeholders, competitors and general economy of the country as well as the global economy. These characteristics imply that the industry is highly volatile in nature and hence the industry can be viewed as operating in dynamic market (Atuahene-Gima and Ko, 2001).

In spite of the above mentioned increased strategic significance of environmental management initiatives for the sector, empirical studies highlight that there is an insufficient level of commitment to adopt environmental initiatives and the rate of implementation is slow in the industry. In this regard, a survey undertaken in 2013 (Wickramasinghe, 2013) on environmental orientation, which covered 56 hotels in the Western province of Sri Lanka found that 37% of the hotels maintain proper monthly records on energy, water and waste whilst around 31% of the hotels are involved in projects to sustainable environmental management. Furthermore, another survey covering all touristic regions and a cross section of sizes, emphasizes that the need to create awareness and the benefits of a good energy, waste and water management programme throughout the sector in a comprehensive manner and help hoteliers identify and evaluate before and after scenarios and clearly quantify savings (Jayawardena and Miththapala, 2013c).

Additionally, discussions held with industry practitioners revealed that there is a suspicion among some executives whether adopting and investing on green initiatives would result in increased business performance. This is confirmed by the interviews held with some hotel executives, who has a strong financial and accounting backgrounds, believed that some competitively important green initiatives involve huge cost and investment which make it difficult to recover in the medium term and hence difficulty in achieving competitive advantage and superior performance.

According to the dominant paradigm in strategic management, many theoretical perspectives assume competitive advantage and performance in a static environment. As per the natural resource based view of the firm following resource based theory of firm (Hart, 2005) it seems logical that adoption of green initiatives might lead to superior performance and financial returns of the hotels in Sri Lanka unless it is operating in a dynamic environment. The study relies on the dynamic capability perspective and takes Hart and Dowell's (2011) logic that promotes the fact that firms which perceive the natural resource as a constraint firm's activities and develop unique environmentally dynamic capabilities can gain superior competitive advantage in a rapidly changing global environment.

The present study, therefore, proposes that hotel industry in Sri Lanka, being in a globally volatile environment as supported by the study of Jayawardena and Miththapala (2013c), should take dynamic capability perspective for developing a firm's ability to create develop and renew these resource and capabilities relevant for sustaining competitive advantage from green initiatives. Thus, it is strategically logical to argue that the hotel sector needs flexibility to successfully implement green initiatives as a competitive weapon. The study further narrows down its scope to strategic flexibility associated with intrapreneurial capabilities as they apply to green initiatives in a dynamic market (Jayawardena and Miththpala, 2103c). Intrapreneurial capabilities are one strategically important market relating capability for business success in a market driven business paradigm (Cronin et.al, 2010; Morgan et.al, 2009). This context signifies the strategic relevance to formally investigate the relationship between strategic flexibility of green intrapreneurial capabilities and sustainable competitive advantage in the hotel industry.

In order to answer the above research problem, the study has formulated the following research objectives:

1. To identify the level of strategic flexibility of green based intrapreneurship practices of these hotels.
2. To describe the level of green based sustained competitive advantage enjoyed by the hotels in Sri Lanka.
3. To elucidate the link between strategic flexibility of green based intrapreneurship and green based sustained competitive advantage of the hotels in Sri Lanka.

LITERATURE SURVEY AND CONCEPTUALIZATION
▮ Green Based Sustained Competitive Advantage

Competitive advantage can be conceptualized as a superior "marketplace position" that captures the provision of superior customer value and/or the achievement of lower relative costs, which results in market share dominance and superior financial performance (Day and Wensley,1988; Hunt and Morgan, 1995). Much of the existing research uses superior financial performance or "rent" as an indicator of competitiveness (Aharoni, 1993). Similarly, sustained

competitiveness is believed to be simply a competitive advantage that lasts a long period of calendar time (Jacobson, 1988).

The present study identifies sustained competitiveness as a situation where an organization reflects more than simply financial performance (Day and Wensley, 1988). It is also achieved when the advantage resists erosion by competitor or the resources and capabilities underlying a business's competitive advantage that must resist duplication by other firms (Bharadwaj et al. 1993). Sustained competitiveness can result in superior financial and market advantages and distinctive capabilities (Day and Wensley, 1988). This study defines sustainable competitive advantage as a firm to gain not only superior financial and market performance but also firm distinctive capabilities that competitor are unable to duplicate due to eco-friendly initiatives.

Theoretical developments in the field of the strategic management has focused to explain how firm attain and sustain competitive advantage. There are many paradigms involved such as a Porter's (1980) Competitive Forces Model, the resource-based view (RBV) (Barney, 2001; Wernerfelt, 1984), a strategic conflict approach (Brandenburger and Nalebuff, 1996). The present study adopts the theoretical framework that underlies natural resource based view (Hart, 1995; Hart & Dowell, 2011) and dynamic capability view of competitive advantage (Teece, Pisano and Shuen, 1997; Wang and Ahmed, 2007) as this framework identifies interrelationship among natural environment, firm resources and capabilities for sustainable performance of firm in a dynamic environment. As per the above literature and theory of Natural Resource based Theory (Hart 1995), green initiatives are argued a way of improving environmental capabilities of the hotels and a route to green based sustainable competitive advantage by sustaining financial and nonfinancial performance of the hotel sector in a dynamic environment.

Green Based Intrapreneurship and Strategic Flexibility

Intrapreneurship (entrepreneurship within existing organizations) is an important element in organizational and economic development. Literature views intrapreneurship as a process by which individuals inside organizations pursue opportunities without regard to the resources they currently control (Stevenson and Jarillo 1990), as doing new things and departing from the customary to pursue opportunities (Vesper 1990), and as a spirit of entrepreneurship within the existing organization (Hisrich and Peters 1998). Borrowing from the literature, present study defines green based intrapreneurship as entrepreneurship within an existing organization as it relates to eco-friendly products and services. It refers to a green related process that goes on inside an existing firm, regardless of its size, and leads not only to new business ventures but also to other innovative activities and orientations such as development of new eco-friendly products, services, green technologies, administrative techniques, strategies, and competitive postures (Antoncic and Hisrich, 2001; Menon and Menon, 1997).

Based on conceptualizations of ENTRESCALE (Knight 1997) and the corporate entrepreneurship scale (Zahra 1993), views of intrapreneurship can be classified into four dimensions: (1) new business venturing, (2) innovativeness, (3) self-renewal, and (4) proactiveness. The study adopts these four dimensions as they relates to organizations' green product-markets.

New green business venturing is the most salient characteristic of green based intrapreneurship because it can result in a new business creation within an existing organization (Stopford and Baden-Fuller 1994) by redefining the company's green products or services (Zahra 1991) and/or by developing new markets for green products and services (Zahra 1991). In contrast, the green innovativeness dimension refers to green product and service innovation with emphasis on development and innovation in technology. The green self-renewal dimension reflects the transformation of organizations through the renewal of key ideas on which they are built towards eco-friendliness (Guth and Ginsberg 1990; Zahra 1991). Green proactiveness is related to aggressive posturing relative to competitors as it relates to the introduction of new green products or services, green operating technologies, and administrative techniques (Covin and Slevin 1986).

Strategic flexibility has been increasingly recognized as a critical organizational competency that enables firms to achieve and maintain competitive advantage and superior performance in today's dynamic and competitive business environment (Hitt et al., 1998; Sanchez, 1995). Strategic flexibility is widely recognized as a key organizational capability associated with the long-term success of a firm (Hitt et al., 1998; Lei et al., 1996; Sanchez, 1995). According to dynamic capability view, intrapreneurial capabilities should be associated with strategic flexibility (Wang and Ahmed 2007) and generate strategic flexibility. Green based intrapreneurial flexibility is the extent to which organizational is able to pro-act or responds quickly to a changing competitive environment through green based intrapreneurial capabilities.

Alignment between Green Based Intrapreneurial Flexibility and Green Based Sustained Competitive Advantage

One important insight generated from research is that sustainable competitive advantage from organizational capabilities may lie in their influence on value-creating, firm-specific and

hard-to-copy resources and capabilities (Bharadwaj, 2000; Byrd, 2001; Sambamurthy et al., 2003). In other words, organizational resources and capabilities may enhance a firm's bottom-line performance by supporting its efforts to build and exploit valuable, unique and non-imitable resources and capabilities.

Under dynamic capability perspective, green based intrapreneurail flexibility leads firm to develop ability to more creative and new ideas and seeking, forward-looking involving introducing new products or services ahead of the competitor and acting in anticipation of future wants and needs in the marketplace. In addition, firm is brave to take actions such as committing large amounts of resource to operation with uncertain outcomes and willingness to break away from the venture into the unknown (Lumpkin and Dess, 1996). Firm which develops green related intrapreneurial capability may also benefit from the innovative and proactive efforts toward pioneering the development of new products, process, and services related to energy and water, savings, waste reduction and pollution prevention (Chen et al., 2012).

Specifically, firms with green intrapreneurial flexibilities can gain economic benefits as (1) the cost of materials and energy reduce, (2) public pressure minimizes, (3) there is increasing awareness that firms subscribing to triple-bottom line practices can increase consumer demand (Kleindorfer et.al, 2005). These factors would allow the firms to gain a sustainable competitive advantage that leads to improved results for the business. In addition, for a time-series perspective, intrapreneurship and performance can even be sustainable and long lasting (Wiklund, 1999). In addition, this intrapreneurial capability progress is idiosyncratic resources that can provide sustainable competitive advantage. Hence, the study argues that strategic flexibility in green based intrapreneurial endeavors of the hotel firms would result in green based sustainable competitive advantage in a highly volatile tourism industry.

The above review of literature paved the way to develop the following conceptualization as shown in the figure:1

Figure 1. Simple path model, synthesized from literature review
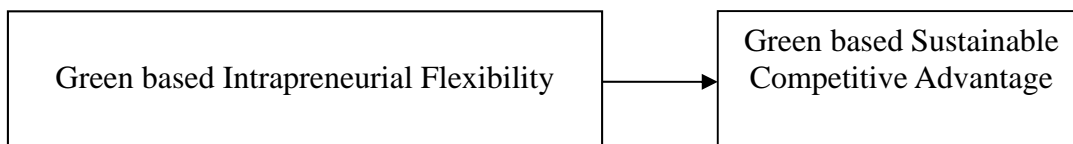
The study has developed the following hypothesis based on the literature review undertaken above as depicted in the conceptual model.

Hypothesis: Green based Intrapreneurial flexibility of the hotel positively influences sustainable competitive advantage.

METHODOLOGY

Following the positivistic research tradition and the quantitative research approach, survey research strategy was adopted.

Population and Sample of the Study

The population of the study consisted of the 266 local star category and unclassified hotels of Sri Lanka registered with the Sri Lanka Tourism Development Authority. It was decided to select 130 hotels covering different categories (from five star to one star and unclassified) of the hotels as it satisfies rules of thumb proposed by Roscoe, 1975 (cited in Sekaran, 2006, p.295). The random sampling techniques were employed in selecting the hotels in each stratum. The response rate was around 78% as some respondents did not return the completed questionnaire.

■ **Operationalization**

Green based intrapreneurial flexibility scale captured the extent to which the hotel's intrapreneurial capabilities are used pro-act or respond quickly to green market demands in changing competitive environment and thereby develop and/or maintain competitive advantage (Hitt et al., 1998; Sanchez, 1995). The scale consisted of a composite measure of four factors adapted from using Antoncic and Hisrich's (2001) Intrapreneurial scale, which included green based new business ventures, green based innovation, green based self-renewal and green based proactivity. Green based sustained competitive advantage was measured using a composite measure by adapting items developed by Day and Wensley (1988), which consisted of namely financial performance, market place position and inimitability of firm's green strategy and distinctive green capabilities. Self-Administrative Questionnaires were used to collect the predetermined data required to measure the two constructs. A structured questionnaire mainly consisting of 5 point -Likert scales (Strongly Agree – Strongly Disagree) was used to measure the variables.

Reliability and Validity of Constructs

The table 1 depicts the reliability and validity of the measurement scales. Cronbach's alpha was calculated to measure the reliability / internal consistency of the measurement scales. As the alpha values for each scale were above 0.7, the scales were sufficiently reliable (Nunnally, 1967) and supported for the unidimensionality of the composite constructs. The face / content validity of the scales was assured through experts' reviews and literature survey. In order to test the dimensionality of the measurement constructs, an exploratory factor analysis was performed by following the procedure recommended by Churchill (1979). In this procedure, the items with very low corrected item-to-total correlation were dropped whilst some of the items which had poor factor loadings and cross loaded items were also removed from final scale. The final scales items which had factor loadings 0.5 and above were retained and are shown in the table.1.

Table 1. Reliability and Factor Analysis Results

Green Intrapreneurial Flexibility :	Cronbach's Alpha =0.71

Factor 1 : Green based New Business Ventures: (a)Stimulating new demand for existing services in current green market segments (b) broadening green based business lines /services in the current green segments (c) finding new niches for existing green services (d) pursuing new business in new industries related to current green services (e) entering new businesses by offering green new product lines & services

Factor 2: Capabilities for Green based innovations : (a) company's emphasis on developing or adopting green based innovations in terms of service innovations, process, product, technology, marketing and administrative methods (b) Rate of green based innovations introduced to the green market segments

Factor 3: Green Self-renewal:(a) company redefining mission and business concepts and industry as per the green market needs (b) reorganizing units and coordination of their to enhance green initiatives (c) adopting flexible structures and policies to increase autonomy of units (d) training & rewarding employees for green based creativity (e) designating green idea champions

Factor 4 :Green Proactiveness: (a) company's bold & aggressive decision making style for eco-friendly initiatives (b) proactive attitudes towards risk-taking for green initiatives (c) competitive posture to undo the competitors' green posture

Sustained Competitive Advantage:	Cronbach's Alpha =0.76

Factor 1: Green based Financial Performance: (a) higher return on investment (ROI) (b) gross profit (c) high price premium over our close competitors

Factor 2: Green based Market Place Position: (a) enter new market (b) to increase our market share (c) increased average room occupancy rate (d) customer satisfaction

Factor 3: Green Inimitability: (a) difficulty for competitors to match firm's capability (b) difficulty for competitors to grasp capability to learn through internal experimental activities (c) difficulty match capability to acquire knowledge and technology (d) easy for our competitors to match our marketing mix strategies (e) inimitability of green intrapreneurial capabilities (f) difficulty for competitors to match the green based innovations**.**

▊ Data Analysis Strategy

Data analysis strategy in the study consisted of both descriptive statistical analysis and inferential statistical analysis. The hypothesis test was carried out using multiple linear regression analysis. The Statistical Package for Social Sciences (**SPSS^R**) version 17.0 was used for data analysis. All of the data measuring independent and dependent variables were obtained from the same source (i.e. managers) using the same method. The issue arises therefore as to whether the covariance between the constructs is an artifact of single-source common method bias. To address this issue, Harman's single-factor test was conducted on all of the items used to measure both the independent and dependent variables that were obtained from managers, (green based intrapreneurial flexibility and green based sustained competitive advantage). The results from this analysis revealed that the first factor accounted for 28 per cent of the total variance in the items, which indicates that common source/method variance does not explain the majority of the covariance between the scales (Podsakoff et al., 2003).

RESULTS

In order to achieve the objective- one and two of the study, a descriptive analysis based on mean values were carried out. The results revealed the following as depicted in the table 2.

Table 2. Descriptive Analysis

Variable	Mean	Standard Deviation
Overall Green based Intrapreneurial Flexibility	4.07	0.51
- Green based new business ventures	3.76	0.56
- Green innovation	4.08	0.44
- Green self-renewal	4.26	0.24
- Green proactiveness	4.16	0.62
Green based Sustained competitive advantage	4.16	0.48

Source: Survey Data

The overall mean value of 4.7 for the green based intrapreneurial flexibility implies that hotels have strategic flexibility from green initiatives to a sufficient level. However, the mean analysis of the sub scales of green based intrapreneurial flexibility highlights that the hotels in the sample have less flexibility in green based new business ventures (3.76 on a Five point Likert scale) whilst they have satisfactory level of flexibility in the areas of green innovation, green self-renewal and green proactivity (respectively 4.08, 4.26 and 4.16 on five point Likert scale). The mean value for the green based sustained competitive advantage is 4.16 (on a five point Likert scale) which describes that the average hotel in the sample enjoy green based sustained competitive advantage to a considerable extent.

As a way of fulfilling the objective-three, first Pearson correlation analysis was calculated to identify the association among the constructs and then linear regression analysis was performed to test the directional hypothesis. According to the Pearson correlation analysis, it was evident that green based intrapreneurial flexibility had a significantly moderate and positive association with green based sustainable competitive advantage (r=0.46). In testing the hypothesis depicted the conceptual model, the linear regression analysis revealed the following results as shown in the table: 3.

Table 3. Linear Regression Results

	Green based sustainable competitive advantage	
Independent Variable	**β**	**"P" value**
Green intrapreneurial flexibility	0.31	0.01
R^2	0.22	

*Dependent variable is green based sustainable competitive advantage
Source: Survey Data

According to the above analysis, hypothesized claim is accepted and there is significant evidence (at significance level of 0.05) to conclude that the green based intrapreneurial flexibility positively influences the green based sustained competitive advantage of the hotels in Sri Lanka. This reveals that green based intrapreneurial flexibility in overall positively affects green based sustained competitiveness of the hotels. The regression coefficient (β=0.31) confirms that hotel's green based intrapreneurial flexibility are positively related green based financial performance, market place position and inimitability of distinctive capabilities. This implies that the hotel's green strategy flexibility resulting from intrapreneurial perspective can be a predictor of green based sustained competitive advantage in the Sri Lankan hotel industry. These findings, in overall, can be validated as these are consistent with the argument of the general literature related to dynamic capabilities, strategic flexibility and intrapreneurship (Bharadwaj, 2000; Byrd, 2001; and Sambamurthy et al., 2003).

The findings empirically support that the hotels have undertaken green initiatives which reflect intrapreneurail capabilities and their associated strategic flexibilities in order to quickly respond to the green market demands in the hotel industry in Sri Lanka. These have paved the way forward to improve green based financial performance, inimitability of green based capabilities and competitive position of the hotels. In the regression model predicting sustained competitive advantage, the goodness of fit is predicted using R^2 which is   0.22. This implies that green based   intrapreneurail flexibility can predict only 22% of the total change of green based sustained competitive advantage whilst there are other important factors that predict green based sustained competitive advantage of the industry.

DISCUSION, CONCLUSION AND IMPLICATIONS

Based on the above empirical findings, it is evident that in the Sri Lankan context, the hotels have adopted green initiatives and been able to maintain their green based competitive advantage. These results also are consistent with the findings of the study of Samarasinghe and Ahsan (2013), which revealed the important role of adopting green market focused learning for sustaining the competitiveness in the industry. The hotels have concerned on green based intrapreneurial perspectives in implementing green initiatives in terms of green based new business ventures, green based innovation, green based self-renewal and green based proactivity. Further, the hotels have gained strategic flexibility by green intrapreneurial focus in the Sri Lankan tourism industry. Furthermore, the associated strategic flexibility of green based intrapreneurail capabilities has enabled the hotel to sustain their competitive advantage during the recent past. In final analysis, developing green market based capabilities from an intrapreneurial perspective is a prerequisite to implement the resource- productivity model and acquire sustained competitive advantage in green based product markets (Johannessen and Olsen, 2003) of the hotel sector in Sri Lanka.

As managerial implications, Sri Lankan hoteliers can adopt green initiatives and implement them to win the long run competitive advantage by focusing on intrapreneurial competencies such as creating new business ventures linked to green / eco-friendly alternatives, eco- friendly innovations at hotels, renewing current skills and technologies related to environmental management of hotels as well as introducing more proactive measures to deal with environmental standards, regulations and stakeholders pressures. Mere adoption of green based intraprenurial pitfalls are not sufficient for winning and sustaining green based competitive advantage in a highly volatile tourism industry but it requires linking intrapreneurial capabilities to create flexibility by introducing and modifying its systems and structures to accommodate an environmental program, covering environmental policy, establish environmental objectives and targets, evaluate the firm's environmental performance in a regular basis, delegates environmental responsibilities and provides environmental training for employees.

In addition to the organizational level flexibilities, the hotel managers should focus on operational factors related to green based initiatives that cut operating costs and minimize resource consumption. In this respect, the hotel managers can revisit main areas causing operational costs, that is, water and wastewater management, energy management, solid waste reduction and management, and green purchasing. Around these operational areas, the needed flexibilities and competencies can be generated as they are important for developing creative and innovative green initiatives for low cost advantage, financial performance and inimitability of distinctive capabilities at the individual hotel level. However, in order to accomplish these targets, the hotel management could develop broader policy framework that guide identification of environmental issues and linking them to the hotels overall value creating activities. It requires hotels have to develop their own unique balanced score cards containing environmental parameters and key performance indicators that shows resource - productivity link.

Further, the present study theoretically contribute to the existing body of literature as it explains the linkage of green based intrapreneurial practices and sustainable competitive advantage in the light of green initiatives. I.e. the study links green based initiatives in the Sri Lankan hotel industry to the theory of sustainable competitive advantage by applying intrapreneurial flexibility as a distinctive capability in a highly dynamic market. It adds novelty to environmental management and marketing literature as the study provides a perspective to the hotel managers to plan and implement innovation-based, productivity-enhancing solutions including beneficial product and service design, packaging, raw material, or process changes as per the argument proposed by Porter and van der Linde (1995).

Future studies should explore additional factors other than green based intrapreneurial flexibility that influence green based sustained competitive advantage of hotels in an emerging market like Sri Lanka. R^2 value of the regression model ($R^2 = 0.22$) implies this possibility to explore other unique factors such as green based supply chain practices, and other types of green market relating dynamic capabilities leading to green based sustained competitiveness in Sri Lankan context for future research. It is also need to identify hotel's reputation, star category, global network, main countries of tourists' arrival, size, and years of experience as controlling variables of green based sustained competitive advantage. Further, it is important to identify competitive intensity, market turbulences, technological, regulatory and stakeholder pressure as moderators to the relationship between green based intrapreneurial flexibility and green based sustained competitiveness advantage in the conceptual model so as to make the findings more conclusive and robust.

REFERENCES

Aharoni Y. (1993). In search for the unique: can firm-specific advantages be evaluated?. *Journal of Management Studies,* 30 (01).

Antoncic, B., & Hisrich, R.D. (2001). Intrapreneurship: Construct refinement and cross-cultural validation. *Journal of Business Venturing*, 16, 495-527.

Atuahene-Gima, K., Ko, A. (2001). An Empirical Investigation of the Effect of Market Orientation and Entrepreneurial. *Organization Science*, 12 (1), 54-74.

Barberán, R., Egea, P., Gracia-de-Rentería, P., & Salvador, M. (2013). Evaluation of water saving measures in hotels: A Spanish case study. *International Journal of Hospitality Management*, *34*, 181-191.

Barney, J. B. (2001). Resource-based Theories of Competitive Advantage: A Ten Year Retrospective on the Resource-based View. *Journal of Management* 27, 643-650.

Bharadwaj, S. G. , Varadarajan, R. P. & Fahy, J. (1993). Sustainable Competitive Advantage in Service Industries: A Conceptual Model and Research Propositions. *Journal of Marketing*, 57, 83-99.

Bharadwaj, A.S., (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly,* 24 (1), pp. 169–196.

Nalebuff, B. J., Brandenburger, A., & Maulana, A. (1996). *Co-opetition*. HarperCollinsBusiness.

Burgelman, R.A. (1983). Corporate entrepreneurship and strategic management: Insights from a process study. *Management Science* 29(12):1349–1364.

Byrd, T.A. (2001). Information technology: core competencies, and sustained competitive advantage. *Information Resources Management Journal* 14 (2), 27–36.

Center for Sustainable Enterprise (2010). About the center for sustainable enterprise (Retrieved June 15, 2010 from www. kenan-flagler.unc.edu).

Chen, Y.S., Chang, C.H. & Wu, F.S. (2012). Origins of green innovations: the differences between proactive and reactive green innovations. *Management Decision*, 50 (3), 368 – 398.

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research,* 16, 64-73.

Covin, J. G., & Slevin, D. P. (1986). The development and testing of an organizational-level entrepreneurship scale. *Frontiers of entrepreneurship research*, *1*(1986), 626-639.

Cronin, J.J., Smith, J.S., Gleim, M.R., Ramirez, E., & Martinez, J.W. (2010). Green Marketing Strategies: An Examination of Stakeholders and the opportunities they present. *Journal of the Academy of Marketing Science*, October 2010.

Day G. S. & Wensley R. (1988). Assessing advantage: a framework for diagnosing competitive superiority. *Journal of Marketing,* 52, 1-20.

Guth, W.D., & Ginsberg, A. (1990). Guest editors' introduction: Corporate entrepreneurship. *Strategic Management Journal* 11:5–15.

Hart, S.L. (1995). The Natural Resource-based View of the Firm. *Academy of Management Review,* 20(4), 986–1014.

Hart, S.L. & Dowell, G. (2011). Invited editorial: A natural-resource-based view of the firm: Fifteen years after. *Journal of Management*, 37, 1464-1479.

Hisrich, R.D., & Peters, M.P. (1998). Entrepreneurship: Starting, Developing, and Managing a New Enterprise (4th Ed.). Chicago,IL: Irwin.

Hitt, M. A., Barbara W. K., & Samuel M. D.M. (1998). Navigating in the New Competitive Landscape: Building Strategic Flexibility and Competitive Advantage in the 21st Century. *Academy of Management Executive* 12, 22-42.

Hunt S.D. & Morgan R.M. (1995). The Comparative Theory of Competition. *Journal of Marketing*, 59: 1-15.

Jacobson R. (1988). The persistence of abnormal returns. *Strategic Management Journal,* 9,41-58.

Jayawardena,C., & Miththapala, S. (2013c). Satisfying Environmentally-Friendly Tourist's Expectations through Innovation in 'Greening' Sri Lankan Hotels. *In proceedings of the 1ˢᵗ International Conference on Hospitality and Tourism Management: The way forward to tourism, ICOHT 2013'*. Colombo, Sri Lanka, 155-171.

Johannessen, J.A. & Olsen, B. (2003). Knowledge Management and Sustainable Competitive Advantages: The Impact of Dynamic Contextual Training. *International Journal of Information Management*, 23, 277-289.

Kassinis G., & Vafeas N. (2006). Stakeholder pressures and environmental performance. *Academy of*

Management Journal, 49,145–159.

King, A., & Lenox, M. (2002). Exploring the locus of profitable pollution reduction. *Management Science*, 48(2), 289-299.

Klassen R. D. & Whybark D. C. (1999). The impact of environmental technologies on manufacturing performance. *Academy of Management Journal* 42(6), 599–615.

Kleindorfer, P. R., Singhal, K., & Wassenhove, L. N. V. (2005). Sustainable operations management. Production and Operations Management, 14(4), 482–492.

Knight, G.A. (1997). Cross-cultural reliability and validity of a scale to measure firm entrepreneurial orientation. *Journal of Business Venturing* 12(3), 213–225.

Lei, D., Michael A., & Joel D. (1996). Advanced Manufacturing Technology: Organizational Design and Strategic Flexibility. *Organization Studies,* 17 (3), 501-517.

Lumpkin, G. T. & Dess, G. (1996). Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance. *Academy of Management Review*, 21, (1), 135-172.

Majumdar S., & Marcus M. A. (2001). Rules vs. discretion: the productivity consequences of flexible regulation. *Academy of Management Journal* 44(1), 170–179.

Menon A., & Menon A. (1997). Enviroprenerial marketing strategy: the emergence of corporate environmentalism as market strategy. *Journal of Marketing* 61(1), 51–67.

Miththapala, S. (2011). Good practice guidelines on environmental management for Sri Lankan hoteliers. Colombo: SWITCH Asia Greening Sri Lanka Hotels Project, C C Solutions.

Morgan, N.A., Vorhies, D.W., & Mason, C.S. (2009). Market orientation, marketing capabilities and firm performance. *Strategic Management Journal, 30*, 909–920.

Nunnally, J. C., Bernstein, I. H., & Berge, J. M. T. (1967). *Psychometric theory* (Vol. 226). New York: McGraw-Hill.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903.

Porter, M. E. (1980). Competitive strategies. *New York*.

Porter M.E., & Van Der Linde C. (1995). Green and Competitive. *Harvard Business Review,* September/October, 120–134.

Samarasinghe, G.D., & Ahsan, F.J. (2013). Role of Green Market Focused Learning in achieving Sustained Competitiveness: Empirical Evidence from Hotel Industry in Sri Lanka. *International Journal of Information Technology and Business Management*, 18(1), 35–44.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly*, 27 (2), 237–263.

Sanchez, R. (1995). Strategic Flexibility in Product Competition. *Strategic Management Journal* 16 (summer), 135-159.

Sekaran, U. (2006). *Research Methods for Business*, India:Wiley.

Sri Lanka Tourism Development Authority. Annual Report-2013 .Colombo, Sri Lanka.

Stevenson, H.H., & Jarillo, J.C. (1990). A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal,* 11, 17–27.

Stopford, J.M., & Baden-Fuller, C.W.F. (1994). Creating corporate entrepreneurship. *Strategic Management Journal,* 15(7), 521–536.

Teece, D.J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18 (7), 509-33.

Vesper, K.H. (1990). New Venture Strategies *(Rev. Ed.).* Englewood Cliffs, NJ: Prentice-Hall.

Wang, Catherine L. & Ahmed, Pervaiz K. (2007). Dynamic Capabilities: A Review and Research Agenda. International Journal of Management Reviews, 9(1), 31-51.

Wernefelt B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal*, 5(2), 171-180.

Wickramasinghe, K. (2013). Environmental Management Practices in the Hotel Sector in Sri Lanka. *In proceedings of the 1ˢᵗ International Conference on Hospitality and Tourism Management: The way*

forward to tourism, ICOHT 2013, Colombo, Sri Lanka, 144-154.

Wiklund, J. (1999). The sustainability of the entrepreneurial orientation- performance relationship. *A paper presented at the 1999 Babson College- Kauffman Foundation Research Conference,* Columbia, NC.

Zahra, S.A. (1991). Predictors and financial outcomes of corporate entrepreneurship: An exploratory study. *Journal of Business Venturing,* 6(4), 259–285.

Zahra, S.A. (1993). Environment, corporate entrepreneurship, and financial performance: A taxonomic approach. *Journal of Business Venturing,* 8(4),319–340.

Economics of E-Learning: Indicators of Comparative Cost Analysis in Higher Education

Sayan Chakrabarty, Mohammad Mafizur Rahman, Rasheda Khanam
University of Southern Queensland
Australia.

ABSTRACT

Estimating cost function for technology based e-learning and face to face traditional learning is important to understand the economics of higher education. Universities are raising their tuition fees, especially for face to face learning to meet increasing cost of higher education. This study attempts to identify and compare the cost components of technology embodied higher education (e-learning) and face to face traditional system of higher education. Cost components are divided in terms of universities' cost of education, students' cost of education and social cost of education. This paper is a background work to initiate an empirical study of comparing cost of higher education. Hence it would clarify and explore the essential elements of cost associated with higher education.

INTRODUCTION

In the verge of increasing cost of face to face learning in higher academic institutions students are showing a tremendous interest on e-learning. E-education refers to a system in which learning materials are available to students in electronic form (Pegrum, Oakley & Faulkner, 2013), teach and support students via online and provide on-line administrative service, e.g. enrolment, billing, information and advice (Rumble, 2004). Littlejohn and Pegler (2014) defines e-learning as "…. the process of learning and teaching using computers and other associated technologies, particularly through the use of the internet" (PP. 17). Technological development has initiated a new paradigm for e-education in higher academic institutes. As such, the concepts of education and learning have evolved beyond their traditional dimensions into a new system of independent space and time, which has potential to minimize costs of higher education. E-learning eliminates distance and time, thus facilitates fast and flexible learning opportunities in terms of financial and economic wellbeing of all stakeholders.

E-learning is used to deliver education and training using various electronic devices based on World Wide Web (www). E-learning facilitates to overcome many barriers associated with traditional face to face learning which include students' tardiness, schedule conflicts, unavailable courses, geographical isolation, demographic and economic disadvantage (Hijazi, 2004). This is why E-learning is becoming increasingly prominent, and more students are enrolling in tertiary education (OECD, 2005), especially in the on-line type of learning.

The economic history of e-education starts from the globalization process and has expended through the technological changes. Table 1 shows some of the major developments of the information and communication technologies over the last two globalization eras, which all help to support e-learning in different ways.

Table 1. Globalization, diffusion of new technology and higher education

Date	Era of globalization	New technology	Old technology equivalent	Learning support function
1970's	Globalization 2.0 (Friedman 2007)	Interactive computers	Writing	New medium for articulating and engaging with ideas
		Local hard drives and floppy discs	Paper	Local storage with the user
1980's	Globalization 2.0 (Friedman 2007)	WIMP interfaces	Contents, indexes, page numbers	Devices for ease of access to content
		Internet	Printing	Mass production and distribution of content
		Multimedia	Photography, sound, and film	Elaborated forms of content presentation
1990's	Globalization 2.0 (Friedman 2007)	Worldwide Web	Libraries	Wide access to extensive content
		Laptops	Published books	Personal portable access to the medium
		Email	Postal services	Mass delivery of communications messages
		Search engines	Bibliographic services	Easier access to extensive content

Date	Era of globalization	New technology	Old technology equivalent	Learning support function
		Broadband	Broadcasting, telephones	Choice of elaborated content and immediacy of communication
2000's	Globalization 3.0 (Friedman 2007)	3G Mobiles	Paperbacks	Low-cost access to elaborate content
2010's		Web 2.0	Pamphlets	Social network, Facebook.com, MySpace.com and Twitter

Source: Modified from Diana Laurillard (2006).

Globalization 2.0 compressed by the Great Depression and World Wars I and II, is only defined and led by companies globalizing, which brings interactive computers that start a new dimension and medium of interactive teaching and learning. As a result of these technological developments, telecommunication costs fall dramatically due to breakthroughs e.g. telegraphs, telephones, the web, satellites and fiber optic cables (Laurillard, 2006). Consequently, a global market for e-learning and online education has been established.

Since the late 1990s, there has been enormous interest on e-learning both by practitioners and academics. We enter Globalization 3.0 in about 2000 to transform the world to a global village with high prospects of e- learning in higher education. Downes (2005) suggested that e-learning has entered into a new dimension of Web 2.0 technology (current development trend in e-learning). Along with the development of Web 2.0 technologies social networking sites like Facebook.com, MySpace.com and Twitter, have become more and more popular among the tertiary students, teenagers and young people, and connections are being established between social networking sites and e-learning. Social networking sites are being adopted as a way of studying communication between tertiary staff and students. It means that connections are being set up between social networking sites and e-learning. In the new phase of globalization mobile learning, or m-learning, is treated as the fastest growth area in the field of ICTs in education (Pegrum, Oakley & Faulkner, 2013).

There are various studies to investigate the impact of technology on education, several studies report positive impacts (O'Dwyer, Russell, Bebell, & Seeley, 2008; Goldberg, Russell, & Cook,2003; Moran, Ferdig, Pearson, Wardrop, & Blomeyer, 2008; Warschauer & Matuchniak, 2010) and few others report negative impacts (Weston & Bain, 2010; Larkin & Finger, 2011). A recent study (Hätönen & Välimäki 2014) that investigates the impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction found no significant difference between e-learning and traditional learning. None of the research papers have identified comparative costs of e-learning and face to face traditional learning,

The importance of the paper lies to determine the indicators of costs of e-learning and compare those cost indicators against face to face traditional learning for different stakeholders (students, university and government) of higher education. The structure of this paper is as follows: section 2 gives a conceptual framework related to e-learning and cost of education. Section 3 describes cost elements of e-learning compared to face to face traditional learning from the point of view of universities, students and society. Section 4 briefly compares the cost of both systems, and finally section 5 concludes the paper.

CONCEPTUAL FRAMEWORK

This section deals with conceptual framework which is generally used in research to outline possible courses of action or to present a preferred approach to an idea or thought.

▌ What Is e-Learning?

E-learning refers to learning with the use of information and communication technologies (HEFCE, 2005). This definition is broad enough to cover non-online technology, e.g. CD, media and is not confined to a narrow idea based on only "internet-enabled learning". Because of its importance in tertiary education OECD (2005) refers to e-learning as the use of information and communications technology (ICT) to enhance and/or support learning in tertiary education.

Falch (2004) proposes four types of e-learning classifications: e-learning without presence and without communication, e-learning without presence but with communication, e-learning combined with occasional presence, and e-learning used as a tool in classroom teaching. Following Falch's (2004) presence/communication classification, Negash and Wilcox (2008) have redefined the terms "presence" and "communication" and expanded the classifications into six dimensions in order to make a distinction between physical presence and virtual presence. These are shown in Table-2

Six e-learning classifications were made for e-learning with physical presence and without e-communication (face-to-face), where both teacher and student are physically present in the classroom, apply e-tools such as video clips, PowerPoint slides, and multimedia to deliver course

contents. For e-learning without presence and without e-communication, this format of e-learning is a method of self –learning. For e-learning without presence and with e-communication (asynchronous), neither physical nor virtual presences are needed during studying contents delivery between the instructor and learner. The instructor prepares the course materials and lecture notes and assignments in advance, and then publishes online for students' access.

Table 2. Different types of e-learning

Classification	Presence*	e-communication**	Alias
Type A	Yes	No	Face-to-Face
Type B	No	No	Self-Learning
Type C	No	Yes	Asynchronous
Type D	Yes	Yes	Synchronous
Type E	Occasional	Yes	Blended/Hybrid-asynchronous
Type F	Yes	Yes	Blended/Hybrid-synchronous

Source: (Negash & Wilcox, 2008)

*   Presence is defined as real-time presence where both instructor and learner are present at the time of content delivery; it includes physical and virtual presence

** E-communication refers to whether the content delivery includes electronic communication or not.

For e-learning with virtual presence and with e-communication (synchronous), the teacher and student do not need to meet physically, however virtual meetings should take place during course content delivery. E-learning with occasional presence and with e-communication (blended/hybrid-asynchronous is a combination of asynchronous e-learning and face to face e-learning. In this format, course content is delivered by occasional physical meetings that are face to face. E-learning with presence and with e-communication (blended/hybrid-synchronous), requires the instructor and leaner meeting (physical or virtual) at the same time during the course content delivery. Some class sessions are held with physical presence (face to face); the rest of the class sessions are set with virtual presence. Overall, it is a combination of synchronous and face to face e-learning.

Cost of Education

The cost function approach is an important tool for higher education policy research. Universities can compare their different modes of education by using cost function. Cost functions also provide an opportunity to evaluate the cost of providing higher education to domestic and international students for online and face to face learning methods. So this section deals with the cost function of education and associated relationship between total, average and marginal costs; it also provides information on the economies of scale and the optimum size of the institution in terms of its cost components.

Total cost of education

The sum of individual cost, institutional cost and social cost is called the total cost of education.

$$TC = UC + SC + EC \qquad\qquad ... (1)$$

where,

$TC =$ Total cost of education
$UC =$ Universities' cost of education (fixed and variable)
$SC =$ Students' cost of education (fixed and variable)
$EC =$ Social cost of education (fixed and variable)

While estimating the total costs of education, it is necessary to avoid any type of double counting. If there is transfer in terms of student fee, it is important that private costs of education takes into account only the net of private payment.

Unit cost of education

Unit cost of education generally means cost per unit. Unit cost is important for measuring effective cost of education, when it ignores drop-outs and considers only the learners who are actually attending the classes. The difference between the effective costs and the normal costs of education reveals the efficiency/inefficiency of the given level of educational system.

$$AC = \frac{TC}{TN} \qquad\qquad ... (2)$$

By decomposing equation (2) we could write

$$AC = \frac{UC}{TN} + \frac{SC}{TN} + \frac{EC}{TN} \qquad \qquad ...\,(3)$$

There are different types of unit cost measurement:

$$CL = \frac{TC}{TN} \qquad \qquad ...(4)$$

$$CA = \frac{TC}{NS} \qquad \qquad ...(5)$$

$$CS = \frac{TC}{NP} \qquad \qquad ...(6)$$

Where, CL = Cost per learner including drop out students
CA = Cost per learner who actually attending school
CS = Cost per successful learner
TC = Total cost of education
TN = Total number of enrolled students
NS = Number of students attending class
NP = Number of successful students

The selection of unit cost measurement depends largely on the objective. Measuring effective unit cost (CS in equation-6) is important for manpower planning and related purpose.

▌ *Cost function and economies of scale*

In strategic planning average cost is used to measure economic sustainability of teaching and learning methods. Economic sustainability of e-learning refers to the ability of all stakeholders to finance an ICT-enabled environment over the long term. Therefore cost-effectiveness through economies of scale is important. Most studies considered economies of scale by quantifying the reduction in average cost of product as level of output expands (Lewis & Dundar, 1999). Economies of Scale exist when long-run average cost declines as output is increased, i.e. each additional unit can be produced for less additional cost than the previous unit.

If a technology, for example ICT, exhibits decreasing returns to scale in education, then average cost of education will be increasing as the enrolment increases. If ICT exhibits constant returns to scale, then average cost will be constant in output. If ICT exhibits increasing return to scale then average cost falls due to increase in the enrolment rate. This increasing returns to scale in education sector is desirable as it increases welfare for all stakeholders. The cubic form of the average cost function indicates rising costs of teaching at low student numbers, while the growth rate of average cost gradually diminishes as student numbers rise for higher level of economies of scale.

▌ *Econometric estimation of cost function*

Traditionally a basic cost function is defined as:

$$C = f(y, p_i, x_i, e_i) \qquad \qquad (7)$$

Where C is the cost of education, y is the student numbers enrolled in face to face and online courses of study, pi represents the price of input i for producing y, xi represents input i, ei represents error term and f represents the functional relationship relating costs to the level of output. The function f is defined by the underlying education technology that is converting different inputs into the final output. A number of specifications for f are possible, although expressions involving third degree polynomials are preferred because they are capable of capturing total cost movements along production stages of increasing and declining average costs (Creedy, Johnson & Valenzuela, 2002).

For a single-output cost function (equation-7), one method of estimating economies of scale is to examine the ratio between marginal and average costs (Cohn & Cooper, 2004). In this context, marginal costs (MC) and average costs (AC) are defined as

$$MC = \frac{dC(y)}{y} \text{ and } AC = C(y)/y$$

If MC/AC < 1, then there is economies of scale (Brinkman, 1990), in this case university is operating to the left of the minimum point of its average cost curve. Average costs could be reduced by expanding output up to the point where MC=AC. Diseconomies of scale can also exist, when MC/AC > 1, in which case a university is operating to the right of the minimum point of its average cost curve. Average costs could be reduced by reducing output up to the point where MC=AC.

A further graphical illustration of the of the features of costing model in higher education with a possible economies of scale over a wide range of output is presented in Figure-1; this means that the average cost of production of education continues to fall as the chosen level of output increases until that level becomes large. Figure 1 illustrates the average (AC) and marginal (MC) costs, when the output capacity has to be increased it usually involves construction of a large university which has the capacity to produce more students subject to an increased demand. This means that the university may be operating on the declining portion of its average and marginal cost curves, as illustrated in Figure 1.
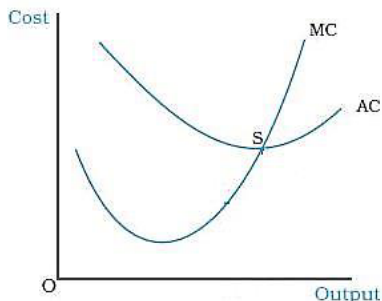
Figure1: Cost of higher education with possible economies of scale

The above theoretical discussion provides a general guidance for data analysis. However, the transition from theory to statistical analysis is difficult as cost functions are dependent on the underlying production function (Creedy, Johnson & Valenzuela, 2002). A possible endogeneity for measuring cost function lies to the fact that cost might defines quality of education. In addition, identifying proxy measures for variables to be included in an educational cost function are also difficult and challenging that we are going to discuss in the next section.

COST ELEMENTS OF E-LEARNING COMPARED TO FACE TO FACE TRADITIONAL LEARNING

As we mentioned earlier, total expenditure on traditional education rose sharply; therefore, all stakeholders related to education are more interested in whether or not technology could reduce educational costs. It is difficult to compare the costs of distance/online and traditional systems of learning. They might have different objectives; they could teach different subjects or the same subjects in different ways; the prerequisite or educational qualifications of the students entering into the systems may be different, and this could affect their success in producing graduates; and the quality of the teaching might be different (Rumble, 2004). Any one of these variables could affect costs and the way we view them. Generally, however, cost comparisons are confined to institutions teaching at the same level (primary, secondary or tertiary) and the assumption is made that the quality of the education offered is similar. The sub-sections below compare the cost of e-learning with traditional learning considering the key stakeholders (universities, students and governments).

Universities' Cost of Education

Traditionally universities are labour intensive; substituting IT technology for labour could increase productivity by reducing costs while maintaining same outcomes relative to the traditional ways of handling day to day activities.

The total costs of learning are divided into fixed and variable costs. Fixed costs are defined as those that do not change with a change in the number of students. Fixed costs do not vary continuously, although they may change if activities are ended or if there are very significant changes in volumes. Variable costs tend to change directly (linearly) with the change in activity. Rumble (2004) proposed the basic cost function for any educational system is

$$UC = S\alpha + C\beta + P\gamma + F \qquad \dots (7)$$

In equation (7), UC is the Universities' cost of education, S is the number of students, C is the number of courses which are being developed, P is the number of courses being presented to students, F is fixed cost of the system (administrative costs and other overheads), α is the direct cost of teaching per student, β is the direct cost of developing a course, and γ is the direct course-related cost of presenting a course. The direct costs comprises labour costs (payments to authors, editors, designers, broadcast producers) as well as the development and production costs of producing 'master copies' or prototypes of course materials (for example, payments to consultants, payments for rights, cost of editing broadcasts and preparing master tapes, etc.).The total direct cost of teaching students is Sα, the total direct cost of courses in development is Cβ, and the total direct cost of courses in presentation is Pγ. All the costs on the right hand side of the equation are

dependent on providers' choice on S, C and P.

Overhead costs are related to management functions (personnel, finance, management services, administration, institutional planning and evaluation, etc.). Overhead costs may also include an allowance for the replacement of capital (studio and transmission equipment, computers, etc.), all of which will in due course wear out and need to be replaced.

Rumble states "As a general rule, the fixed costs of distance education systems are high when compared to traditional education, but the variable costs per student are low. The result is that (…) the average cost per student falls as student numbers increase. However, whereas the rate of decline in average costs is relatively large to begin with, it quickly falls off."

Table 3. Universities' cost of education: a comparison between face to face and online learning

Cost elements		Face to face cost elements	Online learning elements
Fixed Costs	Capital costs	Construction of building, rental/lease, utilities, insurance, cleaning, power etc.	Learning platform (servers, intranet, software licenses, maintenance, infrastructure, support staff)
		Equipment (furniture, PCs, flip charts, boards, overheads displays, training systems/servers, etc.)	PCs, laptops, networks, intranets, software etc.
		Administration (registration and tracking systems, invitations, reminders, evaluations, etc.)	Administration (registration and tracking systems, invitations, reminders, evaluations, etc.)
Variable Costs		Supplies (printing, workbooks, refreshments, meals, pens, markers, etc.)	Supplies (CDs, supplemental workbooks, supporting Knowledge Management (KM) sites)
		Course development (designers, subject matter experts, editors, etc.)	Course development (web development, designers, subject matter experts, editors, etc.)
		Course delivery (instructors, facilitators, support staff overhead)	Support (Facilitators or coaches, help desk, training customer service, overhead)

Source: modified from Berge, Z. & Donaldson, C. (2008).

■ Students' Cost of Education

Students' cost of education (SC) largely depend on the tuition fee per student per course (δ) will follow the following equation, modified from Rumble, 2004.

$$\delta = \alpha + \frac{P\gamma + (C\beta/E_{12}) + F}{\eta} \qquad ... (8)$$

In equation (8), **α** is the direct cost of teaching per student, Pγ is the direct costs of presenting the courses, Cβ is the development and production costs of the courses, E_{12} is the elasticity of substitution between e-learning and face to face learning; and F is the fixed costs of the enterprise, including an allowance for the replacement of capital. The more is the student numbers in the course (**η**), the lower the fee (δ) for economies of scale.

Table 4. Students' cost of education: a comparison between face to face and online learning

Cost elements	Face to face cost elements	Online learning cost elements
Fixed costs (domestic students)	Direct cost (fees) minus government student benefit	Direct cost (fees) minus government student benefit
	Purchasing books, computers and related materials	Purchasing computer, related technologies and high speed internet
Fixed costs (international students)	International students fee, visa and travel costs, living costs (accommodation and food), insurance costs,	Direct cost (fees) minus government student benefit (if any)
	Purchasing books, computers and related materials	Purchasing computers and related technologies (mandatory purchase) including internet.

Cost elements	Face to face cost elements	Online learning cost elements
Variable costs (domestic students)	Educational loan, foregone income from labour market activity/ other non-market activity during period of education (opportunity cost).	Educational loan, foregone income from labour market activity / other non-market activity during period of education (opportunity cost). Health related problem due to use of technology (eye problem, obesity)
Variable costs (international students)	Educational loan, opportunity cost i.e. foregone income from labour market activity (where they could legally work) / other non-market activity during period of education.	Educational loan, opportunity cost i.e. foregone income from labour market activity (where they could legally work) / other non-market activity during period of education, Health related problem due to use of technology (eye problem, obesity)

Direct costs are the most visible costs; include all money expenditure incurred on different items: expenditure on tuition fees, other fees and charges, purchase of books, stationary, uniforms, hostel accommodation expenses and transport. In e-learning, student related costs include the volume and mode of distribution of reference materials supplied to students, the costs of tutors for marking students' assignments/examination scripts. The variable costs for students depend on the stated indicators and will vary, sometimes depend on the management decision.

Indirect costs (opportunity costs) are those costs which are not directly visible. Students who could be doing productive work rather than spending time in education have opportunity cost. This refers to the value of students' time often measured by the earning forgone for any productive work to continue the study. Any opportunity cost comparison depends on student's time invested on education and related wage of that time.

▌ Social Cost of Education

Social costs are comprised by environment costs and public costs which include financing by the government on the basis of taxes, loans and other public revenues.

Table 5. Social cost of education: a comparison between face to face and online learning

Sector	Cost elements	Face to face cost elements	Online learning cost elements
	Fixed Costs	Subsidizing facilities (building, amortization, rental/lease, utilities, insurance, cleaning, etc.)	Subsidizing learning platform (servers, intranet, software licenses, maintenance, infrastructure, support staff)
Government	Variable Costs	Students benefit (transfer payment), scholarship Loss of output (displacement effect), tax forgone	Students benefit (transfer payment), scholarship Loss of output (displacement effect), tax forgone (if any)
	Fixed Costs	Co2 and other greenhouse gas emission for fixed establishment costs	Co2 and other greenhouse gas emission for fixed establishment costs
Environment	Variable Costs	Co2 and other greenhouse gas emission for per student learning.	Co2 and other greenhouse gas emission for per student learning.

Both face to face and on-line educations have anthropogenic impact on the environment, which includes carbon dioxide emissions in the production process. Research shows that offering a lower-division class of 100 students with an online format leads to reduce CO2 emission of 5-10 tons per semester than that of face to face learning (Campbell & Campbell, 2011). Offering online course could result in less carbon footprints compare to online learning as fewer students commute trips to campus. However, online learning is not free from carbon emission because of its establishment cost and other variable cost of using machine and computers per student.

COMPARING E-EDUCATION COSTS WITH FACE TO FACE LEARNING

Many countries of the world are emphasising on supply of digitally literate, technologically able graduates who are employable in the digital global economy (Buchanan, 2011). However, there is almost no research on the cost elements of comparing traditional face to face education with

e-learning.

The use of media and the problems of managing online students mean that the overhead costs of the institution, the costs of developing a course, and the course related costs of presenting courses are in general higher in distance teaching institutions than in traditional institutions with comparable student numbers. However, cost per student is lower. This is because the relatively limited amount of support given to students means that the direct cost per student is lower, but overhead cost is higher because much of the managerial and academic effort of the institution is being put into the development and maintenance of educational materials and administrative systems for the control of distance students (Rumble, 2004).

In an Australian study Inglis (1999) found if the communication costs are borne by the student rather than by the institution, then there may be some circumstances in which online delivery is less expensive, otherwise not. Battaglino, Haldeman & Laurans (2012) compared financial costs of blended learning and fulltime virtual school with face to face learning and found that average overall per-pupil costs of both models are significantly lower than the $10,000 national average for tradition-al brick-and-mortar schools—and that virtual schools are cheaper on average than blended schools.

CONCLUSION

In this study we have presented the determinants of comparative costs for both e-learning and face to face learning to provide a more comprehensive picture of the cost components in higher education. While both types of education have similar cost components, we find that the various cost components have somewhat different implications for different mode of education and different resource allocation at both the social and individual level. Basically, economies of scale determine and differentiate the extent of economic costs for e-learning and face to face education.

Thus, one may argue that the high economies of scale to invest in e-learning go a long way toward justifying the society's faith in education, and individuals can minimize their costs. However, we need to know much more about the empirical relationship between economies of scale and cost components of e-learning vs. face to face education. This would justify the importance of e-learning, if any, and its significance for the individual, household and society.

Literature that estimates financial cost functions of higher education both for e-learning and face to face learning is very limited. However, financial estimation is incomplete for educational cost, because education is being treated as a merit good; we need extensive economic study for measuring the true cost of education, where social and environmental costs have to be considered. There is almost no comprehensive empirical study on comparing e-education and face to face learning in terms of their overall cost components. This study has constructed basic elements of the cost indicators in a theoretical way to estimate comparative costs of online and face to face learning. The novelty of this study is that it sheds some lights on various aspects of cost functions including social and environmental aspects which are often neglected but useful for economic analysis.

REFERENCES

Battaglino, T.B., Haldeman, M. & Laurans, E. (2012). The Costs of Online Learning.

A Working Paper Series from the Thomas B. Fordham Institute, USA.

Berge, Z.L. & Donaldson, C. (2008). Cost benefit of online learning. In W. Bramble & S. Panda (Eds.), *Economics of Distance and Online Learning Theory, Practice and Research.*

(pp. 207-224). Routledge.

Brinkman, Paul T. (1990), 'Higher education cost functions', in Stephen A. Hoenack and

Eileen L. Collins (eds), The Economics of American Universities, Albany, NY: State University of New York Press, pp. 107–28.

Cohn, E & Cooper S. T. (2004). Multi-product cost functions for universities: economies of scale and scope, In Johnes, G and Johnes J. (Eds.) International Handbook on the Economics of Education Edward Elgar Publishing Ltd Cheltenham, UK.

Creedy, J., Johnson, D. and Valenzuela, M.R. (2002). A cost function for higher education in Australia. Melbourne Institute Working Paper no. 11/02. Melbourne Institute of Applied Economic and Social Research.

Buchanan, R. (2011). Paradox, promise and public pedagogy: Implications of the Federal Government's Digital Education Revolution. *Australian Journal of Teacher Education*, 36(2), 67–78.

Campbell J.E. & Campbell D.E. (2011). Distance learning is good for the environment: savings in greenhouse gas emissions. *Online journal of distance learning administration.* Vol. XIV, No. V.

University of West Georgia, Distance Education Center.

Diana L. (2006). E-learning in higher education, In P. Ashwin (Eds.) Changing Higher Education, Routledge. Taylor & Francis Group, 270 Madison Avenue,New York, NY 10016

Downes, S. (2005). E-learning 2.0. Retrieved October 20, 2010 from http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1

Friedman, T.L. (2007). *The world is flat : a brief history of the twenty-first century* (3rd ed.). New York: Picador/Farrar, Straus and Giroux : Distributed by Holtzbrinck Publishers.

Falch, M. (2004). A Study on Practical Experiences with using E-learning Methodologies and Cooperative Transnational Development Methodology.*CTI Working Paper*, no. 97, 2004, Center for Tele-Information, Technical University of Denmark.

Goldberg, A., Russell, M., & Cook, A. (2003). The effect of computers on student writing: A meta analysis of studies from 1992 to 2002. *Journal of Technology, Learning, and Assessment*, 2(1).

Lahti M, Hätönen H, Välimäki M (2014). Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: a systematic review and meta-analysis. International Journal of Nursing Studies, 51(1); PP:136-149.

Littlejohn, A. and Pegler, (2014). Preparing for blended e-learning, Routledge, 270 Madison Ave, New York, NY 10016; ISBN 0 –415 – 40361-8.

Rumble G. (2004). E-Education: Whose Benefits, whose costs? In G. Rumble (Ed.), *Papers and Debates on the Economics and Costs of Distance and Online Learning* (Vol. 7, pp. 119-138). Carl von Ossietzky University of Oldenburg, Center for Distance Education.

Hijazi, S. (2004). Interactive technology impact on quality distance education. *Electronic Journal of e-Learning*, Vol 2, Issue 2, December, paper 5.

Higher Education Funding Council for England (HEFCE). (2005). HEFCE Strategy for e-Learning. JISC, HEA. London.

Inglis, A. (1999). Is online delivery less costly than print and is it meaningful to ask? *Distance Education* 20 (2), 220-39,

Moran, J., Ferdig, R. E., Pearson, P. D., Wardrop, J., & Blomeyer, R. L., Jr. (2008). Technology and reading performance in the middle-school grades: A meta-analysis with recommendations for policy and practice. *Journal of Literacy Research*, 40, 6–58. Retrieved from http://jlr.sagepub.com/content/40/1/6

Negash, S. and Wilcox, V. M. (2008). E-Learning Classifications: Differences and Similarities. In Negash, S., Whitman, M., Woszczyn ski, A., Hoganson, K., and Mattord, H. (Eds.), *Distance Learning for Real-Time and Asynchronous Information Technology Education*, IGI Global, Hershey: Information Science Reference.

OECD. (2005). E-learning in Tertiary Education. Policy Brief.

O'Dwyer, L. M., Russell, M., Bebell, D., & Seeley, K. (2008). Examining the relationship between students' mathematics test scores and computer use at home and at school. *Journal of Technology,Learning, and Assessment*, 6(5), 4-45. Retrieved from

http://ejournals.bc.edu/ojs/index.php/jtla/issue/view/174

Pegrum, M., Oakley, G., & Faulkner, R. (2013). Schools going mobile: A study of the

adoption of mobile handheld technologies in Western Australian independent schools. *Australasian Journal of Educational Technology*. 29(1), 66-81.

Lewis, D., & Dundar, H. (1999). Cost productivity in higher education: Theory, evidence, and policy implications. In J. Smarth (Eds.), *Higher education: Handbook of theory and research*. Agathon Press, NY. ISBN: 0-87586-125-3

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education*, 34(1), 179-225.

Weston, M. E., & Bain, A. (2010). The end of techno-critique: The naked truth about 1:1 laptop initiatives and educational change. *Journal of Technology, Learning, and Assessment*, 9(6) Retrieved from http://ejournals.bc.edu/ojs/index.php/jtla/article/view/1611/

Larkin, K., & Finger, G. (2011). Informing one-to-one computing in primary schools: Student use of netbooks. *Australasian Journal of Educational Technology*, 27(3), 513-530. Retrieved from http://ascilite.org.au/ajet/ajet27/larkin.html

Using Ajzen's TPB Model to Explain The Ethical Intentions of Chinese Accounting Professionals

Yan Yan Tan (PhD) Zhongnan University of Economics and Law, China
Ying Han Fan (PhD), Gordon Woodbine (PhD), Ru Chuan Jiang ,Curtin University, Australia

ABSTRACT

This paper reports the findings of a cross-sectional study of the moral belief systems of 368 Chinese accounting professionals (i.e. 186 auditors and 182 salaried accountants). It is a first study of the ethical intentions of local Chinese auditors and salaried accountants based on Ajzen's (1985) Theory of Planned Behaviour. A self-rated questionnaire is used to examine the antecedents to behavioural intention using a familiar scenario based vignette. A multi-group confirmatory factor analysis (MGCFA) was employed to validate each construct of TPB before a path analysis was performed. Salaried accountants were found to be significantly less conservative than auditors in their intention, when stating their agreement with the decision when faced with a moral dilemma about whether to reject a supervisor's directions to manipulate financial reports. The results of this study have also demonstrated that the TPB can be applied when studying the ethical behaviour of Chinese accounting professionals, and the findings support that Chinese accounting professionals' attitude toward the ethical behaviour, their perceptions of subjective norms, and perceived behavioural control over of the behaviour are positively associated with their ethical behavioural intentions. However, Chinese auditor group reveals a 51% of **variance in the** ethical intention which is significantly higher than the salaried accountant group (i.e. 38%).
Keywords: Theory of Planned Behaviour, ethical intention, Chinese auditors and salaried accountants

INTRODUCTION

The development of the accounting/auditing profession in China is different to those in western countries due to the government's dominant role in the reform process (Yee and West, 2010). Yee (2009) asserts that the government is the most significant force in the professionalization of its accounting sector. Economic reforms changed the view of Chinese people from one of absolute obedience to a centrally managed socialist system of government to one that encourages greater economic freedom for its people. The "To get rich is glorious"[8] policy of the 1990s brought about a new market ethic, i.e., that the pursuit of profit as the primary goal of business (Whitcomb *et al*., 1998). The consequences of economic reform have provided the Chinese people with opportunities to accumulate wealth, while simultaneously creating ethical quandaries for its business sector. In particular, its growing population of accounting personnel many of whom graduated from universities and joined local professional institutions striving to adopt western business practices and procedures. The Central Government also introduced rules and regulations that demanded adherence to legal premises based on rules of law similar to their western counterparts. However, the search for maximum profits and greater wealth by Chinese entrepreneurs created conflicts in relation to concepts of professional independence and integrity as embedded in the fabric of the newly acquired standards of practice. The existing culture of corruption and bribery in business was itself now open to criticism and has attracted the attention of the Central Government. The professional judgments of Chinese accounting professionals came within the purview of administrators who strongly criticized their failure to act to deter fraud following the collapse of large listed companies during the past two decades.

Accounting professionals in all environments encounter ethical dilemmas during their working experience. Classically, they may be instructed by executives, directors of companies or audited clients to compromise professional values and manipulate financial statements or modify audit opinions. Kleinman and Palmon (2001) suggested that the opinion from the colleagues, clients and other significant individuals affect the auditor's intention of maintaining independence. Unethical demands create significant cognitive dissonance in the minds of professionals as they form intentions in ways anticipated Ajzen's (1985) theory of planned Behaviour (TPB). For example, accounting professionals' attitudes toward the questionable practices, their perceptions of the social pressures from different stakeholders and internalized perceptions about control are important factors likely to influence behavioural intention.

Research on ethical decision-making in a Chinese business context emerged since the turn of the present millennium. For example, Tsui and Windsor (2001) and Gul *et al*. (2003) examined auditors' moral reasoning and ethical decision-making processes based on Kohlberg's (1969) theory of cognitive moral development and Rest's (1979) defining issues test (DIT). Woodbine (2002; 2004)

---

[8] Glorious means 'good' in that it is rewarding to both China's people and the nation.

examined employees' moral choice in Chinese financial institutions based on Rest's (1986) theoretical four-component model and applied within an agency framework. Douglas and Wier (2005) examined the impact of Chinese managers' moral philosophies on slack-creation behaviour based on Forsyth's (1980) ethical ideologies. Shafer and Simmons (2011) examined the impact of organizational ethical culture on the moral choices of Chinese tax practitioners based on Trevion *et al.*'s (1998) organizational ethical culture theory. Fan *et al.* (2012) examined the two dimensions of *guanxi* (i.e., favour-seeking and rent-seeking *guanxi*) on Chinese auditors' ethical judgments based on Hunt and Vasquez-Parraga's (1993) general theory of marketing ethics. All studies identify an underlying presence of market opportunism, pervasive in Chinese business, although they have been somewhat narrowly focused and ignore the impact of the pressures associated with competing moral demands introduced and assumed within the western systems of accountability. In this study, Ajzen's (1985; 1991) theory of planned behaviour (TPB), a widely recognized model for explaining organizational psychology can better explore individual intentions and behaviour (Carpenter and Reimers, 2005). TPB provides a comprehensive decision-making model for understanding individual beliefs, attitudes, intentions and behaviour. Specifically, the three constructs include attitudes forming the basis of a belief, beliefs about the normative expectations of others (subjective norms), and the apparent power in performing the behaviour (perceived behavioural control). Thus the broadly based theory involving judgment, intentions and actions can be applied to capture these personal beliefs and social environmental factors permitting the prediction of behavioural intentions.

The theory of planned behavior (TPB) has been widely used in research in different disciplines including accounting in a western context (e.g., Cohen *et al.* 1994; Gibson and Frakes, 1997; Buchan, 2005; Carpenter and Reimers, 2005; Bagley *et al.*, 2012). There is no apparent evidence however that TPB has been used to examine professional behaviour in a Chinese context. Like some previous researches, this study is premised on a belief that it is necessary to identify the ethical behavioral intentions of its accountants for the reasons stated above. How has China's recent emergence as a superpower, applying western systems involving professional practice demands alien to their culture, affected the minds of its growing population of accountants? How do they cope with the demands for independence and integrity within a business environment strongly governed by executives whose 'profit at any cost' culture continues to encourage fraud and mismanagement? These questions underlie the aims of this study, which is to investigate the ethical intentions of Chinese accounting professionals using an expost facto research design. The specific research objectives include the examination of attitudes toward unethical behaviours, perceptions of subjective norms, and perceived behavioural control and the impact of the outcomes of their evaluations unethical issues on intention to act. In addition, this current study includes two specific test groups: accountants in business and auditors employed in accounting firms. The former include salaried officers subject to the directions of their executive officers, while the latter enjoy a degree of independence as agents for their clients (Yee and West, 2010).

THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

The Theory of Planned Behaviour (TPB)

Ajzen's (1985) TBP is an extension of the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980). TRA posits that "people consider the implications of their actions before they decide to engage or not in a given behaviour" (Ajzen and Fishbein, 1980, p. 5). According to this theory, a person's behavioural intention is a function of two determinants, 'personal in nature' and 'social influence' (Ajzen and Fishbein, 1980). It implies that behavioural intention is influenced by a personal judgment concerning the outcomes of that individual's behaviour and his or her perception about the social pressures in relation to it. The person therefore is more likely to implement an action if he or she believes that performing the behaviour is good or positive. This factor is termed as *attitude toward to the behaviour* by Ajzen and Fishbein (1980). In this context, attitudes are somewhat analogous to judgments about the ethicality of particular behaviours (e.g., Rest, 1979). The social influence factor suggests that an individual is more likely to have an intention to perform a behaviour if he or she believes that important others think they ought to implement it. Ajzen and Fishbein (1980) use the term *subjective norm* to describe this psychological attribution.

Although the TRA can parsimoniously explain behaviour, this theory is limited to predicting the behaviour under conditions of incomplete volitional control. Ajzen and Madden (1986) argue that the behaviours under incomplete volitional control are more common than the ones under volitional control. Ajzen (1991) suggests that resources and opportunities available to a person play an important role in influencing his or her motivation in performing the intended behaviour. Thus they infer that having a consistent attitude toward the behaviour and applying given social pressures on individuals, a person who is more confident in his or her ability to perform the behaviour is more likely to proceed with the action compared to a person who lacks control over the situation

(Ajzen, 1991). To address this limitation of the TRA, Ajzen (1985) introduced the theory of planned behaviour (TPB) as an extension of TRA by adding a further dimension, *perceived behavioural control*. It is the individuals' evaluation of how easy or difficult it is for them to perform a given behaviour (Ajzen, 1991). Bandura (1982) refers this dimension as "… concerned with judgements of how well one can execute courses of action required to deal with prospective situations" (p. 122). Thus one's perceived behavioural control is recognised as an additional important factor influencing intention in TPB. It also suggests that *perceived behavioural control* together with *intention* can predict a person's likely *behaviour* (Ajzen, 1991). Thus these five factors (i.e., attitude toward to the behaviour, subjective norm, perceived behavioural control, intention and behaviour) constitute the theory of planned Behaviour (TPB) (see Figure 1).
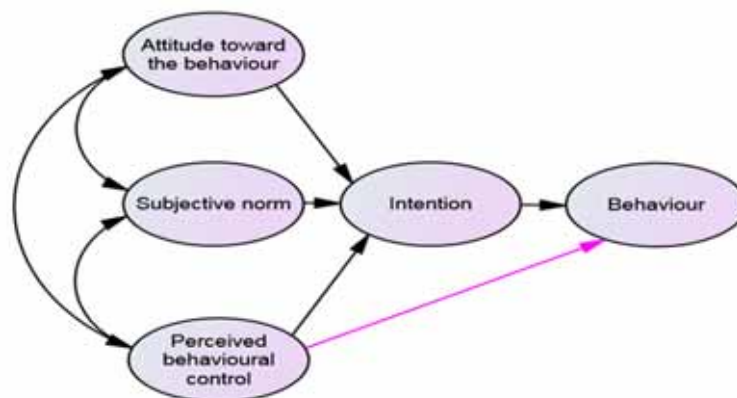
Figure 1. Theory of Planned Behaviour (Ajzen, 1991)

The theoretical framework of this current study is based on the TPB model however actual behaviour is not examined because of the nature of the experiment. It is not possible to view actual behaviour, given the nature of the application, which involves the third party ethical scenario used in this study. Thus the focus of attention is given to the effect of Chinese accounting professionals' perceptions of attitude toward the behaviour of others, related subjective norms, perceived behavioural control and their impact on ethical intention. By assuming the persona of the accountant embedded in a scenario based vignette, participants are more likely to express useful normative reckonings based on their personal experiences (Finch, J. 1987).

▌**Hypotheses Development**

Southey (2011) concluded that the findings of prior studies generally support the theories proposed by Ajzen and Fishbein (1980) (i.e., theory of reasoned action) and Ajzen (1985) (i.e., theory of planned behaviour) after reviewing the related literature. TRA and TPB have been widely used in research for the prediction of intentions and behaviours in different disciplines including accounting since they were published. The following studies are some examples which are identified in this study.

▌*Attitude toward to the behaviour*

Cohen *et al*., (1994) studied behavioural determinants of audit aggressiveness in client relations by using 65 American audit managers. Their study found that auditors' attitude toward the consequences of being aggressive in client relations was highly correlated to their perceived intention to act aggressively. Felton *et al*. (1995) studied 897 graduating business students' choice of a career in Chartered Accountancy (CA). Results showed that students who strongly believed in the benefits of a CA career had high intentions about choosing it as an employment option. It suggests that students' choice to become a chartered accountant is a function of the students' attitudes towards becoming a CA. Gibson and Frakes (1997) studied unethical behaviours of CPAs in the state of Washington. The result from 188 CPAs showed that CPAs' attitude toward performing the behaviour had significantly impacted on their intentions to behave unethically. Buchan (2005) studied public accountants' ethical decision-making by using a sample of 95 accounting professions from five public accounting firms in US. Results showed that American accounting professionals' attitudes toward the ethical dilemmas were strongly associated with their ethical intentions. Carpenter and Reimers (2005) studied American MBA students' behavioural intention to violate generally accepted accounting principles (GAAP) using survey and experimental design research methods. Results of both studies provide strong evidence that TPB can help explain ethical judgment making of business students. In particular, student attitude towards the behaviour is the most important factor influencing the prediction of their behavioural intention. Bagley et al. (2012) also found that the attitudes toward the advantages and disadvantages of Big 4 accounting firms of American accounting graduates and accountants significantly impact on their decision of seeking careers with accounting firms.

Subjective norm

The effect of Azjen's (1985) concept of subjective norm on behaviorual intention is generally supported by the above literature. Buchan (2005) however reported no significant relationship possibly due to the attitude toward the behaviour and subjective norm being highly correlated. On the contrary, Cohen *et al.* (1994) found auditors' perceptions of how much they cared whether their supervisors approved of their being aggressive in client relations are highly correlated to their intention to act aggressively. Gibson and Frakes (1997) also found that American CPAs' perceptions of how their audit supervisors view their sign-off actions significantly impacted their intentions to behave ethically. Stevens *et al.* (2005) found that senior financial officers are more likely to apply their company's ethical code into their strategic decision making when they felt pressure from market stakeholders. Again, Bagley *et al.* (2012) report that the perceptions of subjective norms such as pressures from family, friends and important others significantly impacted the decisions of American graduates about seeking careers with Big 4 firms and non-Big 4.

Perceived behavioural control

Buchan (2005) showed American accounting professionals' perceived control the behaviour was not associated with their ethical intentions. Variations in research findings may be the result of inappropriate survey techniques (Buchan, 2005). Similarly, Carpenter and Reimers (2005) found that financial manager perceptions about whether their control over the actual recording of the transactions was not significantly associated with their intentions about condoning accounting fraud. The authors explained that it "could be caused by the hypothetical situation given" (p. 125) to the subjects. Bagley et al. (2012) reported that American graduates power to control their choice of employment options had a significant effect on their future employment choices.

TPB studies in China

The studies discussed above were all conducted in western countries. Ajzen's (1985) TPB model has been applied in research in a social or business context in China in recent years with some success. For example, Yoon (2010) found that Chinese student attitudes toward digital piracy, subjective norms, and perceived behavioural control influence their intentions to commit digital piracy. Similarly, Wu and Tang (2012) found that each of the three components of TPB significantly impact on Chinese college students' gambling intentions. Furthermore, Padgett *et al.* (2013) found that perceived behavioural control is the most significant factor impacting Chinese consumer purchase behaviour regarding choice of a fast food restaurant meal. Attitudes toward the meal and subjective norms of these subjects were significant in explaining their purchase behaviour.

Although TPB has not been applied in a Chinese accounting context, the results from other accounting behavioural research are consistent with the findings reported in the TPB studies. For example, Tsui and Gul (1996) showed that the greater confidence an auditor feels the more likely he or she will perform in accordance with professional standards. Shafer (2008) found that the way Chinese auditors perceived ethical climates in CPA firms significantly impacted on their perceptions of organizational-professional conflict and affective organizational commitment. Furthermore, Shafer and Simons (2011) found that Chinese tax practitioners' perceptions of organisational ethical culture significantly influenced their intentions to engage in aggressive tax minimisation strategies. Recently, Fan et al. (2013) found that Chinese accountants' attitude toward maintaining audit independence in mind significantly impacts on their ethical judgment.

As mentioned, this study is the first Chinese study to apply a sociological research template to explain the ethical preferences of accountants. It is argued that the theory of planned behaviour (TPB) can be used to explain the ethical intentions of Chinese accounting professionals and after reviewing the literature, the following hypotheses are proposed:

H_1: The attitudes of Chinese accounting professionals toward an observed ethical behaviour directly influence their intentions to act.

H_2: The perceptions of subjective norms reported by Chinese accounting professionals with respect to an observed ethical behaviour directly influence their intentions to act.

H_3: The degree of perceived behavioural control reported by Chinese accounting professionals with respect to an observed ethical behaviour directly influences their intentions to act.

The hypotheses are worded logically to imply a positive relationship between tested variables. Given the evidence of prior research, it is anticipated that perceptions regarding the ethicality of the agent depicted in the case scenario will be positively influenced by the extent to which accountants judge the related action as ethical directly influencing intentions (H_1). In addition, the extent to which accountants rate the perceptions of important others (H_2) and also the extent to which they believe they have control over the issue (H_3) directly influences intentions to act when placed in the position of the agent depicted in the case scenario.

Auditors versus salaried accountants

The Chinese accounting/auditing profession has a short history. Chinese economic reform and

its impact on the accounting/auditing profession suggest that China's business environment has improved significantly since 1980. The government has been taking steps to build business infrastructures based on accountability and corporate governance since China joined the World Trade Organization (Tai, 2003). A number of international accounting/auditing provisions based Chinese accounting and auditing standards were subsequently issued for regulating the accounting/auditing profession. For example, the Chinese Ministry of Finance announced the introduction of an entirely new regime of Chinese Accounting Standards (CAS) based on International Financial Reporting Standards (IFRS) in 2006. A set of *Auditing Standards 1101* was issued by the Chinese Institute of Certified Public Accountants (CICPA) in the same year. Those accounting and auditing standards were revised in 2010 effective from 2012. The Chinese Institute of Certified Public Accountants (CICPA) adopted the principles-based conceptual frameworks to improve the quality of its code of professional conduct since it was first published in 1993. As a result of the *China Code of Ethics for Professional Accountants* was issued by the CICPA in 2009 based on the International Federation of Accountants' (IFAC) Standard – *Code of Ethics for Professional Accountants* as the means for assisting its members in their ethical decision-making. It includes the codes of ethics for Certified Public Accountants and Non-Practicing Accountants (e.g., accountants in businesses). Professional integrity is emphasised as the principle for maintaining professional ethics after the above accounting/auditing standards and the code of professional ethics were issued and implemented.

The qualification requirements are different between accounting and auditing professions. According to Chapter II of the CPA Law, individual membership is divided into two categories, non-practising members (e.g., members in businesses) and practicing members (i.e., CPA members). For an individual to be granted a non-practising certificate, he/she must be a member of an accounting firm or work for an organization in accounting (or relevant area) and possess a university degree. For an individual to become a CPA member, he/she must meet the above education requirements and also pass the national CPA examination and have two years or more work experience in public auditing. In addition, those personnel who are engaged to provide professional services for listed companies should pass the qualifying exam and they must have a crime free and no administrative punishment record.

Salaried accountants, on the other hand, are regulated by Chinese governments such as Ministry of Finance and Ministry of Industry and Commerce using a rating system of qualifications which includes four different titles, junior accountant, assistant accountant, accountant, and senior accountant (Zhen, 1999). Accountancy Certificate (AC) is the basic qualification for those seeking accounting position in an organisation. To acquire the above professional titles, a person must passed the different levels of examinations on accounting professional knowledge and other knowledge such as regulation rules and laws. Zhen (1999) stated that "there is no direct relationship between the AC and CPA qualifications" (p. 298). For example, salaried accountants cannot obtain a CPA title automatically even they have passed the required examination(s) but a CPA can get an accountancy certificate easily because they hold a bachelor degree which meets the qualification requirement of Accountancy Certificate (Zhen, 1999).

In terms of duties and responsibilities, salaried accountants are different to public accountants due to the nature of profession. The duties of salaried accountant mainly focus on the recording business transactions and the preparation of financial information. Public accountants such as auditors on the other hand, provide professional opinions on their audit-clients' financial information. They are generally expected to be held a high moral standard. Fan *et al*. (2014) suggest that public accountants and those employed within business (i.e., salaried accountants) engage with different job descriptions, which may affect the way they view ethical dilemmas. The results of their study show those public accountants' perceptions of rent-seeking *guanxi* issues are negatively associated with their ethical judgment on making adjustments on the financial statements in accordance with the client's request. However, the results from private accountants show no significant predilections in this direction. Public accountants appear primed for independence and integrity, while salaried practitioners are subjected to the directions of local management and not subjected to the same professional demands as their auditing counterparts in the public arena.

Based on the literature discussed above, the following hypotheses are therefore proposed:

H_4: When presented with an ethical dilemma, Chinese auditors' attitudes toward the unethical behaviour of the CFO, perceptions of subjective norms and perceived control over of the avoidance of unethical behaviour will be significantly higher than their counterparts, Chinese salaried accountants.

H_5: Compared to Chinese salaried accountants, Chinese auditors will demonstrate a significantly greater concern about the actions of the CFO as reflected in the level of agreement to reject the CFO's unethical proposal (i.e., intentions).

RESEARCH METHOD

Method And Sampling

An expost facto research survey methodology is used in the current study. The instrument is a self-administered Mandarin questionnaire that includes demographic information and a short accounting ethical scenario (refer to Appendix).

A sample consisting of accountants in business (i.e., salaried accountants) and auditors employed in accounting firms in three provinces, Hubei, Guangdong, and Zhejiang and a city, Beijing, was used in this current study. The method of recruitment included inviting accountants and auditors to volunteer to complete the anonymous survey at the end of professional development training sessions. Six hundred and fifty-three (653) survey instruments were collected. A further examination of the quality of responses was undertaken in order to check whether there were any inconsistent answers or incomplete instruments. Results show that 285 responses did not meet these requirements. Thus they were excluded from the study reducing the useable number of respondents to 368 including 182 salaried accountants and 186 auditors respectively. The background information of respondents is provided in Table 1.

Table 1: Selected background information on respondents

Background information		Salaried Accountants		Auditors		Total	
		Sample size	%	Sample size	%	Sample size	%
Gender	Male	86	47	96	52	182	49
	Female	96	53	90	48	186	51
	Total	182	100	186	100	368	100
Education level	Master	62	34	72	39	134	36
	Bachelor	61	34	75	40	136	37
	Diploma	59	32	39	21	98	27
	Total	182	100	186	100	368	100
Position	Financial manager	81	45			81	22
	Accountant	101	55			101	27
	Auditing manager			65	35	65	18
	Auditor			121	65	121	33
	Total	182	100	186	100	368	100
Experience	0 to 5	70	39	59	32	129	35
	6 to 10	50	28	69	37	119	32
	10 above	62	33	58	31	120	33
	Total	182	100	186	100	368	100

The demographics for the two groups are quite similar (refer Table 1). Both genders are well represented and an equal spread of educational and vocational experiences is demonstrated between the sub-groups.

Measurement Process

Ethical behavioural intentions

Cavanagh and Frizsche (1985) suggested a preferred method in behavioural research is the vignette approach, which helps to create contextual stimuli (i.e., creative accounting behaviour in the current study) motivating decision-making, including statements of intention. Alexander and Becker (1978) also commented that scenarios can "standardize the social stimulus across respondents and at the same time makes the decision-making situation more real" (p. 11). The scenario created in this cross-sectional TPB study of Chinese professionals is about how they deal with a common form of business malpractice. In this instance, an accounting manager is instructed to alter the financial statements to record a profit, when in reality the company is facing ongoing losses. Additional compromising information is provided (e.g., reference to stakeholder needs, monetary bonus), which is expected to cause respondents to take a utilitarian perspective of costs and benefits as well as express opinions that draw on Kantian or idealistic value orientations creating a dilemma.

The single scale-based question used to measure behavioural intention with respect to this

scenario. It requires participants to place themselves in the position of the accountant and indicate the extent to which they agree with the action taken by that person (in this instance, the accountant decides to refuse the CEO's request to alter the accounts to record a profit). When rating this proxy for behavioural intention, each participant will draw on the circumstances of the case as well as his or her own moral predisposition. The decision they make is also expected to reflect as hypothesised on the antecedent attitudes, norms and perceived loci of control expressed in the independent variables.

Attitude toward the behaviour

The eleven questions immediately following the scenario are organized to conform to past TPB based studies. Respondents are requested to indicate a level of agreement by scoring each question using a seven-point Likert scale ranging from completely disagree (1) to completely agree (7). The first four questions are concerned with belief statements that signify a personal attitude toward the observed behaviour and agree with those developed by Gibson and Frakes (1997). They are value based constructs (moral as well as pragmatic concepts) and are expected to factor within a latent variable expressing attitude on the ethical issue about the matter.

Subjective norms

The second set of three questions were constructed based on Madden *et al.* (1992) and Gibson and Frakes (1997) studies for measuring subjective norms, where respondents demonstrate the extent of their concerns about what important others would think about a behaviour that in the short term benefits the few (including himself) at the expense of others. The actual respondents would be encouraged to consider their own personal relationships with colleagues and other professionals as well as being influenced by the circumstances in the scenario (e.g., the stakeholder benefits presented by the CFO as reasons for agreeing to make the adjustments).

Perceived behavioural control

The last four questions relate to perceived behavioural control and were developed based on a similar study by Randall and Gibson (1991). When adding this additional construct to the formulation of TPB, Ajzen (1985) maintains that an individual's intention and subsequent behaviour are premised by an assessment of such psychological concepts as self-efficacy, locus of control, self-esteem and moral courage. Judge et al. (2002) have since argued that the first three concepts measure the same, single factor and provided empirical evidence to demonstrate this relationship. Similarly, moral courage is a function of one's ego strength, which defines a person's capacity to maintain his or her own identity despite psychological discomfort, distress, turmoil and conflict between internal forces as well as the demands of reality. In the context of TPB and this study, the last four questions require respondents to draw on these faculties when addressing the issue about whether to resist or agree with the CFO's instructions.

Construct validity test

Construct validity of each variable in TPB was tested by performing a confirmatory factor analysis using AMOS to confirm the instrument measures effectively what it is intended to measure in the current data. Chi-square (   ) statistic and goodness-of-fit indexes (GFI) are the two popular model evaluations methods suggested by Hu and Bentler (1999). However, prior studies suggest that the statistic is sensitive to sample size and the distribution can lead to problems of fit (e.g., Joreskog and Sorborm, 1993). Other goodness-of-fit indices such as Comparative Fit Index (CFI) were developed for the evaluation process (Byrne, 2010) to avoid the problems of sample size and distributional misspecification (Bentler and Bonett, 1980). The CFI copes better with small samples as suggested in the literature (see Bentler, 1990; Du and Tang, 2005; Byrne, 2010). Bentler (1990) suggest the goodness-fit-indices such as CFI between .90 - .95 indicates a satisfactory fit.

The results of confirmatory factor analysis for each measurement model suggest that the data of the total sample and two sub-samples fit the measurement models of attitude toward the behaviour and perceived behavioural control very well (e.g., $p > .05$ and CFI > .98). Results also suggest that the public accountant sample fits the model of subjective norms perfectly (i.e., $p = .227$, CFI = .988). The total sample did not fit this model well due to the results from the salaried accountant sample (e.g., $p = .000$).   However, a result of CFI .94 in this group suggests that the model is still acceptable for the relatively small sample in the current study.

A multi-group confirmatory factor analysis (MGCFA) was performed for testing the instrument equivalence across groups due to the sample includes two different accounting professionals. Vandenberg and Lance (2000) suggest that the tests of whether compared groups have the same factor structure in relation to the underlying dimensions identified (i.e., configural invariance or unconstrained model) and whether the groups have the same factor loadings across the dimensions (i.e., metric invariance or measurement weights) are fundamental operations in the process of equivalence in testing measurement invariance of an instrument. The equality between

the measure variable intercepts of the construct (Hair *et al.*, 2010) is also important in comparing subjects from different cultures or occupations. It establishes whether two different groups use a response scale in a similar fashion (Hong *et al.* 2003; Campbell et al. 2008).

The measurement invariances can be explained using the CFI difference (e.g., ΔCFI) as suggested by Little (1997; Cheung and Rensvold (2002), and Raykov and Marcoulides (2012). Cheung and Rensvold (2002) suggest that the conservative CFI difference should be lower than 0.01 (i.e., ΔCFI <0.01). However, Little (1997) and Raykov and Marcoulides (2012) suggest that ΔCFI less than or equal to .05 also indicates a satisfactory model.

Results suggest that both samples (i.e., salaried accountants and auditors) fit the configural (unconstrained) models well. In addition, the measurement weights invariances (i.e., attitude toward the behaviour ΔCFI = .000; subjective norms ΔCFI = .007, perceived behavioural control ΔCFI = .000) and intercepts invariances (i.e., attitude toward the behaviour ΔCFI = .004; subjective norms ΔCFI = .017, perceived behavioural control ΔCFI = .000) are found to be exist in the samples of salaried accountants and auditors. Thus it is concluded that all measurement models in the current study fit the sample data fairly well and adequate for use in the analysis of constructs.

Reliability test

The reliability of each construct (i.e., internal consistency of each construct) was tested using Cronbach's alpha. Results reveal the internal consistency of each construct is reliable e.g., (1) attitudes toward the behaviour (i.e., salaried accountant group: α = .81; auditor group: α = .85), (2) subjective norm (i.e. salaried accountant group: α = .73; auditor group: α = .84), and (3) perceived behavioural control (i.e., salaried accountant group: α = .83; auditor group: α = .84).

RESULTS

Following the determination of the structural integrity of the associated variables, the results of applicable univariate analyses relating to hypotheses H_4 and H_5 are provided first. Descriptive and independent sample t-tests are shown in Table 2.

Table 2. Results of independent samples t-tests between two groups

| Variables	Salaried accountants		Auditors		Mean difference	t	Sig.
	Mean*	SD	Mean	SD			
Attitude toward the behaviour	5.16	1.22	5.34	1.25	-.17	-1.34	.18
Subjective norms	4.34	1.23	4.57	1.32	-.23	-1.72	.09
Perceived behavioural control	4.84	1.26	4.90	1.29	-.05	-.39	.70
Ethical behavioural intentions	4.65	1.14	5.09	1.10	-.44	-2.60	.01

*Represents the grand mean for variables items along a nine-point scale 1= completely disagree to 7 = completely agree. The mean score of each item is significantly higher than the mid-point value (i.e. 4)

One sample t-tests reveal that the average mean score of each construct in both groups is significantly higher than the mid-point value (i.e., 4). The results of independent sample tests suggest that there is no significant difference between Chinese accountants and auditors in terms of their attitude toward the behaviour (i.e., sig, .18), perceived behavioural control (i.e., sig, .70), and perceptions of subjective norms (i.e., sig = .09). Thus the hypothesis 4 (H_4), that when presented with an ethical dilemma, Chinese auditors' attitudes toward the unethical behaviour of the CFO, perceptions of subjective norms and perceived control over of the avoidance of unethical behaviour will be significantly higher than their counterparts, Chinese salaried accountants, is not supported.

Salaried accountants and auditors share similar positions in relation to the CFO's unethical proposal to alter business records, which signifies a fairly strong concern by all. Mean scores and standard deviations are similar and the sample of Chinese accountants as a whole rejects the CFO's request to alter financial statements. Auditors show greater concern about what important others think about the unethical action, but again between group differences are not significant (*p>0.05*).

The relative conservatism displayed by Chinese auditors compared to salaried accountants in terms of their intention to reject the CFO's unethical proposal is established in the independent t-test of the sample data (H_5 supported).   Auditors are significantly more disposed (*p<0.05*) to reject the supervisor's request to alter financial records (mean score 5.09 out of a maximum of 7) compared to their salaried counterparts (4.65).   The issue now is to establish whether Ajzen's precursors to intentions have an influence on intentions.

In this connection, a path analysis was performed to test the first three hypotheses H_{1-3}) proposed earlier. The results from the overall sample (*n*=368) are presented in Figure 2.
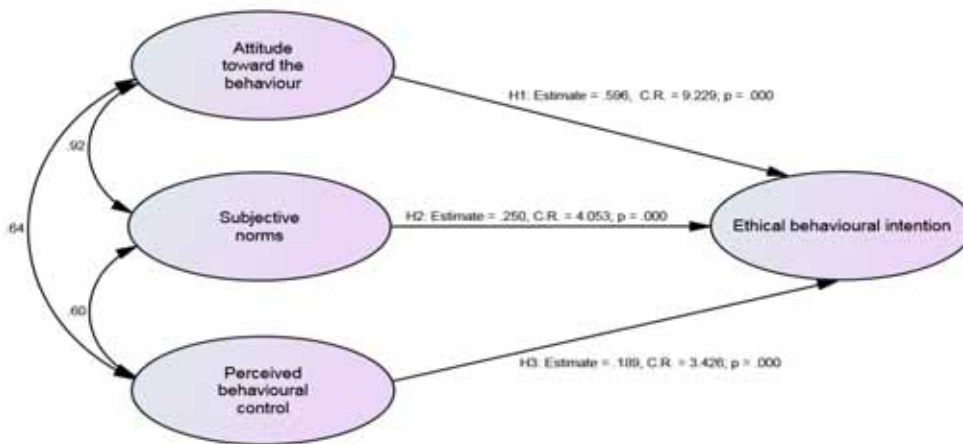
Figure 2. Results of path analysis for two groups (unstandardised estimates)

The path analysis produced a 45% of squared multiple correlations (i.e., R^2) for the regression model, explaining over 45% of the variance in the dependent variable, ethical behavioural intention. The attitudes of Chinese accounting professionals towards the CFO's unethical behaviour, their subjective norms and perceived behavioural control responses are highly correlated and all significantly associated with the ethical behavioural intentions in a positive direction (i.e., $p=0.000$). Among of these three independent variables, attitudes toward the unethical behaviour contribute most towards the explanation of changes in the dependent variable. This result is consistent with the findings reported in the literature such as Carpenter and Reimers (2005). Thus the results of this study have demonstrated that the TPB can be applied when studying the ethical behaviour of Chinese accounting professionals, and the findings support the hypotheses that Chinese accounting professionals' attitude toward the ethical behaviour (H$_1$), their perceptions of subjective norms (H$_2$), and perceived behavioural control over of the behaviour (H$_3$) are positively associated with their ethical behavioural intentions.

Path analyses results from the two sub-groups (i.e., 182 salaried accountants and 186 auditors) are shown in Figure 3. Results show that the three independent variables, attitude toward the behaviour, subjective norms, and perceived behavioural control are also highly correlated in both models. The path results also show that attitude toward the behaviour ($p =.000$) and subjective norms ($p =.000$) are significantly associated with intentions at a 1% significance level while perceived behavioural control ($p = .026$) is significantly associated with intentions at a 5% significance level in the auditor sample. Results for the salaried accountants on the other hand, show that attitude toward the behaviour ($p =.000$) and perceived behavioural control ($p =.008$) are significantly associated with ethical intentions at a 1% significance level but subjective norms ($p =.058$) is only significantly associated with intentions at a 10% significance level. The result could be due to the fact that attitudes toward the behaviour and subjective norms are highly correlated e.g., the correlation coefficient is more than .87 in this case.

However, the results of squared multiple correlations (i.e. R^2) reveal that the behavioural intentions are better explained by these three variables in the auditor group (e.g., $R^2 = .510$) than in the accountants group (i.e. $R^2 = .379$). These findings suggest that Ajzen's TPB suggest strong associations between all variables within the model, although that involving auditors appears significantly more robust.

Auditors   Salaried accountants
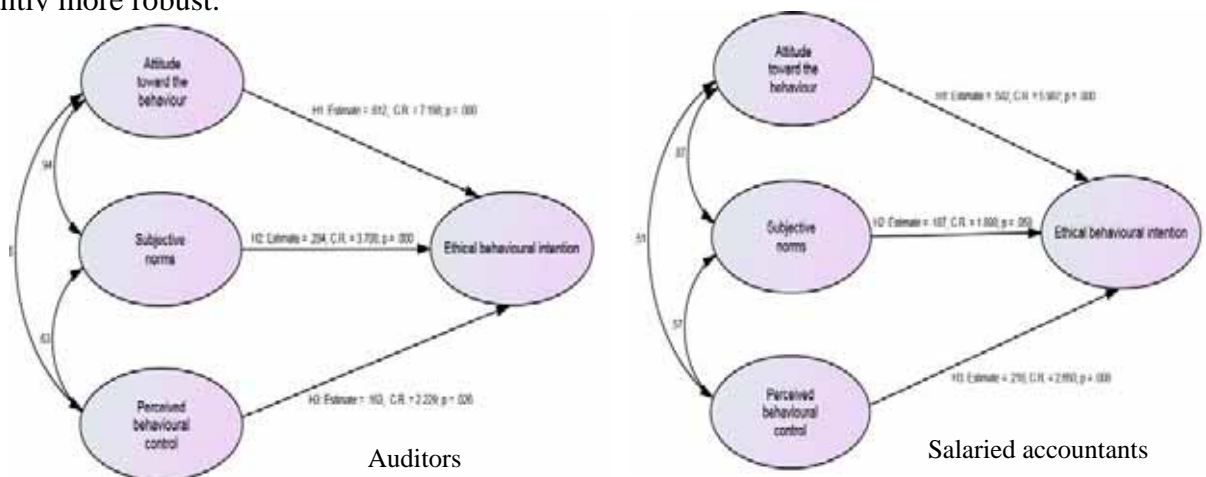
Figure 3. Results of path analyses (auditors *v.* salaried accountants)

DISCUSSION

Within a global context, it is usually anticipated that the ethical perceptions of auditors responding to self-rated instruments will be somewhat more conservative than those provided by salaried accountants. The accounting scenario provided to participants in this study involved the actions of an accountant in practice facing a moral dilemma that included a demand to be obedient to his employers' instructions by considering the needs of employees and other related stakeholders and being offered a reward for compliance. It was believed that this may influence the thinking of accountants directly affected by these types of scandals, but not the auditors, who are generally distant from such issues and likely to take a more objective and conservative view. Independence t-tests of the two samples confirmed this thinking (refer Table II). Auditors (mean score 5.09/7) are significantly more likely on average ($p<0.05$) to agree with the decision to reject the CFO's demands to manipulate accounting data than are the accountants sub-group (mean score 4.65/7). These results are not consistent with Fleming *et al.* (2010) study, which asserts that Chinese auditors and accounting students (as proxies for new salaried accountants) have the same ethical reasoning level. The use of actual salaried employees in this study would provide a better basis for comparison.

This cross sectional study of the ethical perceptions of Chinese accounting professionals is believed to be the first that has applied Ajzen's (1985) Theory of Planned Behaviour (TPB). A substantial sample of relevant psychometric data was obtained from auditors and salaried accountants in the People's Republic of China. The results confirm that Ajzen's (1985) TPB can be used to explain Chinese accounting professionals' ethical intention. Figures 2 and 3 summarise the results of path analyses for the overall sample and two sub-samples. The three antecedents to intentions, namely attitude toward the behaviour (ethical beliefs), subjective norms (the proximal influence of other persons) and perceived behavioural control (capacity to influence) all act as significant predictors (*p<0.05*), except subjective norms which is only significant at a 10% significance level in the salaried accountant model. This finding is consistent with the results reported in the Buchan's (2005) study that the reason for the limited prediction of subjective norm could be due to the attitude toward the behaviour and subjective norm are highly correlated (correlation coefficient > .87). The findings of this study establish the efficacy of Azjen's (1985) within this particular research paradigm   beliefs and attitudes influence Chinese professionals in much the same fashion as in other western contexts, attesting to the universality of the TPB. Furthermore, this study discovers that Chinese auditors and salaried accountants respond similarly to the same determinants when determining ethical intentions as a precursor to behaviour. However, **the percentage of variance in the** ethical intentions **that can be explained by these variables is different between the two groups. The** auditor group reveals a 51% of **variance in the** ethical intention which is significantly higher than the salaried accountant group (i.e. 38%). The result indicates that salaried accountants within business may have other factors influencing their decision making. For example, whereas the testing device applied in this study appeals directly to the moral predispositions of respondents, one should also consider the competing interest of loyalty towards employers, particularly within a Chinese context where *guanxi* and other cultural factors affect decision making. As mentioned earlier, it appears the sub-samples share similar demographics, otherwise this aspect may deserve attention. Further studies, including the likely impact of gender differences and ethical climate types may clarify this issue to some extent.

CONCLUSION

The most encouraging finding associated with this examination of modern Chinese accounting professionals is that their behaviours can be predicted using a western developed theory and that the results demonstrate underlying moral psychodynamics similar to those likely to be explicable within a western context. Moreover, the differences in the moral intention between auditors and accountants are also demonstrated. Finally, this study reveals that no variances exist in the determinants for ethical intentions between these two subgroups of accounting profession in China. Such findings provide some assurance to legislators and standards setters that Chinese accounting professionals are adequately provisioned to accommodate associated ethical demands.

The research has limitations in common with many cross-sectional post-test only field studies that rely on self-rated questionnaires. Care was taken to exclude incomplete and unreliable responses and it was evident that a high degree of consistency was ensured. However, respondents are able to pre-interpret the expectations of the research and provide findings that indicate positive outcomes. At the same time however, they are unable to predict how others will rate the issues and the findings that relate to the various groupings (e.g., employment group, gender etc.) explain significant deviations from the standard. It would be interesting to undertake a study of practitioners in less developed areas of China and to compare these with the above findings as well as other national groups, using the Ajzen model.

APPENDIX:

Company A is a listed international trading company in China. It has more than 500 shareholders and 10,000 employees. Its major business operation is to export goods to American markets. Due to the global financial crisis, its income decreased significantly in 2008 and it also incurred losses of RMB 35,000,000 in 2009. In the following year, the financial performance did not improve and it was expected to record a further loss.   The share price of the company decreased 70% from 2009 to 2010.

In January 2011, the Board of Directors called an urgent meeting to discuss business strategies that could help the company's survival from the current difficult situation. The accounting manager of Company A was told by the Chief Financial Officer (CFO) a profit figure in the Financial Statements of 2010 must be shown as RMB 26,000,000. He was also asked to consider the company's future, shareholders' interests, and also employees' job security. The CFO told the accounting manager, he will receive a handsome bonus if he follows the Board's instructions.

Assume you are currently working for Company A as the accounting manager. Please answer each question, circling **one** number that best describes the extent of your agreement.

1. I believe it is a bad thing to do if I follow the CFO's request.
2. I believe it is unethical if I follow the CFO's request.
3. I believe it is unwise if I follow the CFO's request.
4. I believe it is not useful if I follow the CFO's request.
5. My colleagues who are important to me would probably think I should not follow the CFO's request.
6. Other accounting professionals who are important to me would probably think I should not follow the CFO's request.
7. The users of financial statements who are important to me would probably think I should not follow the CFO's request.
8. For me, refusing the CFO's request would not be difficult.
9. If I wanted to I could easily refuse the CFO's request.
10. I have complete control over whether I want to follow the CFO's request.
11. It would mostly up to me whether or not I should refuse the CFO's request.
12. I decide to refuse the CFO's request.
13. (A 7-point likely scale is used, ranging from completely disagree (1) to completely agree (7))

REFERENCES

Ajzen, I. (1985), "From intentions to actions: a theory of planned Behaviour ", in Kuhi, J. and Beckmann, J. (Eds.), Action control: From cognition to behavior Heidelberg: Springer, pp. 11-39.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Process*, Vol. 50, pp. 179-211.

Ajzen, I. and Fishbein, M. (1980), Understanding attitudes and predicting social behavior, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Ajzen, I, and T.J. Madden. (1986), "Prediction of goal-directed behavior: attitudes, intentions, and perceived behavioral control", *Journal of Experimental Social Psychology*, Vol. 22, pp. 453-474.

Alexander, C. S. and Becker, H. J. (1978), "The use of vignettes in survey research", *Public Opinion Quarterly*, Vol. 42, pp. 93-104.

Bagley, P. L., Dalton, D. and Ortegren, M. (2012), "The factors that affect accountants' decisions to seek careers with Big 4 versus Non-Big 4 accounting firms", *Accounting Horizons*, Vol. 26 No. 2, pp. 239-264.

Bandura, A. 1982. "Self-efficacy mechanism in human agency" *American Psychologist*, Vol. 31, pp. 122-147.

Bentler, P. M. (1990), "Comparative fit indexes in structural models ", *Psychological Bulletin*, Vol. 107 No. 2, pp. 238-246.

Bentler, P. M. and Bonett, D. G. (1980), "Significance tests and goodness of fit in the analysis of covariance structures", *Psychological Bulletin*, Vol. 88, pp. 588-606.

Buchan, H. F. (2005), "Ethical decision making in the public accounting profession: an extension of Ajzen's theory of planned behavior", *Journal of Business Ethics*, Vol. 61, pp. 165-181.

Byrne, B. M. (2010), Structural equation modeling with AMOS basic concepts, applications, and programming, Routledge New York

Cavanagh, G. F. and Fritzsche, D. J. (1985), "Using vignettes in business ethics research", in Lee, E. P. (Ed.), Research in Corporate Social Performance and Policy. JAI Press Inc., Greenwich, CT.

Carpenter, T. D., and J. L. Reimers. (2005), "Unethical and fraudulent financial reporting: applying the theory of planned behavior", *Journal of Business Ethics*, Vol. 60, pp. 115–129.

Campbell, H. L., Barry, C. L., Joe, J. N. and Finney, S. J. (2008), "Configural, metric, and scalar invariance of the modified achivement goal questionnaire across African American and white university students", *Educational and Psychological Measurement,* Vol. 68, Iss 6, pp.988-1007.

Cheung, G. W., and R. B. Rensvold. (2002), "Evaluating goodness-of-fit indexes for testing measurement invariance", *Structural Equation Modeling*, Vol. 9, No. 2, pp. 233-255.

Cohen, J., Pant, L., and Sharp, D. (1994),"Behavioral determinants of auditor aggressiveness in client relations", *Behavioral Research in Accounting*, Vol. 6, No. 1, pp. 121-43.

Douglas, P. C., and Wier, B. (2005), "Cultural and ethical effects in budgeting systems: A comparison of U.S. and Chinese managers", *Journal of Business Ethics*, Vol. 60, No. 2, pp. 159-174.

Fan, Y. H., Woodbine, G., Chen, W., (2013), "A study of Australian and Chinese accountants' attitudes towards independence issues and the impact on ethical judgements", *Asian Review of Accounting*, Vol. 21, No. 3, pp.205-222

Fan, Y.H., Woodbine, G. F. and Scully G. 2014. *Guanxi*, a two-edged sword! How Australian accounting professionals view the process within a moral framework. *Managerial Auditing Journal*, 29(8)

Felton, S., Dimnik, T. and Northey, M. (1995), "A theory of reason action model of the chartered accountant career choice ", *Journal of Accounting Education,* Vol. 13 No. 1, pp. 1-19.

Finch, J. (1987), "Research Note: Vignette Technique in Survey Research", *Sociology* Vol. 21, No. 1, pp. 105-114

Forsyth, D. R. (1980), "A taxonomy of ethical ideologies", *Journal of Personality and Social Psychology*, Vol. 39 No. 1, pp. 175-184.

Gibson, A. M. and Frakes, A. H. (1997), "Truth or consequences: a study of critical issues and decision making in accounting ", *Journal of Business Ethics*, Vol. 16, pp. 161-171.

Gul, F., Ng, A. and Tong, M. (2003), "Chinese auditors' ethical behavior in an audit conflict situation", *Journal of Business Ethics*, Vol. 42, pp. 379-392.

Hair, J. F., Black, W. C., Banin, B. J. and Anderson, R. E. (2010), "Multivariate data Analysis: A Global Perspective", New York: Pearson.

Hong, S., Malik, M. L. and Lee, M. (2003), "Testing configural, metric, scalar, and latent mean invariance across genders in sociotropy and autonomy using a non-western sample", *Educational and Psychological Measurement,* Vol 63, Iss4, pp.636-54.

Hu, L. and Bentler, P. M. (1999), " Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives", *Structural Equation Modeling*, Vol. 6, pp. 1-55.

Hunt, S. D. and Vasquez-Parraga, A. Z. (1993), "Organisational consequences, marketing ethics, and salesforce supervision ", *Journal of Marketing Research*, No. February, pp. 78-90.

Jöreskog, K. G. and Sörbom, D. (1993), LISREL 8: Structural equation modeling with the SIMPLIS command language Scientific Software International, Chicago.

Kleinman, G., and D. Palmon. 2001. Understanding auditor-client relationships: a multi-faceted analysis. The United States Markus Wiener Publishers

Kohlberg, L. (1969), "Moral stages and moralization: the cognitive-development approach to socialisation.", in Goskin, D. (Ed.), Handbook of Socialization Theory and Research. Rand McNally, Chicago.

Little, T. D. (1997), "Mean and covariance structures (MACS) analyses of cross-cultural data: Practical and theoretical issues", *Multivariate Behavioral Research,* Vol. 32, pp.53-76.

Madden, T. J., Ellen, P. S. and Ajzen, I. (1992), "A comparison of the theory of planned behavior and the theory of reasoned action", *Pers Soc Psychol Bull*, Vol. 18, No. 1, pp. 3-9.

Padgett, B. C., Kim, H., Goh, B. K., and Huffman, L. (2013). "The usefulness of the theory of planned behavior: understanding US fast food consumption of generation Y Chinese consumers", *Journal of Foodservice Business Research*, Vol. 16, No. 5, pp. 486-505.

Raykov, T., and Marcoulides, G. A. (2012), A first course in structural equation modeling. Routledge.

Randall, D. M. and Gibson, A. M. (1991), "Ethical decision making in the medical profession: an application of the theory of planned behavior", *Journal of Business Ethics*, Vol. 10, pp. 111-122.

Rest, J. (1979), Development in judgment moral issues, University of Minnesota Press, Minneapolis.

Rest, J. R. (1986), Moral development: advances in research and theory, New York, Praeger.

Shafer, W. E. (2008). Ethical climate in Chinese CPA firms. *Accounting, Organizations and Society, 33*, 825-835.

Shafer, W. E. and Simmons, R. S. (2011), "Effects of organizational ethical culture on the ethical decisions of tax practitioners in mainland China", *Accounting, Auditing & Accountability Journal*, Vol. 24 No. 5, pp. 647-668.

Southey. (2011), "The theories of reasoned action and planned behaviour applied to business decisions: a selective annotated bibliography", *Journal of New Business Ideas & Trends*, Vol. 9 No. 1, pp. 43-50.

Stevens, J. M., Steensma, H. K., Harrison, D. A. and Cochran, P. L. (2005), "Symbolic or substantive document? The influence of ethics codes on financial executives' decisions", *Strategic Management Journal*, Vol. 26, pp. 181-195.

Tai, K. (2003), "Corporate Governance Study", available at: http://icf.yale.edu/research/china/newpage/cn/feature/mainland/corporate%20governance%20in%20china.htm (accessed).

Tsui, J. and Gul, F. (1996), "Auditors' behavior in an audit conflict situation: a research note on the role of locus of control and ethical reasoning", *Accounting, Organisations and Society*, Vol. 21 No. 1, pp. 41-51.

Tsui, J., and Windsor, C. (2001), "Some cross-cultural evidence on ethical reasoning", *Journal of Business Ethics*, Vol. 31, No. 2, pp. 143-150.

Vandenberg, R.J. & Lance, C.E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. Organizational Research Methods, Vol 3, pp. 4-70.

Whitcomb, L., Erdener, C. and Li, C. (1998), "Business ethical values in China and the U.S.", *Journal of Business Ethics*, Vol. 17, pp. 839-852.

Woodbine, G. F. (2002), "Moral choice in an agency framework and related motivational typologies as impacted by personal and contextual factors for financial institutions in China", Ph.D. Dissertation, Curtin University of Technology, Perth.

Woodbine, G. F. (2004), "Moral choice and the declining influence of traditional value orientations within the financial sector of a rapidly developing region of the People's Republic of China", *Journal of Business Ethics*, Vol. 55, pp. 43-60.

Wu, A. M., and Tang, C. S. K. (2012), "Problem gambling of Chinese college students: Application of the theory of planned behavior", *Journal of Gambling Studies*, Vol. 28, No. 2, pp. 315-324.

Yee, H., (2009) "The re-emergence of the public accounting profession in China: A hegemonic analysis", *Critical Perspectives on Accounting*, Vol. 20, No. 1, pp. 71-92.

Yee, H., and West B., (2010), "Accounting professionalisation and occupational context: The role of the public accounting profession in China", Working paper, Deakin University, available at: http://apira2010.econ.usyd.edu.au/conference_proceedings/APIRA-2010-308-Yee-Accounting-professionalisation-and-occupational-context.pdf

Yoon, C. (2011),"Theory of planned behavior and ethics theory in digital piracy: An integrated model", *Journal of Business Ethics*, Vol. 100, No. 3, pp. 405-417.

Zhen, P. H. (1999), "Regulation and organisation of accountants in China", *Accounting, Auditing & Accountability Journal*, Vol. 12, No. 3, pp. 286-302.

Analyzing Healthcare Management Data to Improve Glycemic Control for Management of Patients with Diabetes

Jing-De Weng ,Chun-Liang Lai(Corresponding author), Yang-En University, China

ABSTRACT

Since last decade, we have been confronted with the rapid growth of diabetic patients who have become one of the most important burdens of public health. The complications of diabetes can be slow or even prevented by glycemic control in advance. The purpose of this study is to investigate the ranking of features of glycemic control and compare the performance of four feature ranking methods with different classifiers. Four feature ranking methods including information gain, gain ratio, symmetric uncertainty, and ReliefF were used to rank the features of glycemic control. In order to compare the effectiveness of attribute selection, subsets of attribute were tested with three classifiers: C4.5, K nearest neighbor (KNN), and naïve Bayes. We presented a comparison of four feature ranking methods that produce ranked lists of features. The results show that feature selection is beneficial to improving the performance of common learning algorithms.

INTRODUCTION

Since last decade, we have been confronted with the rapid growth of diabetic patients who have become one of the most important burdens of public health. The prevalence of diabetes for all age-groups worldwide was 2.8% in 2000 and was estimated 4.4% in 2030 (Wild, Roglic, Green, Sicree, & King, 2004). The excess global mortality attributable to diabetes in the year 2000 was estimated to be 2.9 million, equivalent to 5.2% of all deaths (Roglic, Unwin, Bennett, Mathers, Tuomilehto, Nag, et al., 2005). Accompanied with different complications, diabetes has considerable influences on the quality of individual life and the use of medical resources. The complications of diabetes can be slow or even prevented by glycemic control in advance. In general, the health care quality of diabetic patients is evaluated by using Hemoglobin A1C (American Diabetes Association, 2006).

Feature selection objective is to select a minimal subset of features according to some criteria so that the performance can be achieved equally well. By choosing a minimal subset of features, irrelevant and redundant feature are removed. The purpose of this study is to investigate the ranking of features of glycemic control and compare performance of four feature ranking methods with different classifiers.

The remainder of this paper is organized as follows. The next section presents the background of feature selection and four feature ranking methods. Section 3 describes the classification algorithms and performance evaluation. Section 4 describes the dataset, presents the classification results and compares the performance of classification models. Finally, Section 5 provides the conclusion and future work.

LITERATURE REVIEW

Feature selection methods can be grouped into two categories. One category is ranking features according to some evaluation criteria; the other is choosing minimum set of features that satisfies an evaluation criterion (Liu, & Motoda, 1998). Methods of feature ranking determine the importance of individual features, neglecting possible feature interactions (Duch, Grabczewski, Winiarski, & Biesiada, et al., 2002). Feature ranking algorithms evaluate each individual feature with a measure. A list of features are ranked according to evaluation measures. Feature selection algorithms are described below:

Information gain (IG)

Entropy of the class can be present below (Liu, & Motoda, 1998):

$$H(C) = -\sum_{c \in C} p(c) \log_2 p(c) \quad (1)$$

$$H(C \mid A) = -\sum_{a \in A} p(a) \sum_{c \in C} p(c \mid a) \log_2 p(c \mid a) \quad (2)$$

A is an attribute and C is the class; each attribute is assigned a score based on the information gain between itself and the class.

$$IG(A) = H(A) + H(C) - H(A, C) \quad (3)$$

Gain ratio (GR)

Gain ratio is expressed as the following:

$$GR(A) = \frac{IG(A)}{H(A)} \qquad (4)$$

▌ Symmetric uncertainty (SU)

Symmetric uncertainty presents as follows:

$$U(A,B) = 2\frac{H(A) + H(B) - H(A,B)}{H(A) + H(B)} \qquad (5)$$

where H is the entropy function, $H(A,B)$: the joint entropy of *A* and *B* (Witten, & Frank, 2005).

▌ ReliefF

Kira and Rendell (1992) developed an algorithm called Relief which was shown to be very efficient in estimating attributes. Relief works by randomly sampling an instance from the data and then locating its nearest neighbours from the same and opposite class. The values of the attributes of the nearest neighbours are compared to the sampled instance and used to update relevance scores for each attribute.

Instead of finding one near miss M from different class, the algorithm finds one near miss *M(C)* for each different class and averages their contribution to updating estimates *W[A]*. The average is weighted with the prior probability of each class (Kononenko, 1994):

$$W[A] := W[A] - diff(A,R,H)/m + \sum_{C \neq class(R)}[P(C) \times diff(A,R,M(C))]/m \qquad (6)$$

Where function *diff* (Attribute; Instance1; Instance2) computes the difference between the values of Attribute for two instances. *A* is attribute, *R* is an instance, *H* is nearest hit, and *m* represents the number of instances for approximating probabilities.

CLASSIFICATION ALGORITHMS AND PERFORMANCE EVALUATION

In order to compare the effectiveness of attribute selection, attribute sets were tested with three classification algorithms: an instance-based learner KNN, a decision tree learner C4.5 (Quinlan, 1993), and a probabilistic learner Naïve Bayes classifier. KNN is an example of instance-based learning, for a new instance, the KNN algorithm assigns the classification of the most similar instance or instances (Larose, 2005). The similarity is calculated in terms of distance between instances.

Decision tree algorithm is probably the most extensively researched method of machine learning used in data mining. Decision tree uses algorithms to identify a variable and corresponding threshold for the variable that splits the input observation into two or more subgroups. This step is repeated at each leaf node until the complete tree is constructed. Decision trees are efficient and easy to use. Rules that are easy to interpret and understand can be generated. Naïve Bayes classification is based on Bayes rule of conditional probability and assumes all attributes are independent and that each attributes equals to the classification problem (Dunham, 2003).

In this study, we used classification accuracy and the area under ROC curve (AUC) to evaluate the performance of analysis models (Hanley, & McNeil, 1982). Classification accuracy is the principle and most commonly used measure. The AUC has an important statistical property; the AUC of a model is equivalent to the probability whether a randomly chosen positive instance will rank higher than a randomly chosen negative instance in the model (Fawcett, 2006). Roughly speaking, the larger the area is, the better the model.

EXPERIMENTS AND RESULT DISCUSSION

In this section we describe the dataset and discuss the experiment results.

▌ Dataset Description

This study used the clinical database of a teaching hospital in central Taiwan, where there are 110 physicians, six hundred hospital beds, 60 thousand outpatient services, and ten thousand inpatient services annually. There are 1498 instances in the data set. The features we collected including: age, onset period, body mass index (BMI), which are continuous data; gender, education, family history, regular exercise, daily drink, smoke, self-care, having comorbidity, using glucose monitor, and treatment, which are categorical data.

The comorbidity were divided into five categories, judging from ICD-9 diagnosis codes which were diabetes with renal complication, diabetes with ophthalmic complication, diabetes with neurological complication, diabetes with vascular complication, and diabetes with foot complication. Treatment were divided into three categories including diet control, oral medicine and insulin injection. Decision attribute A1C was classified into two levels: A1C＜9.0% was

considered to have good glycemic control; A1C≧9.0% was considered to have poor glycemic control (Rydall, Rodin, Olmsted, Devenyi, & Daneman, 1997).

▌ Results Discussion

Glycemic control data were used in experiments. Feature ranking was determined by the full data set using the Information gain, Gain ratio, Symmetric uncertainty, and ReliefF ranking algorithms. Three continuous features and ten categorical features were used in the dataset. The four feature ranking methods provide different rankings and obviously lead to different classification performance.

The ranking of features are listed in Table 1. The top five important features of glycemic control are age, treatment, self-care condition, education status, and regular exercise. The classifier C4.5, KNN (k=1), and Naïve Bayes were used to test the classification and AUC. We use the 10-fold crossvalidation as standard to predict the accuracy and AUC of a learning classifier with a fixed sample of data (Kononenko, 1994).

The classification accuracy and AUC are presented in Table 2 and Table 3 respectively. Compare the classification accuracy for C4.5 by using the four feature ranking methods, and the ReliefF ranking algorithm with five and six features obtained best classification accuracy of 73.56%. The ranking algorithm ReliefF with four features acquired best accuracy of 73.56% from KNN classifier. The ranking algorithm IG, GR, and SU with five features acquired best accuracy of 74.10% from NB classifier. Compared accuracy of C4.5 and KNN classifiers, NB obtained better accuracy than C4.5 and KNN model.

Compare the AUC for C4.5 by using the four feature ranking methods, and the ReliefF ranking algorithm with seven features obtained maximum AUC of .6199. The ranking algorithm ReliefF with five features acquired maximum AUC of .6251 from KNN classifier. The ranking algorithm IG, GR, and SU with five features obtained maximum AUC of .6553 from NB classifier. Compared with AUC of C4.5 and KNN classifiers, NB acquired better accuracy than C4.5 and KNN model.

Table 1. Ranking of features from most to least important with different criteria

No.	IG	GR	SU	ReliefF
1	Age	Age	Age	Education
2	Treatment	Self-care	Treatment	Family history
3	Education	Treatment	Self-care	Treatment
4	Self-care	Exercise	Education	Self-care
5	Exercise	Education	Exercise	Exercise
6	Comorbidity	Comorbidity	Comorbidity	Gender
7	Smoke	Smoke	Smoke	Glucose monitor
8	Glucose monitor	Daily drink	Glucose monitor	Comorbidity
9	Daily drink	Glucose monitor	Daily drink	Onset period
10	Gender	Gender	Gender	Age
11	Family history	Family history	Family history	Smoke
12	BMI	BMI	BMI	Daily drink
13	Onset period	Onset period	Onset period	BMI

Table 2. Classification accuracy of C4.5, KNN and NB

	C4.5				KNN	(k=1)			NB			
	IG	GR	SU	ReliefF	IG	GR	SU	ReliefF	IG	GR	SU	ReliefF
1	73.10	73.10	73.10	73.30	*72.70*	*72.70*	*72.70*	73.30	73.30	73.30	73.30	73.30
2	72.63	*73.63*	72.63	73.30	72.03	72.16	72.03	73.30	73.30	73.21	73.30	73.30
3	73.16	72.90	72.90	72.70	68.89	71.16	71.16	72.43	73.63	73.36	73.36	73.03
4	*73.36*	*73.63*	*73.36*	73.36	68.69	70.16	68.69	73.50	73.83	73.70	73.83	73.03
5	72.03	72.03	72.03	*73.56*	64.82	64.82	64.82	*73.56*	*74.10*	*74.10*	*74.10*	73.77
6	70.96	70.96	70.96	*73.56*	60.68	60.68	60.68	73.43	73.70	73.70	73.70	73.70
7	71.76	71.76	71.76	73.50	61.62	61.62	61.62	73.16	73.83	73.83	73.83	73.70
8	70.36	71.43	70.36	72.36	61.95	61.82	61.95	71.09	73.90	73.90	73.90	73.21
9	70.02	70.02	70.02	70.36	62.35	62.35	62.35	64.55	73.83	73.83	73.83	73.36
10	70.36	70.36	70.36	67.56	62.75	62.75	62.75	66.56	73.70	73.70	73.70	73.70
11	69.30	69.30	69.30	67.89	63.55	63.55	63.55	65.82	73.70	73.70	73.70	73.77
12	67.96	67.96	67.96	67.76	63.15	63.15	63.15	67.02	73.36	73.36	73.36	*73.97*
13	66.42	66.42	66.42	66.42	64.49	64.49	64.49	64.49	73.16	73.16	73.16	73.16
Avg	70.88	71.04	70.86	71.20	65.21	65.49	65.38	70.17	73.64	73.60	73.62	73.46

CONCLUSION AND FUTURE WORK

The purpose of this study is to explore the ranking of features of glycemic control and investigate performance of four feature ranking methods with different classifiers. We present a comparison of four feature ranking methods that produce ranked lists of features. The results show that feature selection is beneficial to improving the performance of common learning algorithms. It also shows that, there is no single best learning classifier for all situations.

We show that the classification and AUC of NB is significantly superior to that of C4.5 and KNN. For classifier C4.5 and KNN, ReliefF ranking algorithm performs best accuracy and maximum AUC; and for classifier NB, IG, GR, and SU perform the same accuracy and AUC. The conclusions drawn in this paper can have important implications in comparing feature ranking methods and learning algorithms. Other feature selection methods and classification models may be of interest for future research for improving accuracy and AUC.

Table 3. AUC of C4.5, KNN and NB

|	C4.5				KNN	(k=1)			NB			
	IG	GR	SU	ReliefF	IG	GR	SU	ReliefF	IG	GR	SU	ReliefF
1	0.5551	0.5551	0.5551	0.4993	0.5479	0.5479	0.5479	0.4933	0.5908	0.5908	0.5908	0.5391
2	0.5588	0.5700	0.5588	0.4993	0.5481	0.5413	0.5481	0.4933	0.6148	0.5940	0.6148	0.5345
3	0.5678	0.5840	0.5840	0.5113	0.5653	0.5585	0.5585	0.6066	0.6434	0.6220	0.6220	0.5708
4	0.5759	0.6063	0.5759	0.5527	*0.5675*	*0.5606*	*0.5675*	0.6239	0.6534	0.6318	0.6534	0.5944
5	0.5829	0.5829	0.5829	0.6064	0.5569	0.5569	0.5569	*0.6251*	*0.6553*	*0.6553*	*0.6553*	0.6140
6	0.5704	0.5704	0.5704	0.5978	0.5305	0.5305	0.5305	0.6180	0.6551	0.6551	0.6551	0.6098
7	0.5957	0.5957	0.5957	*0.6199*	0.5318	0.5318	0.5318	0.6203	0.6539	0.6539	0.6539	0.6076
8	*0.6191*	0.6079	*0.6191*	0.6156	0.5469	0.5315	0.5469	0.6100	0.6502	0.6544	0.6502	0.6160
9	0.6119	*0.6119*	0.6119	0.6002	0.5524	0.5524	0.5524	0.5789	0.6501	0.6501	0.6501	0.6186
10	0.6060	0.6060	0.6060	0.5778	0.5476	0.5476	0.5476	0.5577	0.6478	0.6478	0.6478	*0.6527*
11	0.5909	0.5909	0.5909	0.5741	0.5472	0.5472	0.5472	0.5473	0.6461	0.6461	0.6461	*0.6527*
12	0.5660	0.5660	0.5660	0.5725	0.5280	0.5280	0.5280	0.5628	0.6415	0.6415	0.6415	0.6525
13	0.5566	0.5566	0.5566	0.5566	0.5372	0.5372	0.5372	0.5372	0.6470	0.6470	0.6470	0.6470
Avg	0.5813	0.5849	0.5826	0.5680	0.5467	0.5440	0.5462	0.5750	0.6423	0.6377	0.6406	0.6084
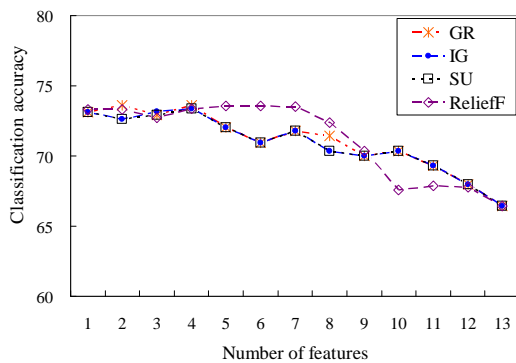
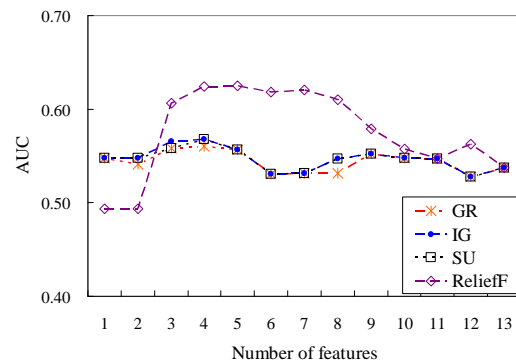Figure 1a Classification accuracy for C4.5
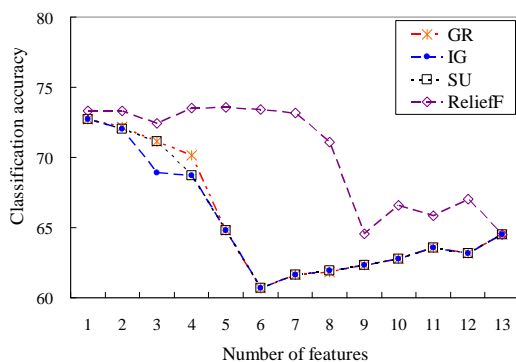

Figure 2a AUC for C4.5
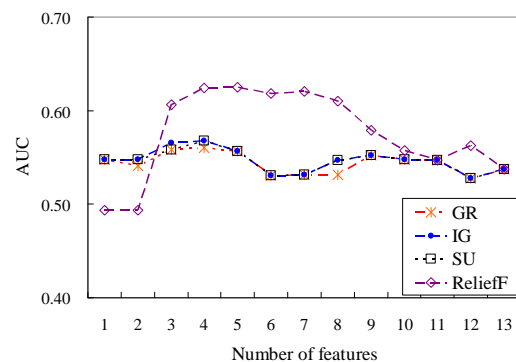

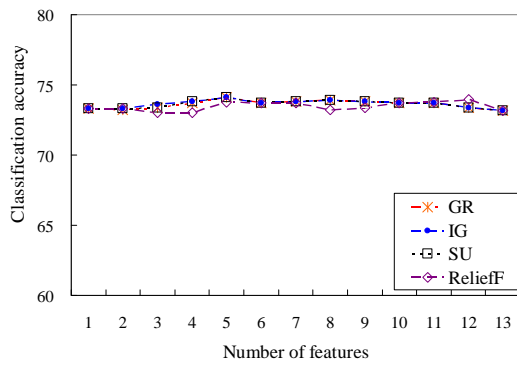Figure 1b Classification accuracy for KNN.

Figure 2b AUC for KNN

Figure 1c Classification accuracy for NB
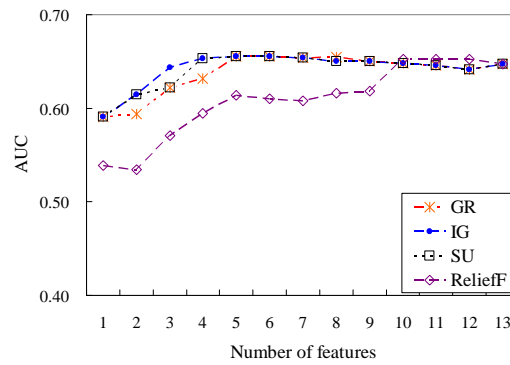

Figure 2c AUC for NB.

REFERENCES

American Diabetes Association (2006). Clinical Practice Recommendations 2006. Diabetes care, 29(S1).

Duch, W., Grabczewski, K., Winiarski, T., & Biesiada, J. et al. (2002). Feature selection based on information theory, consistency and separability indices. Paper presented at Proceedings of the 9th International Conference (ICONIP). 4, 1951-1955.

Dunham, M. H. (2003). Data mining: introductory and advanced topics. Upper Saddle River, NJ: Prentice Hall.

Fawcett, T. (2006). An introduction to ROC analysis. Pattern Recognition Letter, 27(8), 861-874.

Hanley, J.A., & McNeil, B.J. (1982). The meaning and use of the area under a receiver operating characteristic (ROC) curve. Radiology, 143, 29-36.

Kira, K., & Rendell, L.A. (1992). A practical approach to feature selection. Paper presented at Ninth International Workshop on Machine Learning, Aberdeen, Scotland, UK, 249-256.

Kononenko, I. (1994). Estimating attributes: analysis and extensions of RELIEF. Paper presented at European Conference on Machine Learning, Catania, Italy, 171-182.

Larose, D. T. (2005). Discovering Knowledge in Data: An Introduction to data mining. Hoboken, NJ: John Wiley & Sons.

Liu, H., & Motoda, H. (1998). Feature selection for knowledge and data mining. Boston: Kluwer academic.

Quinlan, J. R. (1993). C4.5: Programs for machinelearning. San Mateo, CA: Morgan Kaufmann.

Roglic, G., Unwin, N., Bennett, P.H., Mathers, C., Tuomilehto, J., Nag, S., et al., (2005). The burden of mortality attributable to diabetes: realistic estimates for the year 2000. Diabetes Care, 28(9), 2130-2135.

Rydall, A.C., Rodin, G.M., Olmsted, M.P., Devenyi, R.G., & Daneman, D. (1997). Disordered eating behavior and microvascular complications in young women with insulin-dependent diabetes mellitus. New England Journal of Medicine, 336(26), 1849-1853.

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global prevalence of diabetes: estimates for the year 2000 and projections for 2030, Diabetes Care, 27 (5), 1047-1053.

Witten, I.H., & Fran, k, E.(2005). Data mining: practical machine learning tools and techniques, (2nd ed.).Amsterdam: Morgan Kaufman.