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MULTINATIONAL, MULTICULTURAL, MULTILINGUAL LUXEMBOURG – A SYSTEM OF INTEGRATION OR A SYSTEM OF FAILURE?

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ABSTRACT

The purpose of this study is to describe and explain the Luxembourgish trilingual public education system and, consequently, to determine whether the Luxembourgish trilingual public education system is a system of success or of failure. 154 questionnaires were collected and 36 interviews conducted among 1) Luxembourgers with Luxembourgish Nationality (Lux.Nat.), 2) Luxembourg residents including Lux.Nat. and foreigners who reside in Luxembourg (Lux.All.), and 3) the rest of the world (World). More specifically cross-cultural management theories by Hofstede et al. (2010), Hofstede (2001) serve as basis for this multicultural research. The results indicate that most respondents prefer integration not separation of the population, the system should maintain its instruction in the three official languages of the country: Luxembourgish, French, German. Some of the interviews are reprinted; discussion, implications, and recommendations for future research follow.

Keywords: Language and management, Hofstede, education, cross-cultural management, international business, language, trilingual public education system, Luxembourg

1. INTRODUCTION

The language situation in Luxembourg has been subject to numerous researches, publications, discussions, debates (Fehlen, 1998a; Maurer-Hetto, 2009; Horner, 2007; Weber, 2008; Weber and Horner 2010), and reforms (FGIL, 2012; Kurschat, 2014, pp.4-9), involving even the OECD (Carey and Ernst, 2006). Despite these efforts a solution to the complexity of the situation – integration versus separation (Fehlen et al., 1998b) – seems a remote, unattainable goal. Plurilingual school education (Maurer-Hetto, 2008) goes in parallel with conflicts (Elcheroth, 2010, pp.40), and reflects the complexities and paradoxes of a multicultural national identity shaped by history (Kraemer, 1995, pp.74-75).

2. LITERATURE REVIEW

2.1. Luxembourg

The language situation in Luxembourg's schools is deeply anchored in the specific place the Grand Duchy of Luxembourg takes in Europe and in the world. With its small size of only 2,586 km², 82 km long and 57 km wide at its longest and widest points it is one of the smallest European countries. Its borders are with Germany (138 km), France (73 km), and Belgium (148 km) (The World Factbook). The resident population as of 1 January 2014 (statec, 2014) included 90,764 Portuguese, 37,158 French, 18,773 Italians, 18,159 Belgians, and 12,659 Germans. Cross-border workers make the specific situation (statec, 2013): Luxembourg's total population consisted of 537,000 inhabitants of whom 298,200 (55.53%) were Luxembourgers and 238,800 (44.47%) were foreigners. Domestic employment was 379,000. During the daytime, 156,900 cross-border workers came to Luxembourg to work, 39% of the domestic employment: 77,800 from France, 39,500 from Belgium, and 39,600 from Germany (Schinzel, 2013a,b). You have to genuinely understand the meaning of '*Mir welle bleiwe, wat mir sin*' [*We want to remain what we are*] (Berg, 1993).

The national language is Luxembourgish (Letzebuergesch), and administrative languages are French, German, Luxembourgish (statec, 2013). Citizenship is only awarded to people who speak Luxembourgish (Spizzo, 1995). The language defines the in-group (Briley et al. 2005) and the out-group. Those who speak Luxembourgish are part of the in-group and those who do not speak the language are part of the out-group.

2.2. MANAGEMENT SCHOLARS

Management scholars, such as Hofstede (2001), Hofstede et al. (2010) and House et al. (2004) have acknowledged that language has indeed an impact on culture. Hofstede (2001) defines culture as the “collective programming of the mind which distinguishes the members of one human group from another”. This explains the author’s choice of 3 different groups for the present research: Lux.Nat., Lux.All., World. This research does not investigate Hofstede’s 6 dimensions of culture, but rather the murky field of language and management, it tests their theory of culture across languages rather than across national borders, which is what the above mentioned management scholars do. Hofstede et al.’s (2002) criticism of his own theory goes, among others: “Nations are not the best units for studying cultures”.

Table 1 (Schinzel, 2012) shows Hofstede’s cultural dimensions of Lux.Nat., and Lux.All., Hofstede’s estimates on Luxembourg, his data for France, Germany, the UK, Belgium FR, Belgium NL, Italy, the Netherlands, China, the USA, and Japan, where the cultural differences become clear.

TABLE 1. CULTURAL COMPARISONS: THE AUTHOR’S LUXEMBOURG, LUX. NAT. IN COMPARISON WITH HOFSTEDÉ’S UK – BELGIUM FR – BELGIUM NL – ITALY – THE NETHERLANDS NL – CHINA –USA – JAPAN (ON A SCALE FROM 1-100, 1 BEING THE LOWEST AND 100 THE HIGHEST SCORE)

	The author’s Lux. Nat.	The author’s Lux. All.	Hofstede’s estimates on Luxbg	Hofstede’s France	Hofstede’s Germany	UK	Belgium FR	Belgium NL	Italy	NL	China	USA	Japan
PDI	29	36	40	68	35	35	68	61	50	38	80	40	54
UAI	95	97	70	86	65	35	93	97	75	53	30	46	92
IDV	34	51.5	60	71	67	89	71	78	76	80	20	91	46
MAS	54	47	50	43	66	66	60	43	70	14	66	62	95
LTO	65	69	64	63	83	51	82	82	61	67	87	26	88
IVR	55	53.5	56	48	40	69	57	57	30	68	24	68	42
MON	24	10	-	16.5	9.9	35.4	-	-	35.2	11.9	0	57.2	4.0

2.3. The Luxembourgish Public School System

The 1984 legislation on language made Luxembourgish the official language together with French and German. Despite the growing number of foreign children, Luxembourgish is the language of instruction in pre-school (age 3-6), with the aim to prepare pupils for the alphabetization in German in primary school (age 6-12). In secondary school (age 12-19), German as language of instruction will be replaced by French, until French is near mother tongue level (Kurschat, 2014b; Christmann and Sunnen, 2007). “Moreover, there are few alternatives for parents whose children cannot cope with the state school system. The small number of private, religious (i.e. Catholic) schools follows the state school curricula and students take exactly the same examinations, including the Secondary School Leaving Examination” (Weber and Horner, 2008, p.89). The only alternatives are the Lycee Vauban, the Waldorf School, the European School and the International School, but they tend to charge high fees and to cater for an international elite. “As a result, the only other option taken up by 3.6% of the school population is to attend schools just across the border mostly in Belgium or France (Berg and Weis, 2005, p.58).” Several reform systems are proposed, among them the idea that in Cycle 2 the alphabetisation should be in a language known by the pupils: Luxembourgish, French or Portuguese. However he also suggests 2 parallel systems: the French speaking and the German speaking (Weber, 2014a, pp. 10-11). Luxembourg needs to create an integrative education system and a language policy that prevents the loss in multilingualism (Fehlen, 2009; Houtsch, 2010). Fehlen, shows, despite its smallness, the complexity of the country and its society. However, he explains, Luxembourgish is mostly used as a spoken language. Its use as written language is limited, with the result that German is mostly used as a written language. Fehlen states that the instruction in French in secondary school is responsible for the high failure rate of pupils.

2. 4. Hypotheses

There are more issues to the research subject besides the five main themes 1) integration not separation of the population, 2) learn the three official languages of the country: Luxembourgish, French, German, 3) be prepared for the multilingual and multicultural reality in Luxembourg, 4) high failure rate given the fact that children do not understand the language of instruction especially in mathematics, biology, chemistry, history, and 5) pupils do not learn English well enough.

The author formulates the following three hypotheses.

Hypothesis 1: Lux. Nat. will highly favor trilingualism. Lux. All. will be less in favor of trilingualism. The rest of the world will be afraid of trilingualism in education.

Hypothesis 2: Lux.Nat. will be against bilingualism. Lux.All. will be less against bilingualism. The rest of the world will favor bilingualism.

Hypothesis 3: The other school options will be equally less preferred by all three categories: Lux.Nat., Lux.All., World.

Investigating the above formulated three hypotheses is the content of this research. The deployed methods, instruments, processes are described in the following chapters, providing the respective results from questionnaires, questionnaire's open questions and interviews. The objective is to validate the above formulated hypotheses and to come up with implications and discussions.

3. METHODS AND INSTRUMENTS

The first instrument was a questionnaire developed by the author in English, translated by mother tongue speakers into German and French and back translated for validity check. A five-point Likert-type scale was employed to indicate responses that ranged from 1=strongly disagree 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree. The first part of the questionnaire investigated the advantages of the trilingual public education system, the actual system. In a second part, the advantages and disadvantages of one of the proposed reform systems was investigated. In a third part, the respondents' personal opinion was questioned, respectively if they prefer the trilingual current public system, a bilingual system or rather any other education system. The second instrument were the interviews. Semi-structured interviews were carried out.

4. RESULTS AND DATA ANALYSES – QUESTIONNAIRE'S CLOSED QUESTIONS

The questionnaire provided the following results:

TABLE 2. WHAT ARE THE ADVANTAGES OF THIS TRILINGUAL PUBLIC EDUCATION SYSTEM (THE CURRENT EDUCATION SYSTEM)?

		Total	Lux.Nat.	Lux.All.	World
		N=152	N=62	N=110	N=42
1.1.	Integration of all children into the multicultural, multilingual, multinational environment in Luxembourg.	4.01	4.02	4.06	3.90
1.2.	Children learn 3 languages and have the opportunity to study in L, G, F.	4.13	4.31	4.13	4.17
1.3.	Children are educated following the multicultural education in Luxembourg.	3.82	3.88	3.85	3.69
1.4.	Children are prepared for the multilingual reality of Luxembourg, for the future, for work, for life.	4.05	3.97	4.04	4.05
1.5.	L+G+F is to be seen as ONE language, not three, we add English, Spanish as foreign language.	2.75	2.53	2.69	3.02
1.6	Often, none of the three languages (L+G+F) is the mother tongue of the children at home, but it is Portuguese, Italian, ..., what allows pupils an alphabetisation in L+G+F.	3.54	3.54	3.62	3.38

TABLE 3. WHAT ARE THE DISADVANTAGES OF THIS TRILINGUAL PUBLIC EDUCATION SYSTEM (THE CURRENT EDUCATION SYSTEM)?

		Total	Lux.Nat.	Lux. All.	World
		N=152	N=62	N=110	N=42
2.1.	Pupils do not understand the language of education and therefore cannot follow the content in e.g. biology, mathematics, chemistry...	3.30	3.42	3.35	3.19
2.2.	Pupils are not performing well in the field of study (e.g. biology, mathematics, chemistry...), because they don't understand the language.	3.29	3.53	3.34	3.14
2.3.	This causes a high failure rate.	3.17	3.46	3.33	2.76
2.5.	Loss of identity in terms of culture. Language is not only a method of communication but also determines my cultural identity, my: who am I?!	2.93	2.81	2.99	2.79
2.6.	Pupils do not learn English well enough. English is neglected. L+G+F favoured.	3.05	3.00	3.01	3.29

TABLE 4. WHAT WOULD BE THE ADVANTAGES OF THIS BILINGUAL PUBLIC EDUCATION SYSTEM (THE DISCUSSED PROPOSED BUT CONTESTED REFORM-SYSTEM: IN KINDERGARTEN THE LANGUAGE OF EDUCATION WOULD REMAIN LUXEMBOURGISH. BUT THEN THE CHILD WOULD HAVE THE CHOICE BETWEEN A FULL EDUCATION (PRIMARY AND SECONDARY) IN GERMAN LANGUAGE OF INSTRUCTION, OR IN FRENCH)?

		Total	Lux.Nat.	Lux.All.	World
		N=152	N=62	N=110	N=42
3.1.	All children still would learn Luxembourgish in Kindergarten.	3.91	3.85	3.87	3.95
3.2.	The choice of one language of instruction for primary and secondary education allows that children understand the content of instruction (e.g. biology, mathematics, chemistry...).	3.69	3.68	3.65	3.74
3.3.	The failure rate would decline.	3.30	3.27	3.36	3.19
3.4.	Children could better concentrate on the content of instruction than on the language of instruction.	3.66	3.69	3.70	3.55
3.5.	Better motivation of children who will be more motivated to learn the different subjects thanks to the taught language.	3.43	3.44	3.44	3.43
3.6.	Pupils could concentrate better on learning English .	3.24	3.21	3.20	3.48

TABLE 5. WHAT WOULD BE THE DISADVANTAGES OF THIS BILINGUAL PUBLIC EDUCATION SYSTEM (THE DISCUSSED PROPOSED BUT CONTESTED REFORM-SYSTEM)?

		Total	Lux.Nat.	Lux. All.	World
		N=152	N=62	N=110	N=42
4.1.	This reform system would be a separator of the population – those who speak German – divided from those who speak French.	3.60	3.86	3.67	3.40
4.2.	This separation in 2 different languages would divide the society into different levels.	3.36	3.60	3.46	3.12
4.3.	Children/Pupils would not be prepared for the multilingual reality in Luxembourg, where at least L, G, F are needed in	3.62	3.95	3.75	3.31

	everyday situations.				
4.4	There might not be enough teachers in Luxembourg capable of teaching and/or in German and/or in French in primary and secondary school.	2.88	2.88	2.78	3.19
4.5	There would be an administrative problem, because this division would duplicate all classes, new school rooms would be needed, new schools would need to be constructed.	3.44	3.57	3.46	3.48
4.6	This language division (in German or French) would re-enforce the cultural division into German or French culture .	3.58	3.76	3.63	3.50
4.7	Other countries (Germany, France,) also experience the same problem with immigrant children not understanding the language of instruction in class.	3.29	3.31	3.22	3.52

TABLE 6. WHAT IS YOUR PERSONAL OPINION. WHICH SYSTEM WOULD YOU PREFER?

			Total	Lux.Nat.	Lux.All.	World
			N=152	N=62	N=110	N=42
5.1.1	I prefer the trilingual public education system (the actual system: in Kindergarten Luxembourgish as language of education, in primary school German, and in secondary school French)?	yes no Total	98 54 152	53 (84%) 9 (16%) 62 (100%)	77 (65%) 33 (21%) 110 (100%)	22 (52%) 20 (48%) 42 (100%)
5.1.2	I prefer the bilingual public education system (the system under discussion, where children decide which language of education they chose for both primary and secondary school: German or French)?	yes no	45 105	9 (16%) 53 (84%)	27 (24%) 82 (66%)	19 (45%) 23 (55%)
5.1.3	I prefer other options: (please complete the three questions below only if you answered this question with yes)	yes no	56 92	23 (36%) 37 (64%)	41 (37%) 67 (63%)	15 (34%) 26 (63%)
	5.1.3.1 There is the choice to go to European School for an education in your mother tongue.	Average	2.93	2.73	2.95	2.81
	5.1.3.2 There is the choice to go to International School, or St. George , for a full education in English.	Average	2.62	2.49	2.48	3.11
	5.1.3.3 There is the choice to go to Lycee Français for a full education in French.	Average	2.67	2.51	2.55	3.13

84% of the "Lux.Nat" prefer the trilingual public education system, with only 16% against it. Regarding the bilingual reform system, only 16% were for it, whilst 84% were against it. Other schools were considered negatively by 64%, but positively by 36%.

69% of the "Lux.All." are for the current trilingual public education system, 21% are against it. The bilingual system is preferred by 24%, and rejected by 66%. Other schools are preferred by 37% with 63% against them.

52% of the "Rest of the world" are for the current trilingual public education system, 48% are against it. The bilingual system would be preferred by 45%, and rejected by 55%. Other schools are preferred by 34% with 63% against them.

5. RESULTS – QUESTIONNAIRE'S OPEN QUESTIONS AND INTERVIEWS

By keeping the three categories, 1) Lux.Nat., 2) Lux.All., 3) World, the open questions' responses provided in-depth insight into serious reflections of directly concerned parents, whose children follow the

Luxembourgish trilingual education system, or who consider doing so or who hypothesize in case of an eventual move to Luxembourg.

Among the 36 interview responses the main themes already mentioned and questioned above re-appeared. Other themes were discussed. Here is what participants wrote and said:

	Open questions	Interviews
Lux.Nat. respondent who is for the trilingual system	<i>"I followed the Luxembourgish school system and today I am very happy to have done it (as my origins are Portuguese). I must admit that it was very hard: German lessons and some matters (biology / geography) were given in German. I felt alone as nobody (my parents) could support me on a day to day basis with my homework. My child is in the Luxbg school system. I speak Luxembourgish, Portuguese and French with my own child..."</i>	<i>"We absolutely have to stick to our trilingualism. This is our identity, our culture. It represents a challenge and at the same time our wealth. In France, in Alsace, there is a similar situation: they also have trilingualism: French, German, Alsatian, and the Alsatians also speak well English"</i>
Lux.Nat. respondent who is against the system	<i>".... The Luxembourgish education system is not the best, pupils don't have enough knowledge, following the PISA results, especially in sciences, biology, physics, chemistry, philosophy. They only learn these matters by heart without any generation of own ideas or any creativity. ... Motivation in general is low. ... School teachers lack knowledge themselves and teach frontally without any inspiration ... What misses at their language level is the mastering of one language. Pupils express themselves badly in written and orally in all languages. ... Pupils' only wish is to become school teacher or civil servant because of the fringe benefits. There is no real motivation, nor enthusiasm ..."</i>	<i>"The main issue is the division into 'Lycee Classique' and 'Lycee Technique' Integration is a complicated matter. The integration of the Portuguese children is lagging behind. The reality is that the good Luxembourgers go to 'Lycee Classique' where they speak Luxembourgish and German, but the bad Portuguese and French attend 'Lycee Technique' where they speak French</i>
Lux.All. respondent who is for the trilingual system	<i>"... It is an enormous chance for our children to be given the possibility of learning three languages. ... Knowing to speak three languages opens up their mind for other languages, cultures and knowledge ... Yet, we should teach better our teachers. ... Today my son speaks five languages, despite the initial problems with German, he had needed extra tutorial lessons ..."</i>	<i>"... We have to keep trilingualism at all costs. When I started going to school, I spoke only Italian as my parents only spoke Italian with me. I rapidly learned Luxembourgish, French and German and later English. But mathematics is a matter I just don't understand, in whatever language ... It's fantastic, with my language knowledge, I can travel everywhere in the world ... We have to continue to have our children develop in a multilingual society ... " (Respondent : Italian living in Luxbg)</i>
Lux.All. respondent who is against the trilingual system	<i>"... The requirements are too high. Strong pupils are able to follow, weaker not. Languages should be taught differently. French and German should be taught together from primary school on, and additionally offer extra tuition classes for weaker pupils. ... Luxembourg pupils have problems with French, whereas others with German. ... European School, International School, St. George ... are no public schools and therefore</i>	<i>"... Time spent with the instruction of three languages is at the detriment of the matter of its own. At the moment children in Albania or in France study 'history' or 'mathematics', the real content of it, because the linguistic problems are not given. Here the language is dominant, not the content "</i>

	<i>not for free ...</i>	(Respondent : Albanian living in Lxbg)
'World' respondent who is for the trilingual system	<i>"I think a trilingual system best prepares a child for the realities of Luxembourg and Europe. However, as a teacher, I would certainly think there would be issues switching from one language in primary to a second language in secondary. It would be better to study in German and French all the way through. My husband and I are both bilingual English and Spanish, however, we tend to speak mostly in English out of habit ..."</i> (Respondent from Canada)	Future research is needed to get an interview in this category. So far none has occurred.
'World' respondent who is against the trilingual system	<i>"I think the current system is too complicated to be followed by a Chinese family, because we were taught English in China, so it is very difficult to learn 3 new languages, not only for the child but also for the parents. I just feel this is too complicated"</i> (Respondent from China)	<i>"Language is a highly contested subject in Quebec in general and particularly in Montreal. I always refused that my children learn English at low age, because it is important that they master their mother tongue first"</i> (Respondent from Quebec, Canada)

7. CONCLUSION, DISCUSSION, IMPLICATION AND FUTURE RESEARCH

This research has brought light to the particular elements of trilingualism in Luxembourg. A huge majority respondents from Lux.Nat., Lux.All., and the rest of the world provided astonishingly similar answers. From the questionnaires, the written open questions and the interviews no significant differences in the results emerge. Only one question regarding preference of the system showed significant differences between Lux.Nat., Lux.All., and the rest of the world. Hypotheses 1, 2, 3 were validated. Trilingualism is part of the Luxembourgish constitution, namely Luxembourgish, French and German are the three official languages of the country. It is the characteristics of the country, it is its culture, its collective programming of their mind (Hofstede et al., 2010). While Cummins (2000) researches Canada's language situation - French-English - and García (2009, 2014) in the USA - Spanish-English – tends to translanguaging, Blackledge and Creese (2010) situate linguistic practices in their respective social, historical, cultural and political contexts, Brannen, Piekkari and Tietze (2014) combine language and management and Schinzel (2013) uses language as identifier.

This research paths the way for more studies in the field of multilingualism and multiculturalism. In a world of increasing separation, conflict, crisis and war, the integrative, tolerant system of Luxembourg may serve as an example for peace, integration, tolerance, and harmonious coexistence.

Luxembourg is searching for new visions. Right in the heart of Europe, Luxembourg fights for peace, integration, tolerance, harmonious coexistence among people from different race, color, and mother tongue, qualities that are becoming increasingly rare in today's world. Future research could investigate into a comparison with Canada, Alsace, Switzerland, China, combining language and management.

In conclusion, even though the language situation in Luxembourg has been subject to many discussions, debates and reforms, numerous questions concerning future developments remain unanswered: What will the future of Luxembourg look like? Where does Luxembourg go? Where does the current developments lead to? Will it be the multilingual integrative direction (Maurer-Hetto, 2008), or will it be the monolingual, separatist direction? The ongoing continuous changes reflect the mood of modification that reigns. Luxembourg searches for its visionaries, just like Europe, in memory of Victor Hugo, Winston Churchill, Alcide de Gasperi, Robert Schumann, Jean Monnet, and Altiero Spinelli (Bumb, 2014, pp.2-3).

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THE PROFESSORIAL ROLE: REFLECTIONS FROM ANCIENT ATHENS TO THE WORLD WIDE WEB

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ABSTRACT

This paper reviews the historical and sociological development of the role of the professor from Before Christ through the Middle-Aged European ascent to the deep impact of the internet. It addresses the challenges to the modern tripartite role to include the massification, commodification and administratization of the profession. It concludes with some recommendations for the modern professoriate.

Keywords: professorial role, Socratic method, massification, commodification, administratization

1. INTRODUCTION

Robison (2013) aptly pointed out the tripartite job of the professor as a teacher, a writer and a service provider; and likened it to a triple-threat actor who sings, dances and acts – three very different professional activities. The image of Jennifer Lopez springs to mind, Hollywood's highest paid Latin actress and pop singer who got her high-profile start as an energetic Fly Girl dancer on the 1990s American television comedy series *In Living Color*. Lopez is also a successful author, fashion designer and producer. These additional roles might equate to an academic department chair or program director on a lesser scale. The analogy continues when one considers the term *edutainment* – the combination of education and entertainment. Moreover, Robison continued, the professoriate may look like a cushy job to outside observers but it has never been an easy career and it is not getting any easier. Fairweather (2002) reported only 22% of the professors in this study performed all three roles well while Astin, Astin and Lindholm (2011) added a list of increased pressures affecting the modern professoriate to include (in no certain order): more online courses and the considerable learning curve of this technology; budget cuts affecting pay, benefits, programming, equipment and staffing; loss of perceived job security through decline/elimination of tenure and full-time positions; increased expectations from accrediting agencies; Increased pressures for faculty scholarship funding/grant money; demanding students; competition from MOOCs (free online courses) with questionable quality and rigor. To this I would add increased class size and increased administrative workload.

2. ORIGINS OF THE PROFESSION

The passing of knowledge from designated teachers to adults in a place of gathering has been documented by historians as early as 400 BC. Perhaps the most famous higher educational lineage began in Greece with Socrates (Figure 1). The Socratic Method, a prolonged series of leading questions and answers which develops critical thinking, self-examination and challenges assumptions, is still used widely in modern day law, medical and some business; letters and science; and military schools (Tucker, 2007). Ben Franklin, Abraham Lincoln and Winston Churchill, too, were proponents of the method throughout their political careers.

FIGURE 1. THE WESTERN ORIGINS OF ACADEMIA (ADAPTED FROM GRUN, 1982)

Socrates>Plato's Academy>Aristotle's Lycium>Alexander the Great>Ptolemy (founded Alexandria Center of Greek Learning and the Library of Alexandria)>Arcesilaus (founded Second Academy of Athens)

Haskins (1923) reported that the ancient Greeks and Romans "had no universities" although Delbanco (2012) pointed out, "in Augustan Rome, gatherings of students under instruction by settled teachers took on some of the attributes we associate with modern colleges". Hence, the word *academy*, borrowed from Latin *academia*, "the name of a park and a school near Athens where Plato taught" (Chambers, 1988). Plato's pupil, Aristotle, taught Alexander, who, after conquering most of the Western world, inspired

Ptolemy to create the Alexandria Center of Greek Learning which had a library and a museum. Ironically one of Plato's lessons, "politics should not be about power", was countermanded by his pupil, Alexander; and the pursuit of power continues to poison the mind of contemporary authorities around the world. Nevertheless, the ancient curriculum consisted of instruction in Roman law, rhetoric, music and philosophy. Sadly, the world's first library at Alexandria was destroyed by fire in 47 BC but managed to resurface as perhaps the original book publisher for hundreds of years until destroyed by Arabs in 641. The history of higher education is somewhat obscure until the eleventh century. Certainly monasteries and other worldwide religious institutions promoted their faiths and philosophies through central gatherings but these can hardly be considered advances in knowledge (with the possible exception of wine and beer production); translations notwithstanding.

Hilal (2012), a contributor to Wikipedia, reported that the ancient University of Timbuktu (circa 1100) in Mali, West Africa, had 25,000 students from all over Africa who studied religion, mathematics, geography, science, medicine and history. Wikipedia claims this as "the world's first university". There were four levels within the University curriculum that included the Circle of Knowledge, the Superior Degree, the Secondary Degree and the Primary Degree. Meanwhile McClusky and Winter (2012) noted that China, too, possessed "great bodies of learning" at Shang Xiang school founded in the Yu Shun Era. However, this writing will focus on the Western development of the idea of the university and its professors.

Other mediaeval universities began in Italy and France. Bologna and Paris are credited with expanding and popularizing the institution in the twelfth century but the first recorded one was the University of Salerno in Southeast Italy which existed "as early as the middle of the eleventh century". Salerno, however, was only a school of medicine. Bologna was a many-sided institution to include the revival of Roman law which previewed the renaissance of the twelfth century. Bologna was founded by a student guild whereas Paris was run by a faculty guild, the predecessor to modern day faculty governance (Rashdall, 2010). Faculty governance continues to be a hallmark of institutions of learning (McClusky and Winter, 2012).

Early European universities, with the notable exception of the Alexandria Center of Greek Learning (307 BC), were somewhat mobile: they had no libraries, laboratories, museums, endowments, boards of trustees, catalogs, athletics, or buildings of their own. Early universities rented private halls or churches to meet. They were congregations of students who paid their teachers ("masters") a fee to learn from them and receive a certificate. The professors formed guilds which required for admission certain qualifications ascertained by examination, "so that no student could enter [except with] the guild's consent". This certificate, a license to teach, became [one of] the earliest form[s] of academic degree. It is interesting to note that modern-day master's degree recipients (teachers of the bachelors) still use their master's degree to compete for teaching positions at the community college level.

The University of Paris, established a school of theology in 1200, spawned sixty-eight colleges throughout Paris during the three hundred years later. Eighty-some additional universities spread to different parts of Europe including Cambridge and Oxford by the end of the Middle Ages. Mediaeval professors taught one or more of seven liberal arts: grammar, rhetoric, logic, arithmetic, geometry, astronomy or music in a large hall – the center of college life – where dining, theatre and music also took place. Professors, then known as Masters, were permitted to marry and live with their family in an attached house. Perhaps this is why the undergraduate degree is still called "bachelors": students of this age were not expected to be married. In any case, Delbanco continued, "It was important for undergraduates to witness social and intellectual exchange among their superiors in the hope that they would aspire someday to be worthy of sitting among them".

American universities have their roots in the European university system (McCluskey and Winter, 2012), especially Germany where "the German model was a comprehensive research university ...influenced American universities even now". Hence the word *chancellor*, first recorded as the head of a university around 1300. The word *professor*, too, is borrowed from Old French *professeur*, and directly from Latin *professor*: a person who professes to be expert in some art or science, a teacher of the highest rank (Chambers). American colonial colleges were patterned after Oxford and Cambridge but had some important differences. First, the university became a configuration of colleges "each with its own heritage, tradition, funding and emphasis" (Thelin, 2011). Next, enrollments at Harvard, Yale, the College of New

Jersey and the College of William and Mary remained intentionally small – under a hundred students a year – until major growth occurred in the 1800s. A landmark event occurred in 1900 when the presidents of fourteen universities met to form the Association of American Universities (AAU). The charter members included: Harvard, Hopkins, Columbia, Chicago, California, Clark, Cornell, Catholic, Michigan, Stanford, Wisconsin, Pennsylvania, Princeton and Yale. Large-scale philanthropy ensued and a revival of gothic architecture and elaborate university planning occurred. Many wealthy donors were not even alumni or college graduates but believed in the national importance of higher education.

3. ENTER THE INTERNET

Regarding the constrained resources period (1990 – present) of the American research university, Taft, Perkowski and Martin (2011) pointed out the obvious “explosion” of online courses/programs and that universities are pressured to increase class enrollments due to revenue challenges from domestic and global economic forces. Tomei (2006) predated and perhaps preempted the aforementioned 2011 study and concluded that online teaching demanded a minimum of 14% more time than traditional instruction, most of which was spent preparing instructional content. The weekly impact on teaching load also varied considerably between the two formats...asynchronous communication continues to represent the greatest use of technology in terms of quantity of student-teacher interaction...traditional students required 136.5 hours of faculty interaction while the online format demanded 155.83 hours...therefore, the calculation of ideal class size for the traditional classroom (in 170 available semester hours) was 17...[and] for online was 12...online teaching should not be expected to generate larger revenues by means of larger class sizes at the expense of effective instructional or faculty over-subscription...

At the author's university there is continuing pressure to increase class size despite the research on this but class sizes in the twenties do not seem unreasonable or unmanageable. The author also notes that the challenges outlined above by Tomei are multiplied and further compounded in the accelerated, compressed teaching format featured at his own university, especially in consideration of an administrative workload approaching or perhaps exceeding 40% of the total workload.

Continently, Noble (2001) reported that “in the course of 1997 events at two large North American universities [UCLA and NYU] signaled dramatically that we were entering a new [automated] era in higher education”; and codified it “the commodification of higher education”. He continued, once faculty and courses went online, administrators gained much greater direct control over faculty performance and course content than ever before.

McCluskey and Winter (2012) also corroborated that the online course can be considered the biggest revolution in the history of the university. Assessment in digital courses can be done more rigorously because there is more data. Course-to-course comparison has become a distinct capability of the internet and has redefined the role of the traditional professor from that of “individual craftsman” to “digital collaborator who is a partner in a learning enterprise”. Coleman and Bandyopadhyay (2011) concurred and cited research from Wang (2009) “collaboration becomes the essential competency in the current knowledge society”.

4. AN UPDATE ON THE TRIPARTITE ROLE OF THE PROFESSOR

In 1968 the American Association of University Professors (AAUP) statement on faculty workload suggested 40% teaching, 40% research and 20% service. Maneing updated this in 1991 and stated “many professional associations [now] recommended 80% teaching, 5% research and 15% service”. At my own university, percentages are closer to 50% teaching, 10% research and 40% service. While percentages will vary between institutions and positions (and rank within institutions) the point is professors do a lot more than teach.

McCluskey and Winter (2012) aptly pointed out the role of the professor shifted from philosopher/questioner in Ancient Greece and Rome to expert lecturer during the Middle Ages. Yet it is interesting to note that the terminal degree for most disciplines is still called a Doctor of *Philosophy* (in *x*); and many doctoral curricula require a beginning course in epistemology, the subset of philosophy that attempts to answer “*how do you know what you know?*”? I was completely convinced after I took this course in my own doctoral program that I didn't know anything about anything: a humbling experience indeed. In another example, Dr. Albert Einstein, the renowned 20th Century physicist, also contributed

meaningful works on the history and philosophy of science. Professor Einstein, as told by Isaacson (2007) enjoyed going for walks after class with his students and “talking shop” to include scientific philosophy at Cafe Terasse in Zurich in the early 1900s.

The shift from philosopher/questioner to teaching *expert* (while maintaining some roots in philosophy) continues to typify the modern professor. However, the emphasis on expertise/ knowledge creation i.e., research is perhaps best summarized by Macfarlane (2012) who said, “Despite institutional rhetoric claiming an equal valuing of teaching, service or knowledge transfer activities, in practice the research profile of the individual is the dominant criterion rather than other aspects of their work”. This is certainly the case at my university. *Publish or perish* is alive and well so it seems.

Professors normally work in isolation from other professors: writing and teaching are mostly solitary activities. Delbanco (2012) acknowledged college teaching as a delicate and difficult art requiring both confidence and tact, putting students under pressure and clarifying complex ideas. The lecture can be likened to performance art [hello Jennifer Lopez] hopefully characterized with distinction vs. boredom. Yet the physical, emotional and cognitive act of teaching in front of students (or online) is only one aspect of the teaching role.

Ironically, professors are not trained to teach (with the possible exception of professors of education) but they are taught to research. The entry ticket to university teaching is of course, the doctorate (from the Latin *docere*, meaning “to teach”). The original medieval doctors were tested for ecclesiastical knowledge at the University of Paris in 1213 and granted the license to teach by the pope. As of 2014 there are 26 different kinds of doctoral degrees in the United States, mostly in health-related fields but also in arts, music, government and management. There are numerous international variations.

As for the service role of the professor, Buller (2010) identified this as the “maligned stepchild of the academic triad” and continued explaining “teaching is the service we provide our students [while] scholarship is the service we provide our discipline or to society at large”. Einstein added, after considerable thought (in his later years when asked the purpose of human life) “our purpose is to serve others... what other purpose could there be?”

Yet service that is not teaching or scholarship only accounts for approximately 10% of the professor’s role at most academic institutions (arguably much higher at many institutions such as mine). Service can be to the program one teaches in (such as course updates or program reviews); to the discipline (such as referee or editor to papers or academic conferences); to the department (such as hiring new faculty); to the School (such as grade appeals committee); to the university (such as academic senate); to the community (such as workshops or public information); or to any combination of the samples above. Service can also include leadership opportunities such as a committee chair, department chair or membership on boards. Moreover, the increasing number and scope of administrative tasks such as ordering textbooks, staffing adjuncts and the endless curricula reporting requirements used to be the responsibility of administrative or teaching assistants but now relegated to the professor. I call this “administratization” of the role of the professor. This less important work significantly detracts from the professor’s intellectual contributions to teaching and scholarship.

Additional service to students can also take the form of academic advising (curriculum advice based on the student’s long-term interests) or perhaps thesis selection as another example. Mentoring is another form of service, independent of advising or teaching, and it can be accomplished with students or with junior faculty. Buller (2010) described mentoring as “helping to shape the future, one life at a time” by being a good role model, providing objective guidance, support and *career* advice. He also recommended defining the goals of the relationship at the start, encouraged risk-taking and helping the protege become successful on their own terms not necessarily the mentor’s standards.

McCluskey and Winter added, “in searching for the heart and soul of a university, it cannot be found anywhere but in a strong faculty voice and shared governance” and “there should be a Chinese Wall between the administrative functions...and its academic life”. Moreover, “what is needed now is a synthesis that respects the traditional role that faculty play in academic leadership while at the same time modernizing the university for the digital age”. Bravo. Hopefully the “Chinese Wall” will prevent administrators from further administratizing the role of professor which is the case at my university. Yet

Buller (2010) aptly pointed out that “service on committees is one of the most important ways in which college professors participate in shared governance...”.

5. RECOMMENDATIONS FOR THE FUTURE OF THE PROFESSORiate

Thankfully, the time-honored tradition of shared governance continues to be an item of evaluation by many regional and discipline-specific accreditation bodies. The business equivalent of shared governance has gained wide support in the management literature (less so in practice) and is frequently termed empowerment or participative decision-making. The concept of shared governance in academia, however, is subject to wide interpretation by administration and faculty. For example, should professorial representatives (i.e., academic senators, task forces or union officials) be consulted in hiring and promotion decisions and, if so, to what degree of involvement or approval? Most universities have faculty policies that dictate faculty involvement in such decisions. Given the unusually high intelligence level of the professoriate as compared to other institutions it makes sense to ask professors for their recommendations on decisions which affect them. After all, we are the educational elite of society; and quite capable of expressing ourselves. In the absence of these shared governance bodies the professoriate may be in danger of eroding the time-honored practices of academic freedom, academic integrity and perhaps the entire institution of higher education. Nevertheless I remain cautiously optimistic!

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MULTI-CRITERIA ANALYSIS OF DISTRICT HEAT GENERATION TECHNOLOGIES IN LITHUANIA

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ABSTRACT

District heat sector is one of the most important energy sectors in Lithuania. Based on energy policy priorities in Lithuania comparative assessment of heat generation technologies was performed. There are several main criteria useful for assessment of energy technologies in district heating selected from energy policy priorities analysis. The aim of the paper is to assess biomass technologies in district heating. The main tasks of the paper are: to analyse priorities of Lithuanian energy policy and based on these priorities to analyse, compare and rank the heat generation technologies in Lithuanian district heat sector.

Keywords: District heat, heat generation technologies, multi-criteria analysis, comparative assessment.
JEL classification: Q02, Q28, Q29, Q20.

1. INTRODUCTION

In 2011 EU has prepared the Roadmap for moving to a competitive low-carbon economy in 2050. With it's this plan the European Commission is looking beyond these 2020 objectives and setting out a plan to meet the long-term target of reducing domestic emissions by 80 to 95% by mid-century. The plan indicates how the sectors responsible for Europe's emissions - power generation, industry, transport, buildings and construction, as well as agriculture - can make the transition to a low-carbon economy over the coming decades (Streimikiene, Balezentiene, 2012).

EU authorities promoted the use of Renewable Energy Sources for heating and cooling uses (RES H&C) in order to reduce primary energy dependency and the stress of demand on primary energy resources. From an energy policy perspective, the substitution of natural gas by RES for these uses would contribute to a reduction in primary energy dependency and reduce stress on natural gas energy resources, thereby leading to a higher level of GHG abatement as required by EU energy strategy. However, although there is a wide range of technologies based on RES H&C, they cover only 2–3% of global energy demand for H&C (excluding traditional biomass). In fact, if biomass is included and we refer only to EU-27 MSs, the RES H&C consumption represented 11.9% of final heat use in 2008 (Cansino, Pablo-Romero, Yniguez, 2011 (Cansino, Pablo-Romero, Yniguez, 2011)).

The main aim of the paper is to assess biomass technologies in district heating. The main tasks of the paper are: to analyse the main criteria of sustainable district heating and to analyse, compare and rank the biomass technologies for heat generation in Lithuania according the main criteria of sustainable energy development.

2. CRITERIA FOR RANKING OF ENERGY TECHNOLOGIES IN DISTRICT HEAT

The EU Commission has issued several strategic documents concerning the future of energy, such as Energy 2020 - A strategy for competitive, sustainable and secure energy issued at the end of 2010 and the Energy Infrastructure Package. The European Union energy policy is facing huge challenges and changes. The operational environment of energy policy is facing challenges concerning the constantly growing demand for energy, its availability, and the threat scenarios brought about by climate change. Energy policy choices are highly significant in the effort towards a balance of economic, social and environmental factors necessary for sustainable development. For ranking of energy technologies in district heat the sustainable energy development criteria were selected based on priorities of sustainable energy policy: security of energy supply and competitiveness in terms of lower energy prices, energy efficiency improvement, increase the share of renewables in energy consumption, reduce of GHG emission (Roos et al, 2012).

In order to assess energy technologies in district heat the following sustainable energy development criteria were selected based on the analysis of priorities of Lithuanian energy policy: security of supply, heat generation costs, primary energy factor, renewable energy fraction and carbon dioxide emission factor.

Security of energy supply will be assessed by applying scores from 1 to 3 where 3 – the highest security of energy supply; 1- the lowest security of energy supply.

The competitiveness will be assessed by comparing heat generation costs. These costs for energy technologies in district heat will be assessed by applying the following formula (Dzenajaviciene, 2012):

$$SS = KAPS + KS + KES + PES; \quad (1)$$

Here: SS - heat generation costs, Lt/MWh, KAPS - capital costs, Lt/MWh, KS - fuel costs, Lt/MWh, KES- variable operation and maintenance costs, Lt/MWh, PES - fixed operation and maintenance costs, Lt/MWh..

Primary energy factor *PER* (primary energy factor for supplied heat) is assessed based on the following formula (Dzenajaviciene, 2012):

$$PER(i) = \frac{\sum_{i=1}^n E_{K(i)} * PER_{non} - (E_{elCHP(i)} - E_{el}) * PER_{EU}}{\sum_{j=1}^n Q_{tj}} \quad (2)$$

here, *PER(i)* -primary energy fact or for heat delivered to the building from a DH grid and/or individual heating system within a considered period (one year); MWh/MWhdh; *PER_{non}* - non-renewable primary energy factor for the fuel *i*, *E_{K(i)}* -net energy content of fuel *i* delivered to the gate where it is finally converted to heat (using lower heating value); *PER_{EU}* - primary energy factor for electricity is set to 2.6 as average for EU fuel mix; *E_{elCHP(i)}* - net produced electricity in co-generation plants measured at the output of the plant. Only applicable for electricity produced in CHP mode; *E_{el}* - all use of electricity for operating the heating network; and *Q_{tj}* - delivered heat to the building; building, *j*, at system boundary. For DH this is the same as measured heat at building system boundary which is the primary side of the substation.

Carbon dioxide emission factor *CO₂* define the fuel supply chain CO2 emissions, when one energy unit, lower heating value, of a fuel is extracted, refined, stored and transported and finally converted to useful heat, kg CO₂/MWh_{dh}. Carbon dioxide emission factor for energy technologies in district heat is assessed according to the formula (Dzenajaviciene, 2012):

$$CO_2 = \frac{\sum_{i=1}^n (E_{K(i)} * CO_{2(i)}) - \frac{\sum_{j=1}^n (E_{elCHP(i)} * CO_{2(i)})}{\eta_{el}}}{\sum_{j=1}^n Q_{tj}} \quad (3)$$

CO₂- CO₂ emission factor for delivered heat provided to the building, kg CO₂/MWh; *CO_{2(i)}*- CO₂ emission factor for fuel *i*, kg CO₂/MWh; *E_{K(i)}* - net energy content of fuel *i* delivered to the gate where it is finally converted to heat (using lower heating value); *E_{elCHP(i)}* - net produced electricity in co-generation plant from fuel *i* (produced electricity minus auxiliary electricity use). If more than one fuel is used in CHP mode the electricity produced from fuel *i* can be approximated the energy input fraction from fuel *i* to the CHP, *η_{el}*- default electrical efficiency condensing for a conventional thermal power plant set to 40 %; *E_{el}* - all use of

electrical energy for operating the heating network; and Q_{ij} - delivered heat to the building, j , at system boundary. In case of DHS heat delivered to building sub-station.

Criterion of renewable energy fraction $AEId$ is introduced to specifically support the use of renewable and surplus energy in district heating systems. The criterion presents the content of the fuels delivered to the gate where they are finally converted.

Renewable and recycled energy fraction $AEId$ is calculated according to formula (Dzenajaviciene, 2012):

$$AEId = 100 * \frac{\sum_{i=1}^n E_{K(i)} * AEId_{K(i)}}{E_K} \quad (4)$$

here $AEId$ - share of renewable and recycled energy of the district heating system, %; $AEId_{K(i)}$ - renewable and recycled energy factor for fuel i , between 0 and 1; $E_{K(i)}$ - energy content of fuel i allocated to DH (lower heating value); and E_K - energy content of all fuels allocated to DH (lower heating value).

In the following chapter energy technologies in district heating will be assessed based on the defined criteria by applying data collected from Lithuanian district heat companies.

2. MULTI-CRITERIA ASSESSMENT OF BIOMASS TECHNOLOGIES FOR HEAT GENERATION

Multi-criteria decision making (MCDM) methodology is a suitable tool for sustainable energy development (Stein, 2013). The Multi-criteria method Topsis was introduced by Brauers and Zavadskas (2006) and employed in various areas of research (Brauers et al., 2011, 2012a, 2012b; Brauers, 2013; Hwang, Yoon, 1981; Behzadian et al., 2012), was employed for the analysis.

The algorithm of TOPSIS method is presented according to Hwang and Yoon (1981) and Behzadian et al. (2012). The TOPSIS method will use the same weighted normalized values from Eq. 5, thus let **Error! Objects cannot be created from editing field codes..**

Firstly, positive-ideal and negative-ideal solutions, denoted respectively as **Error! Objects cannot be created from editing field codes.** and **Error! Objects cannot be created from editing field codes..**, are identified in the following way:

$$\text{Error! Objects cannot be created from editing field codes.}, \quad (5)$$

$$\text{Error! Objects cannot be created from editing field codes.}, \quad (6)$$

where **Error! Objects cannot be created from editing field codes.** and **Error! Objects cannot be created from editing field codes.** are the sets of benefit and cost criteria, respectively.

The n -dimensional Euclidean distance then measures the distances of each alternative from the positive-ideal solution and the negative-ideal solution:

$$\text{Error! Objects cannot be created from editing field codes.}, \text{ for Error! Objects cannot be created from editing field codes.}, \quad (7)$$

$$\text{Error! Objects cannot be created from editing field codes. Error! Objects cannot be created from editing field codes.}, \text{ for Error! Objects cannot be created from editing field codes.}, \quad (8)$$

with **Error! Objects cannot be created from editing field codes.** and **Error! Objects cannot be created from editing field codes.** being obtained from Eqs. 7 and 8, respectively. Finally, the relative similarity to the positive-ideal solution is calculated (proximity to positive and remoteness to negative values):

$$\text{Error! Objects cannot be created from editing field codes.}, \quad (9)$$

where **Error! Objects cannot be created from editing field codes.** with **Error! Objects cannot be created from editing field codes.**. The closeness coefficient approaches its lower bound, i. e. zero, if a certain alternative gets more similar to the negative ideal solution (alternative), and increases if the former alternative becomes remoter to the negative ideal solutions. The best alternative can therefore be found according to the preference order of **Error! Objects cannot be created from editing field codes.**.

3. RESULTS OF COMPARATIVE ASSESSMENT OF HEAT GENERATION TECHNOLOGIES

Comparative assessment of six heat generation technologies can be performed by employing the following criteria relevant for sustainable energy development: primary energy factor, non-renewable energy factor, carbon dioxide emission factor and renewable energy fraction. The data for energy technologies assessment in district heat sector was collected from Lithuanian district heat companies (Dzenajaviciene, 2012). Thus, the autonomous heating technologies were compared by applying a set of the quantitative criteria and qualitative criteria (Table 1):

TABLE 1. THE INITIAL DECISION MATRIX.

	Standard primary energy factor, MWh/MWh chs	Newly prepared primary energy factor, MWh/MWh chs	Standard CO ₂ emission factor, kg/MWh	Newly prepared fuel CO ₂ emission factor, g/MWh	Production costs at thermal capacity of 10 MW, Lt/MWh	Production costs at thermal capacity of 50 MW, Lt/MWh	Renewable energy fraction, %	Security of supply, scores, 1-3	Income from heat sales, Lt/MWh
	C1	C2	C3	C4	C5	C6	C7	C8	C9
Desirable trend	-	-	-	-	-	-	+	+	-
1. Natural gas boiler house	1.6	1.25	325	220	170	160	0	1	175
2. Oil shale boiler house	1.6	1.25	359	350	160	150	0	2	165
3. Biofuel boiler house	1.25	1.39	1	10	99	99	100	3	125
4. Natural gas CHP with internal combustion engine	0.98	0.5	150	125	190	175	0	1	120
5. Natural gas CHP with gas turbine	0.98	0.5	150	125	190	160	0	1	125
6. Biofuel CHP	0.97	1.00	1	5	125	115	100	3	70

The initial decision matrix was normalised by employing Eq. 5 and 6. All the objectives were considered as equally important and therefore no weights were used. The resulting normalised decision matrix is given in Table 2. Note that all the variables are now expressed in dimensionless numbers.

TABLE 2. THE NORMALISED DECISION MATRIX.

	C1	C2	C3	C4	C5	C6	C7	C8	C9
1.	0.518	0.488	0.615	0.489	0.436	0.448	0.000	0.200	0.532

2.	0.518	0.488	0.679	0.778	0.410	0.420	0.000	0.400	0.501
3.	0.405	0.543	0.002	0.022	0.254	0.277	0.707	0.600	0.380
4.	0.317	0.195	0.284	0.278	0.487	0.490	0.000	0.200	0.364
5.	0.317	0.195	0.284	0.278	0.487	0.448	0.000	0.200	0.380
6.	0.314	0.391	0.002	0.011	0.320	0.322	0.707	0.600	0.213

The TOPSIS method was further employed for MCDM. As it was already said, the TOPSIS method uses the same normalised values given in Table 5. The ideal solutions were found in terms of Eqs. 8 and 9. The Euclidean distances were then estimated as defined in Eqs. 7 and 8. The following Table 3 presents these computations.

TABLE 3. DISTANCES FROM THE IDEAL SOLUTIONS FOR THE TOPSIS METHOD.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	S_i^*/S_i^-
<i>Ideal solutions</i>										
A^*	0.314	0.195	0.002	0.011	0.254	0.277	0.707	0.600	0.213	
A^-	0.518	0.543	0.679	0.778	0.487	0.490	0.000	0.200	0.532	
<i>Distances from the positive ideal solution (S_i^*)</i>										
1	0.042	0.086	0.376	0.229	0.033	0.029	0.500	0.160	0.102	1.556
2	0.042	0.086	0.459	0.588	0.024	0.020	0.500	0.040	0.083	1.842
3	0.008	0.121	0.000	0.000	0.000	0.000	0.000	0.000	0.028	0.157
4	0.000	0.000	0.079	0.071	0.054	0.045	0.500	0.160	0.023	0.933
5	0.000	0.000	0.079	0.071	0.054	0.029	0.500	0.160	0.028	0.922
6	0.000	0.038	0.000	0.000	0.004	0.002	0.000	0.000	0.000	0.045
<i>Distances from the negative ideal solution (S_i^-)</i>										
1	0.000	0.003	0.004	0.084	0.003	0.002	0.000	0.000	0.000	0.095
2	0.000	0.003	0.000	0.000	0.006	0.005	0.000	0.040	0.001	0.055
3	0.013	0.000	0.459	0.571	0.054	0.045	0.500	0.160	0.023	1.826
4	0.040	0.121	0.156	0.250	0.000	0.000	0.000	0.000	0.028	0.596
5	0.040	0.121	0.156	0.250	0.000	0.002	0.000	0.000	0.023	0.592
6	0.042	0.023	0.459	0.588	0.028	0.028	0.500	0.160	0.102	1.929

The closeness coefficients, C_i , were then obtained by the virtue of Eq. 10. The heat generation alternatives were then ranked in descending order of the coefficients (Table 4).

TABLE 4. RANKING BY THE TOPSIS METHOD

	C_i	Rank
1	0.058	5
2	0.029	6
3	0.921	2
4	0.389	4
5	0.391	3
6	0.977	1

Application of TOPSIS method enabled to rank the heat generation option in terms of multiple criteria. The carried out analysis suggested biofuel CHP, biofuel boiler house, and natural gas CHP with internal combustion engine as the most sustainable options for heat generation, in that order. On the other hand, natural gas boiler house and oil shale boiler house were the lowest ranking options.

4. CONCLUSIONS

1. The several main criteria for assessment of energy technologies in district heating were developed. The criteria were evaluated by applying several indicators for district heat technologies: primary energy factor, carbon dioxide emission factor, renewable and recycled energy factor, long-term heat generation costs and energy efficiency including security of supply are the main criteria applied for the ranking of energy technologies in district heat
2. The 6 main heat generation technologies were assessed in Lithuanian district heat sector: natural gas and oil shale boiler houses, biofuel boiler –house burning wood chips and natural gas CHP with internal combustion engine, natural gas CHP with gas turbine and biofuel CHP plant using wood chips.
3. Multi-criteria Topsis method were applied for energy technologies ranking in district heat sector based on energy policy priorities in Lithuania: competitiveness, security of supply, energy efficiency improvements, and increase of use of renewables and GHG emission reduction.
4. The carried out multi-criteria analysis revealed that biofuel CHP, biofuel boiler house, and natural gas CHP with internal combustion engine as the most sustainable options for heat generation, in that order. On the other hand, natural gas boiler house and oil shale boiler house were the lowest ranking options mainly because of low renewable energy fraction, high CO₂ factor and low security of supply.

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THE IMPACT OF RELATIONSHIP ORIENTATION ON POSITIONAL ADVANTAGE OF THE COMPANIES IN SLOVENIA AND THE ROLE OF RELATIONSHIP VALUE

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ABSTRACT

Based on data of 150 Slovenian companies in B2B relationship, this study analyses the direct impact of relationship orientation, measured by adaptation and trust, as well as a relationship value on the positional advantage. In addition, the study investigates the moderating role of relationship value on the links between adaptation, trust, and positional advantage. In the preliminary phase we have tested the research model with ISM framework, while in the empirical detail study, we have used a non-parametric approach to structural equation modelling – partial least squares (PLS) modelling. We have found that both, relationship value and trust, directly affect the positional advantage, while adaptation does not. However, relationship value positively moderates the link between adaptation and positional advantage. Our research contributes to the existing literature and managerial practice by demonstrating the possible impacts of relationship orientation of B2B companies on positional advantage.

Keywords: Adaptation, trust, relationship value, positional advantage

1. INTRODUCTION

Many researchers have recognized that the intensity of B2B relationship between different relational variables and constructs as well as the outcome of specific relationship depends on moderating and mediating role of some other variables, constructs or characteristics of the company (for example: the characteristic of governance, creativity, business strategy, relational capital, type of industry, type of company, i.e. supplier, consumer, distributor etc., size of company, type of connections, cultural differences, learning and selling behaviour etc.) (Wang, Bradford, Xu, Weitz, 2008; Hadjikhani, Thilenius, 2009; Reimann, Schilke, Thomas, 2010; Claycomb, Frankwick, 2010; Park, Kim, Dubinsky, Lee, 2010; Kohtamaki, Vesalainen, Henneberg, Naude, Ventresca, 2012; Ritter, Walter, 2012; Voldnes, Gronhaug, Nilssen, 2012).

To advance this overall research stream, we build a preliminary research model with three antecedents' constructs: adaptation and trust as prevailing relationship orientation' groups of variables, relationship value as a moderating research construct, and positional advantage of the company as an outcome (consequence, result) of the relationship. We posit that adaptation, trust, costs of relationship, and relationship benefits affect the level of positional advantage of the company.

Relationship orientation is a desire of a company to engage in a strong relationship with a current or potential partner to conduct a specific exchange (Palmatier, Scheer, Evans, Arnold, 2008).

Adaptation is the concept that was introduced already in the early IMP studies (Ford, 1980; Hakansson, 1982). The seminal research focusing particularly on adaptation between companies was conducted by Hallen, Johanson and Seyed-Mohamed (1991). They investigated how adaptations are associated with the power balance in the relationship. The independent variables of the construct of inter-company adaptation in our research model have been collected from the above mentioned previous studies (Hagberg-Anderson, 2006; Canning, Hammer-Lloyd, 2002).

Trust is being discussed as an important moderator in the relationship marketing literature (Groenroos, 1994; Hakansson, Snehota, 2000; Morgan, Hunt, 1994), and an essential ingredient for successful relationships and relationship orientation (Dwyer, Schur, Oh, 1987). Every alliance is based on the thesis that companies must often "cooperate to compete" (Morgan, Hunt, 1994). Therefore, alliances characterized by effective communication generate trust between companies, which promotes cooperation (Sarkar, 2001; Wittmann, Hunt, Arnett, 2009). In our research, we have created the construct of trust on the base of the elements of trust from the relationship atmosphere dimensions taxonomy model suggested by Wong, Wilkinson and Young (2010).

Traditional academic and managerial view on conceptualization of value has been linked with the main goal of marketing which was to create exchange of goods and services for money or equivalent (Bagozzi, 1975; Kotler, 2003; Groenroos, 1997). Concentrating on marketing as exchange draws the marketers' attention to short-term value-in-exchange concept and away from customers' value creation concept. Instead of focusing on exchange, some authors suggested that marketing should take the creation of value for customers as its goal (Sheth, Uslay, 2007). Such concept of value has been discussed in the marketing literature very intensively at the end of 20th century and in the beginning of 21st century (Holbrook, 1994; Rust, Oliver, 1994; Groenroos, 1997; Eggert, Ulaga, Schultz, 2006). In our research we built the construct of relationship value on the conceptual research suggested by Ritter and Walter (Ritter, Walter, 2012).

There were a lot of theories and models in strategic management and strategic marketing in the past thirty-five years that have been appearing until now, which explain different views on competitive advantage of the companies and consequently on their business performance. Morgan (2012) defines a positional advantage as a relative value actually delivered to target markets, which is a result of the company's marketing strategy decision implementation efforts, and the cost of accomplishing this to the company. It has been viewed across a number of different value and cost dimensions as follows: product-based, service-based, price-based, cost-based, image-based, delivery-based positional advantages. The above mentioned dimensions of positional advantage represent the set of dependent variables (consequences) in the research model in our study.

2. RESEARCH

In the first phase of our research we have tested a validation of our theoretical structural research model with a framework for positional advantage of the company through relationship value by Interpretive Structural Modelling (ISM) (Sage, 1977; Srivastava, Singh, 2010). ISM can be used for identifying and summarizing relationships among specific variables, which define a problem or an issue. It provides us a means by which order and direction can be imposed on the complexity of such variables (Mandal, Deshmukh, 1994; Srivastava, Singh, 2010). Based on the above framework we have proposed the research hypotheses which have been empirically tested in the second phase of our research.

2.1. Development of hypotheses

As we have suggested in our theoretical research model, we have defined in the preliminary research 13 groups of variables and the possible relations between them based on previous literature review and with support of five experts from the companies and academia with relevant knowledge, skills, and background on the base of brain storming. On the base of ISM (Interpretive Structural Modelling) framework, suggested by Srivastava and Singh (2010), adaptation, trust, costs of relationship and relationship benefits are identified as antecedents of positional advantage.

In our empirical part of the research, we have measured the impact of two possible positive behavioural responses of the company in the relationship orientation process, i.e. adaptation and trust, on positional advantage of the company. In addition to this, relationship value in moderating role and its impact on positional advantage of the B2B companies have been measured. Therefore, on the base of our theoretical explanations and the results of ISM framework validation, we hypothesize:

H1a: Adaptation has a positive impact on positional advantage of the companies in B2B relationships.

H1b: Trust has a positive impact on positional advantage of the companies in B2B relationships.

H1c: Relationship value has a positive impact on positional advantage of the companies in B2B relationships.

Many researchers, who have investigated possible positive behavioural responses of the company in the relationship orientation process and their influence on positional advantages of the companies based on market offerings, posit, that perceived relationship benefits and perceived costs of relationship have some impact on the effectiveness and efficiency of the relationship orientation implementation of the company in the process of improving its competitive advantage on the market (Dwyer, Schur, Oh, 1987; Heide, John, 1992; Palmatier, Scheer, Evans, Arnold, 2008; Wittmann, Hunt, Arnett, 2009). In addition to this,

the ISM-based framework validation provides sound understanding on the factors to be taken into consideration for developing two meaningful moderating research constructs, i.e. costs of relationship and relationship benefits.

Despite the general assumption and the supporting empirical evidence that relationship benefits and costs of relationship are antecedents of relationship value, some authors agree that the relationship value construct should include four aspects: relationship value as perceived trade-off between benefits and costs, relationship value in relation to the role perceptions of the respondents, relationship value as a measure relative to the offerings of competitors, and relationship value as a multi-attribute concept (Ritter, Walter, 2012).

In our empirical research, we have considered such expanded version of relationship value perceived by CEO's of the B2B companies analysed. Thus, we posit that:

H2a: Relationship value positively moderates the impact of adaptation on positional advantage of the companies in B2B relationships.

H2b: Relationship value positively moderates the impact of trust on positional advantage of the companies in B2B relationships.

2.2. Research methodology

The data for empirical part of research have been collected from the statistical population of 398 Slovenian B2B companies. The study has used a web-based questionnaire which has been sent to CEO's of the companies. The response rate was 37.7%, i.e. 150 completed questionnaires. It is significant to add that the answers, received from the managers in the companies, reflect their subjective perception of the problem. Managers have been asked to consider B2B relations with their most important strategic customer in the sales market.

To test our nomological model, we have used a non-parametric approach to structural equation modelling – partial least squares (PLS) modelling (SmartPLS 2.0). There are a few reasons to choose such method of analysis. First, this study tests an explorative model with potentially alternative hypotheses: whether adaptation, trust and relationship value have positive direct effects on positional advantage of the companies, and/or whether relationship value moderates the impacts of adaptation and trust on positional advantage. Second, PLS modelling is well suited to testing interaction effects because of its ability to model latent constructs without measurement error. Third, PLS modelling does not require multivariate normal data. Fourth, a PLS model can be estimated using a body of cases that is a minimum of ten times the size of the number of constructs affecting the dependent variable (Kohtamaki, Vesalainen, Henneberg, Naude, Ventresca, 2012, 1303). Utilizing the logic of sensitivity analyses, we also tested the measurement model using exploratory factor analysis to confirm high discriminant validity alongside PLS.

In our empirical study we have employed reflective measurement models, as required by the application of a moderation model (Diamantopoulos, Siguaw, 2006). The items for main constructs that we have used in our empirical study have been collected by the relevant authors, who empirically investigated the constructs analysed in our research. The main constructs have been measured by five-point interval scales. Adaptation, trust and relationship value have been estimated by Likert scale (5 – strongly agree, 1 – strongly disagree), while positional advantage has been evaluated by 5 – point scale (5 – strong advantage, 1 – strong disadvantage).

The study measures adaptation with six individual items: adaptation in purchasing and marketing strategies, adaptation in product and service offering, adaptation in service delivery, adaptation in management processes, adaptation in human interaction, and adaptation in organizational structures (Holma, 2008).

Trust has been measured with nine items based on taxonomy model of buyer-seller relations in business markets suggested by Wong, Wilkinson and Young (Wong, Wilkinson, Young, 2010).

Relationship value has been assessed with items, measuring before mentioned four aspects: relationship value as perceived trade-off between benefits and costs, relationship value in relation to the role

perceptions of the respondents, relationship value as a measure relative to the offerings of competitors, and relationship value as a multi-attribute concept (Ritter, Walter, 2012).

Positional advantage as a dependent research construct in our empirical study has been measured with six items: product-based, service-based, price-based, cost-based, image-based, and delivery-based positional advantage (Morgan, 2012).

Based on the PLS analysis, all research constructs and items demonstrated satisfactory average variance, Cronbach's alpha coefficient, composite reliability and item loadings (all loadings are higher than 0.60 for the sample size $n = 85$). Therefore, we conclude that they show overall satisfactory discriminant validity and reliability.

After that, we have tested the validity of the constructs and items by exploratory factor analysis, maximum likelihood factoring, Promax rotation method as well as Bartlett's test of sphericity ($<.001$). Because all the items loaded on their main constructs have main factor loadings above .60 and side-loadings below .3, it means that such results show to us high discriminant validity alongside with the results of the PLS-analysis, in which we also have compared the item's main loadings and side-loadings. In the addition to this fact, we can conclude that convergent validity is satisfactory too.

2.3. Analysis and results

First of all, we have analysed the correlations between the main constructs. According to the variance inflation factor and correlations between the main constructs in the table, we can evaluate the level of multi-collinearity between the independent variables in an ordinary least squares regression analyses. It provides us an index that measures how much the variance of an estimated regression coefficient is increased because of collinearity. Because the highest correlation between the independent constructs (adaptation, trust and relationship value) has yield .41 (threshold $<.8$) and the variance inflation factor has been below 5 for all of the independent constructs, we can conclude that multi-collinearity is not statistically significant (Kutner, Nachtsheim, Neter, 2004).

In the next step of the research, we applied a PLS-analysis to investigate the research model and to test the hypotheses. In order to study individual moderating impact, the interaction terms have been created by standardizing the data. After that we have created the interaction terms by standardizing the data and multiplying the independent constructs (adaptation and trust) by the moderating construct (relationship value). We have tested the hypotheses in two models. In the model 1, we have tested all independent constructs: adaptation, trust and relationship value. In the model 2 we have tested the impacts of the interaction terms on dependent construct: positional advantage.

The results for the model 1 give us the information that relationship value positively and significantly impacts positional advantage of the companies in the sample ($\beta=.35$, $t=2.89$, $p<0.001$). On the other hand, the impact of adaptation is negative and non-significant ($\beta= -.10$, $t=1.64$, n.s.). Trust has a positive and statistically significant influence on positional advantage ($\beta=.48$, $t=3.23$, $p<0.01$). These constructs explain 19% of the variance in positional advantage. Therefore, we have confirmed hypotheses 1b and 1c, but hypothesis 1a has not been confirmed.

In the model 2, we have tested the impacts of the interaction terms on positional advantage. The interaction terms add a statistically significant 6% to the explanatory power of adaptation and trust. They all together explain 22% of the variance of positional advantage. This second model has shown to us that the impact of the interaction term between trust and relationship value is not significant ($\beta = 0.06$, $t = 0.87$, $p>.01$), while the effect of the second interaction term, in which relationship value moderates the link between adaptation and positional advantage, is significant ($\beta = 0.12$, $t = 2.35$, $p<0.01$). It means that the results provide support for hypothesis 2a but not support for hypothesis 2b.

Therefore, we can conclude that the adaptation causes positional advantage only when perceived relationship value is present. Thus, without relationship value, the effect of the adaptation on positional advantage is negative.

3. CONCLUSION

3.1. Theoretical and managerial implications

In the present research we have analysed the direct and indirect impact of three relational antecedents on positional advantage. Based on the analysis of Slovenian companies we have found that both relationship value and trust directly affect positional advantage of the companies, while adaptation does not. However, relationship value positively moderated the link between adaptation and positional advantage. This fact reinforces the value of examining the influence of adaptation in B2B context.

We argue that in the companies with higher relationship value in B2B exchange with their strategic customers as the result of subjective perceptions of managers, the perceived positional advantage of such companies in the market is stronger. This finding therefore contribute to earlier studies by providing evidence that perceived relational benefits and costs as well as perceived performance contributions that the companies gain from their strategic customers (e.g. market share, revenue, image, mutual respect, market information, technology) influence market performance of the companies (Ritter, Walter, 2012; Haas, Snehota, Corsaro, 2012; Park, Kim, Dubinsky, Lee, 2010). Our research contributes to these studies especially in putting positional advantage as a significant dimension of long-term market performance into outcome research construct.

Furthermore, the results also show that trust directly improves positional advantage of the companies in our sample. While some past studies confirm positive correlations between trust and some market and financial outcomes of the companies (Wong, Wilkinson, Young, 2010; Morgan, Hunt, 1994; Berry, Parasuraman, 1991; Dwyer, LaGace, 1986), we have provided additional evidence that trust perceived by managers in the companies significantly and directly influence the perceived level of positional advantage of their companies, especially by the elements of product, service and delivery.

However, our research could not support the hypothesis that relationship value enhances the link between trust and positional advantage. But on the other hand, most importantly, the results provide evidence that relationship value enhances the link between adaptation and positional advantage. We can argue that adaptation of the companies in our sample to requirements of their strategic customers does not have statistically significant impact on the positional advantage of these companies, while the high perceived relationship value enables enriched interaction and contribute to stronger perceived positional advantage of the analysed companies.

Thus, these results contribute to the literature on relationship marketing and, in particular, to discussions on interactions between relationship orientation of the companies on one side and different market and financial outcomes on the other side.

The results suggest that in B2B companies relationship managers should evaluate relationship benefits and costs as well as performance contributions through which it is possible to create high perceived relationship value, because it increases a positive linkage between adaptation and positional advantage. In addition to this fact, they need competences to adapt marketing and purchasing strategies, product and service offering, service delivery, management processes, human resources and organizational structure to the requirements of their strategic customers in the continuing bases. The consequences of continuing care on level of such adaptation with high level of perceived relationship value can improve market and financial performance of the companies through strengthen positional advantage of the companies.

3.2. Limitations and directions for further research

This study has some limitations; it had a relatively small sample of large Slovenian B2B companies, which limits the generalizability of the results. However, the dataset has been carefully selected. The next limitation is that the study deals with the data which are the result of subjective perceptions of the managers in the companies. The last group of limitations are of analytical nature. Nevertheless we have used a non-parametric approach with PLS modelling with its strengths and have utilized the logic of sensitivity analysis using exploratory factor analysis, there has been a limitation in the model, because we have not applied control variables to better understanding the nature of some relationships and research constructs. Hence, the test of the PLS results with another alternative model in PLS, which would utilize a formative measurement model, could be appropriate. Finally, the use of hierarchical regression analysis

to validate the robustness of our findings could be good solution in the next step of further deeper analysis.

Further research work could be focused toward detail analysis of particular dimensions of positional advantage as a consequence of relationship orientation. Next, it will be of great importance to test the influence of other relationship orientation' dimensions (e.g. opportunism, commitment, power and dependence, understanding) on positional advantage of the companies.

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COMPARATIVE ASSESSMENT OF COSTS OF ULTIMATE DISPOSAL FACILITIES FOR CARBON DIOXIDE STORAGE

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ABSTRACT

The paper presents new research and new cost calculation for carbon dioxide storage in Cuba and Lithuania and lessons from comparative assessment of carbon dioxide and RW storage costs in several countries. The paper compares the costs of the geological storage of CO₂ in several countries by applying the same unit - US cent/kWh.

Keywords: Carbon dioxide, ultimate disposal facilities, costs, comparative assessment.

1. INTRODUCTION

There is a lack of comprehensive and comparable data on CO₂ storage costs. Currently format, content and practice of cost estimates for geological storage of CO₂ vary considerably for both, - within and between countries. The paper presents new cost calculation for carbon dioxide storage in Cuba and Lithuania. The focus of the paper is on

Senior Project Business Capstone papers had no impact on the quality of the final Senior Capstone geological disposal costs. The paper aims to explore how the cost estimation methods for carbon dioxide disposal work in countries that have less data and information on the subject and to report the challenges and findings of these countries to other countries that are likely to have similar problems.

The paper is structured in the following way: in second section the literature review in the field of CO₂ cost assessment is presented, in third section on methodology the comparative assessment approach is briefly described and the costs of CO₂ storage are assessed in Cuba and Lithuania, in forthsection the results on carbon dioxide are generalized and in the last section conclusions were developed.

2. LITERATURE REVIEW

Several important studies on CO₂ storage costs were conducted in the US and other countries (Block et al., 2003; Allison et al., 2003; ECOFYS, 2005; Poyry, 2007; IEA, 2008; McKinsey&Company, 2008; Pacific North West National Laboratory, 2008; Global CC Institute, 2009; JRC, 2009; McCoy, 2009; EPA, 2010) however there are no generally accepted reference values for costs of carbon dioxide storage facilities. Studies dealing with this topic show that investment costs for carbon dioxide storage depend on the disposal concept, geographical location and whether the storage facility is offshore or onshore.

The most important recent study conducted in European Union (EU) on CO₂ storage costs is European Technology Platform for Zero Emission Fossil Fuel Power Plants (2011) study. The study indicated the cheapest storage reservoirs (large, onshore DOGF) and found that well construction costs are about 40-70% of total storage costs. The main conclusions of the study were that the wide ranges in total costs (up to a factor of 10) are more driven by (geo) physical variations rather than by the uncertainty of cost estimates (ZEP, 2011). It is necessary to emphasize that the range of costs for EU member states in the study includes the costs of liabilities ranging from 0.2-2 EUR/t CO₂ (0.26-2.6 US\$/tCO₂) having big impact on cost estimates. The literature review showed that costs for various storage options vary a lot. The widest ranges for CO₂ storage costs are provided by ECOFYS (2004) for enhanced coal bed methane recovery (ECBM) on shore ranging from 0 at depth storage under 1000 m to almost 40 US\$/tCO₂ at the depth of storage of 3000 m. According this study the main reason of such big ranges is the permeability of reservoir and depth of storage. The ECOFYS also developed data intensive Geocapacity decision support system (GDSS) software for EU Geocapacity project (2009) by applying the same top-down approach for carbon dioxide storage cost assessment.

In general the lowest costs (negative) are associated with enhanced oil recovery (EOR) or enhanced gas recovery (EGR) if revenues from oil or gas production are taken into account. The highest costs except ECBM at high depth are for saline aquifers (SA). The depleted gas fields (DGF) and depleted oil fields (DOF) on shore are next cheapest options following EOR.

The biggest ranges for SA on shore are provided by McCoy (2009) study – from 0.32 to 31.3 US\$/tCO₂. In recent study conducted in Latvia (Gusca et al., 2010) the costs of storage in on shore SA were assessed as ranging from 0.08 to 5.66 US\$/ tCO₂ avoided and depending mainly on injectivity conditions (depths, porosity, type of storage site). The biggest range of costs estimates for SA off shore are given by Global CCS institute (2009) study and Allison et al., (2003) ranging from 0.5 to 30.2 US\$/tCO₂. According (Global CC institute, 2009) the high permeability of reservoir can reduce cost by factor of 2. The wide range of costs are also related to site selection costs which vary from 25 Mill.US\$ to 150 Mill.US\$ or even more depending on the geology. The cost range for CO₂ storage in DGF and DOF are the same though some studies providing different cost estimates for these storage options indicating higher costs for DGF (Bock et al., 2003). The highest cost estimates for depleted oil and gas fields (DOGF) on shore and off shore are presented in IEA (2008) ranging from 10 to 25 US\$/tCO₂. The study explains that the main reasons for such differences are related to well construction costs which are the function of well depth. The similar high costs for DGF on shore and off shore are presented by Poyry Energy Consulting (2007) study. In the most studies reviewed the CO₂ storage costs in SA on shore and off shore are higher than for DOGF on shore and off-shore as well (ECOFYS, 2004; ZEP, 2011).

The literature review allowed revealing that for different storage options the different cost components are the most important and therefore the main drivers of the costs are different. However the specific studies present quite different structure of costs components for CO₂ storage.

The Department of Energy and the Environmental Protection Agency of USA (EPA, 2010a; 2010b) have developed a comprehensive methodology for the assessment of geological sequestration for US (TVE Public Power Institute, 2003). The study can be used as reference for developing rough cost estimates for CO₂ storage projects in other locations as presents the unit cost data and cost algorithm for specific cost items for different components of costs and doesn't require a lot of input data like in the case of complicated models and software developed by various studies.

3. COSTS OF CO₂ STORAGE

The main indicator for the comparison of CO₂ storage costs in this paper is the disposal costs per unit of electricity produced. In case of CO₂ storage all investments must be completed before starting CO₂ capture from power plants. The comparative assessment of CO₂ storage was performed by applying the indicator of disposal costs per unit of electricity produced. In addition the disposal costs per unit of CO₂ will be assessed and compared between Lithuania and Cuba.

There are a large number of parameters to be considered to realize the CO₂ storage project: geologic site characterization, monitoring, injection well construction, area of review and corrective actions, well operation, mechanical integrity test, post injection well plugging, and site care, financial responsibility, administrative costs (EPA, 2010a).

Cuba and Lithuania have not yet implemented geological storage of CO₂ in any of its variants and no methodology has been developed to estimate its costs. On the basis of the methodology developed by the United States Environmental Protection Agency (EPA) for economic assessment of the geological storage of CO₂ the preliminary estimation of storage cost of CO₂ in Lithuania and Cuba was performed (EPA, 2010a). Different types of CO₂ storage were selected for these countries. For Lithuania – SA and for Cuba – DGF. It is also possible to use in Cuba existing gas and oil reservoirs which are not yet depleted and to apply EOR and EGR techniques.

Until now there has been no capture and sequestration of CO₂ in Cuba in any of its variants but there is quite well elaborated opportunity of injecting CO₂ into one depleted gas field. Cretacic reservoir with capacity of 74.4 Mill.t is located in the Western part of the island and is 1310 meters deep. The storage option requires 3 wells for CO₂ injections however the existence of 1 reusable legacy well can reduce required number of wells up to 2. The power plant of 270 MW with CO₂ emission rate of 1.3 Mt per year and electricity generation of 1229 GWh/year was assumed for installation of CCS equipment.

In Lithuania there are 3 potential geological aquifer structures in South-West of the country: Vaskai 8.7 Million t), Syderiai (21.5 Million t), D11 (11.3 Million t) which can store totally 41.5 Million t of CO₂ (Sliupa et al, 2008). The Syderiai has the highest potential therefore this option was selected for the assessment of CO₂ storage costs in Lithuania. The biggest thermal power plant of 1800 MW was considered for installation of CCS. Electricity generation per year is 2938GWh and total CO₂ emissions from this power plant makes about 2 Mt/per year. The storage with capacity of 21.5 Mt can be used about 10 years for the injection of CO₂ emissions from this power plant. Table 1 shows the main characteristics of the thermal power plants and the reservoirs selected for CCS in Cuba and Lithuania.

TABLE 1. KEY PERFORMANCE PARAMETERS FOR CO₂ STORAGE IN LITHUANIA AND CUBA

No	Parameter	Lithuania	Cuba
1.	Power plant type, fuel and capacity, MW	Power plant, (fuel oil) 1800 MW	Thermal power plant, fuel oil, 270 MW
2.	Average annual electricity generation at power plant MWh	2938000	1 229 904
3	Power plant utilization rate, % of the year	65	52
5	Average CO ₂ emissions per year, Million t	2.10	1.13
6	CO ₂ capture rate, %	90	90
7	CO ₂ storage concept	Saline Aquifer	DGF onshore
8	Stratigraphy	Middle Cambrian	Cretacic
9	Lithology	Sandstone	Gravel, marl, limestone
10	Area of well spacing, km ²	26	33
11	Number of injection wells	3	3
12	Total number of monitoring wells	1	2
13	Injection pipe diameter, m	0.14	0.15
14	Injection depth, m	1458	1310
15	Reservoir thickness, m	57	33
16	CO ₂ supply pressure, MPA	15.3	13.9
17	Reservoir horizontal permeability, mD	400	5
18	CO ₂ storage capacity, Million t	21.5	74.4
19	Injection period, years	10	15
20	Volumes of CO ₂ to be stored per year, Mt	2.10	1.02
20	Volumes of CO ₂ stored during operation, Mt	21.5	15.3

The main costs components for CO₂ storage applied in EPA studies (EPA, 2010a) are the following: site characterization, injection well construction, monitoring, well operation, mechanical integrity test, area of review and corrective actions, site closure (post injection well plugging and site care), financial responsibility and administrative costs. The same cost components were applied for CO₂ storage assessment at Syderiai SA in Lithuania and in Cuba in DGF onshore. According methodology developed by EPA (2011) the unit costs are specified in terms of cost per site, per well, per square mile and other parameters depending on the characteristics of the cost item. The unit costs are applied to type cases which include specification for total area, depth, thickness, well infectivity, number of wells through time and other parameters (EPA, 2010a).

The costs of site characterization are highly depending on the requirements of the regulatory regime for the project. The main factor affecting the costs of site characterization is the area of review. According methodology developed by EPA the injection well construction costs is the most important component and it depends upon geological characteristics of the injection formation, number of wells needed and depth. The operation of the injection wells costs includes costs of measuring and monitoring equipment,

electricity costs, O&M costs, space costs, repair and replacement of wells and equipment, and estimated costs for the possibility of failure at the site and the need to relocate a geological sequestration operation. After the injection phase has ended, the owner or operator must close the site in a safe and secure manner and monitor the site during the post injection period. The financial responsibility and administrative costs are country specific and depend on national laws. These costs were not included in the costs assessment performed for Cuba and Lithuania. In EU liabilities are established under the EU Directive 2009/31/EC. The Study (ZEP, 20110) assumed that cost of liabilities makes from 0.2 to 2 EUR/tCO₂. If such costs would be added it would significantly increase costs estimates for Lithuania as EU member state.

The specific cost items for CO₂ storage in Cuba and Lithuania were selected from tables available in (EPA, 2010a) based on the type of storage and main characteristics of storage site presented in Table 1. The total costs of CO₂ storage in Lithuania and Cuba are summarized in Table 2. The costs assessed in US\$ (2008) were converted into US\$ (2010) by taking into account the exchange rate and annual inflation rate of 1.4% for the period 2008-2010.

TABLE 2. ESTIMATED COST IN LITHUANIA AND CUBA USING THE EPA METHODOLOGY

Activities	Costs (Million US\$ 2010)	
	Lithuania	Cuba
Geologic site characterization and licensing	1.95	0.56
Monitoring	1.03	2.7
Injection wells construction	9.25	4.3
Well operation and mechanical integrity test and corrective actions	1.65	2.2
Post injection well plugging, and site care	0.21	1.56
Total cost	14.1	11.29

As one can notice from Table 2 the obtained total costs of CO₂ storage are quite low. This is related with very low geological site investigation costs and not included costs of financial liabilities. Because of uncertainty in regulation regimes the case with lowest cost according current US Underground Injection Control regulation for Class I non-hazardous waste injection was selected as reference though 4 more stringent regulatory alternatives were available. Lithuania and Cuba does not have such regulations in place. The financial liability costs were also not included as they are unclear for both countries but it may raise the cost significantly.

Comparing CO₂ storage costs by items between Cuba and Lithuania one can notice that Cuba has lower geological site investigation costs as DGF is re-usable infrastructure and knowledge about geological formation is available. At the same time SA are less investigated and needs more resources for geological site investigation though the area of well spacing is quite similar for both countries. The monitoring costs are higher for Cuba, because of higher number of monitoring wells required. Injection well construction costs are higher for Lithuania because of more wells required and higher injection depth and reservoir thickness. The well operation costs are higher for Cuba because of lower reservoir horizontal permeability. Reservoirs with high permeability can reduce storage costs by a factor of 2 compared to reservoirs with lower permeability (Global CC Institute, 2009). The Post injection well plugging and site care costs are higher for Cuba because of higher number of total number of wells in the area 5 (3 injection wells and 2 monitoring wells). In Lithuania the total number of wells is 4.

The main uncertainties of evaluation are related with regulatory requirements applied in US and labor costs. There are no regulatory requirements for CO₂ storage applied in Cuba and Lithuania therefore US requirements were applied. The labor costs in Cuba are significantly lower than in US and Lithuania and this would also affect the cost estimates. Considering the uncertainties referred the costs estimated could be higher considering the particular characteristics of each country. Seeking to compare carbon dioxide storage costs per ton of CO₂ stored and per kWh of electricity produced in Lithuania and Cuba the Table 3 was developed.

TABLE 3. COMPARATIVE ASSESSMENT OF CO₂ STORAGE COSTS IN LITHUANIA AND CUBA

Country	Implementation	Evaluation method	Disposal concept	Total costs, Million US\$ (2010)	Storage capacity, Million t CO ₂	Disposal costs per t CO ₂ , US\$ (2010)	Electricity generated during life time period, mill kWh	Costs/kWh, US cent (2010)
Lithuania	Research	Based on own assessment	Saline aquifer	14.1	21.5	0.656	29380	0.05
Cuba	Research	Based on own assessment	Depleted gas reservoir	11.2	15.3	0.732	18449	0.06

As one can see from Table 3 the total costs of CO₂ storage in Lithuania in Syderiai SA are 14.1 Mill.US\$ (2010) and are similar to estimates obtained by Cuba for DGF– 11.5 Mill.US\$. CO₂ storage costs in Lithuania (0.65 US\$/t CO₂ and 0.05 US cent/kWh) are similar to the estimates in Cuba (0.73 US\$/t CO₂ and 0.06 US cent/kWh) respectively. These costs are similar because of the similar storage capacity and similar parameters of geological formations except horizontal permeability of reservoir. Allison et al., (2003) indicated that the main determinants of storage costs are reservoir and injection characteristics rather than storage option such as saline formation or depleted field.

The obtained CO₂ storage costs for Lithuania and Cuba are quite low having in mind the small storage capacity but this negative scale effect has been mitigated by a several factors such as the favorable geological conditions (low depth, low reservoir pressure, high permeability and thickness of the geological structure) and financial liability costs not included in assessments. These costs according (ZEP, 2011) can increase the costs of CO₂ storage from 0.26 US\$ to 2.6 US\$/tCO₂. The slightly lower costs of CO₂ storage for Cuba were obtained because of lower geological site investigation costs, lower well construction costs related with on re-useable legacy well. The lower CO₂ storage costs per ton of CO₂ stored are obtained in Lithuania because of larger carbon storage capacity. The lower CO₂ storage costs per kWh obtained for Lithuania are mainly related with larger carbon storage capacity, longer life-time of CO₂ storage facility and larger electricity generated costs during this period.

4. CONCLUSIONS

The methodologies for CO₂ costs assessment provided in earlier studies are difficult to follow for new players in this field like Cuba and Lithuania. Complicated cost assessment models requiring a lot of comprehensive data and modeling expertise were developed which are not affordable for countries having less experience.

The most clear and comprehensive methodology for assessment CO₂ storage costs and easy to follow was developed by US EPA. The methodology provides unit cost estimates for all cost components of SA, DGF to estimate total project costs. The examples are provided for both commercial and pilot scale geological storage projects. As the case studies for Lithuania and Cuba are based on these alternatives the proposed technique was quite easy applicable for both cases.

The biggest problems in CO₂ storage costs assessment were related with specific regulations applied in US and differences in labor costs. Taking into account the differences in financial liabilities applied in US and Europe and Cuba these costs were not included in total cost estimates. Adjustments for labor costs were not applied because of the lack of labor cost information in Cuba.

Though the legal regulation and labor costs are the important challenge and serious drawback in application of methodology developed in US for Lithuania and Cuba it allows to compare two CO₂ storage options in terms of cost components as the same approach was applied and to establish the main drivers of costs differences for specific storage options.

The applied methodology showed that the similar CO₂ storage capacity and favorable geological conditions for CO₂ storage had the most important impact on low storage costs in both countries. The

negative impact of small scale effect in both cases was mitigated by favorable geological conditions thereby granting cost reductions for both case studies.

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ASSESSING A FACULTY MEMBER'S ROLE IN CHANGING WRITING OUTCOMES OF UNDERGRADUATE CAPSTONE PAPERS: A QUANTITATIVE STUDY

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ABSTRACT

Determining if a faculty member has an impact on improving student-writing skills, in particular for those completing a senior business capstone project frequently the culminating requirement for a business major, is perplexing and difficult to measure. Additionally, the mixture of course formats (face-to-face, hybrid and online) and diversity of age/skill levels that a faculty member may encounter provide additional challenges to interact with and evaluate if writing improvements occurred due to the instructor's intervention. Institutional student course evaluations rarely provide meaningful, if any, indication of changes in writing skills or an instructor's role in this transformation process. A gap exists in the literature regarding the use of a computerized index such as the Flesch-Kincaid Grade Level score for use in evaluating student writing. A supplemental and easy to use pre/post evaluation of student writing skills was developed and tested with 76 students (face-to-face and online students) enrolled in a Senior Project Business Capstone course at a rural regional university in the United States of America spanning one academic year (2013 to 2014). Results were found using the Flesch-Kincaid Grade Level score as a pre /post instrument to evaluate the writing levels of students after they submitted their first assignment and the final submission of the Senior Project Business Capstone paper. The data derived from the application of Flesch-Kincaid Grade Level writing scores of 76 students indicated that statistically significant writing changes occurred at the .03 level from pre-post scores recorded between the first assignment, prior to the faculty member's comments and corrections, and the final assignment (after two interventions by the faculty member). A secondary goal of the study was to determine if differences existed in the writing level scores between students enrolled in the face-to-face version of the Senior Project Business Capstone course and students enrolled in the online version of the same course. The data indicated there were positive changes (an average pre first assignment grade level average of 12.37 to the post average of 12.41) in the Flesch-Kincaid Grade Level scores; however these changes were not statistically significant ($p = .40$). In contrast, data from pre and post writing level scores of 55 students enrolled in the online version of the same course indicated that statistically significant writing changes occurred at the ($p = .01$) level of significance.

Keywords: Assessment of Learning, Readability Indices, Improvement of Writing

1. INTRODUCTION

Quantifying the effect that a teacher has on the learning outcomes of their students is a continuous and sometimes contentious issue in higher education. Over the past decade, the need to show consistent and clear-cut measurements of institutional and faculty teaching effectiveness has been motivated by a combination of upgraded regional and professional accreditation association requirements, government mandates and increasing competition among educational institutions for student enrollment. Judging teaching efficacy is one of the most challenging and elusive tasks in the education process. Unlike scholarship, artistic productions, scientific experiments, and etc. which result in a tangible product or consequence the aftermath of teaching is contained in the minds of the learner and may or may not manifest itself for years after the final lecture or test is administered (Hooper and Page, 1986).

There is a paucity of quantitative evidence to ascertain if a faculty member directly influences improvements in student writing skills. A supplemental and easy to use pre/post evaluation of student writing skills was developed and tested with 76 students (face-to-face and online students) enrolled in a Senior Project Business Capstone course at a rural regional university located in the United States of America spanning two academic years (2013 to 2014). Results are presented from use of the Flesch-Kincaid Grade Level score as a pre /post instrument to evaluate the writing levels of students after they submitted their first assignment and the final submission of the Senior Project Business Capstone paper.

2. HYPOTHESES FOR THIS STUDY

Below are the null and alternative hypotheses that were tested in this quantitative investigation.

- H1o.* On the Flesch-Kincaid Grade Level score regardless of face-to-face or online version of the Senior Business Capstone Course offered, faculty member comments made on Sne papers (\leq).
- H1a.* On the Flesch-Kincaid Grade Level score regardless of face-to-face or online version of the Senior Business Capstone Course offered, faculty member comments made on Senior Project Business Capstone papers had a significant impact on the quality of the final Senior Capstone papers ($>$).
- H2o.* On the Flesch-Kincaid Grade Level score from the online version of the Senior Business Capstone Course, faculty member comments made on Senior Project Business Capstone papers had no impact on the quality of the final Senior Capstone papers (\leq).
- H2a.* On the Flesch-Kincaid Grade Level score from the online version of the Senior Business Capstone Course, faculty member comments made on Senior Project Business Capstone papers had a significant impact on the quality of the final Senior Capstone papers ($>$).
- H3o.* On the Flesch-Kincaid Grade Level score from the face-to-face version of the Senior Business Capstone Course, faculty member comments made on Senior Project Business Capstone papers had no impact on the quality of the final Senior Capstone papers (\leq).
- H3a.* On the Flesch-Kincaid Grade Level score from the face-to-face version of the Senior Business Capstone Course, faculty member comments made on Senior Project Business Capstone papers had a significant impact on the quality of the final Senior Capstone papers ($>$).

3. LITERATURE REVIEW

The central issue addressed in this literature review was assessing to what extent if any a faculty member plays in changing the writing outcomes as measured by the Flesch-Kincaid Grade Level scores of undergraduate students enrolled in Senior Business Capstone courses taught over one academic year at a rural regional university in the United States of America. Determining what if any effect a faculty member has on student learning and writing improvement is a constant experiment. Regardless of one's position on this important point, inevitably measuring progress from the beginning of instruction to completion remains the salient issue.

Another major concern in the assessment of teaching/learning outcomes is removing as much subjectivity from the measurement process as possible. However, how does a faculty member remove predisposition from non-quantitative course assignments? What is the difference between a well-written paper and an average one? Frequently the faculty member exclusively relies on a subtle yet powerful - *I know good art when I see it* –mental model. The assistance of an *impartial* tool for both faculty and students is needed to gauge a starting level of writing skills and appraising what if any progress was made during a course would be most beneficial.

Rudolf Flesch developed a reading ease score in 1949. The Flesch Reading Ease scale ranges from 0 to 100. Zero to 40 is very difficult to difficult reading. Eighty and above is easy to very easy. Some states require that insurance policies score at least 40 on the Flesch Reading Ease scale. Flesch himself set the minimum score for plain English at 60 (Stockmeyer, 2009). J. Peter Kincaid developed the Flesch–Kincaid Grade Level Score in the 1970s. Kincaid reformulated the Flesch test to produce a formula for calculating a text's reading grade level, initially for use by the United States military to measure the readability of technical manuals used in training. Eventually, the Flesch-Kincaid Grade Level Score and other derivatives were adopted for use by a variety of public and private enterprises. The Flesch-Kincaid Mean Grade Level was also used to judge whether sites comply with the Priority Level One standards recommended by the World Wide Web (West, 2008). Critics of Flesch and Kincaid point to the limits of the application of automated programs to assess fully the quality of reading comprehension and potential manipulation of formula driven programs. Mailloux, Johnson, Fisher and Pettibone (1995) pointed out several limitations of readability formulas noting that:

Readability formulas do not take into account various variables such as legibility, motivation of the reader, learnability of the text, usability, relationship among words, sentences, and sentence parts, and the level of abstraction required of the reader by the material. (p. 225)

In another research project Pothier, Day, Harris, and Pothier (2008) noted that:

Readability scores provide information about the surface of the text, but it does not directly provide information about the comprehensibility of the text. Readability scores do not acknowledge the specific needs of the target readers, for example different levels of reader language skills and reader knowledge. Finally, readability does not provide information about the coherence of a piece of text. (p. 719)

The need for tests such as the Flesch-Kincaid to assess the comprehension level of the reading audience, and by definition the skill level of the writer, is noted in the literature. Loughran and McDonald (2014) commented about the shortcomings of the Fog Index, the most commonly applied readability measure in financial applications and proposed an alternative to it to enable shareholders and others to understand corporate financial disclosures. Subramanian, Insley and Blackwell (1993) conducted a study to test *the relationship between performance and the readability of annual reports using a "computer style analyzer" and found that the annual reports of top performers were easier to read than poor performers.* Sattari, Pitt and Caruana (2011) directed research about the readability of selected Fortune 500 firms' mission statements. Sattari et al. concluded that on average, the mission statements of the firms selected for the research project were written at a university graduate level and in short were not understandable by general audiences. Alexander (2000) employed the Flesch-Kincaid Grade Level score to grade the level of dental educational documents. Alexander found that 41.7% of the materials examined in the scholarship were composed at or near college levels, which put them above the mean level (seventh to ninth grade) above most patients. Williamson and Martin (2010) evaluated patient information leaflets (PILs) using Flesch-Kincaid scores and found the PILs' reading grade level "in excess of the recommended level" (p. 1831). Sawyer, Laran and Xu (2008) evaluated the readability of articles in four marketing journals and compared articles that won an award with articles that did not. The authors found that the meritorious articles were more readable, *as measured by indexes focusing on sentence and word length* than the ones that did not receive distinction.

Jameson (2006) asserted that graduate business programs emphasize technical and decision making analysis using a variety of analytical tools. However;

Management communication courses therefore need to help students write clearly about such technical subject matter. The most important writing many graduates do in their careers involves explaining technical analyses, interpreting numbers, and convincing others that their conclusions are valid. Management communication courses need to help students write clearly about such technical subject matter. (pp. 76-77)

A gap exists in the literature regarding the use of a computerized index such as the Flesch-Kincaid Grade Level score for use in evaluating student writing. The need for an appraisal tool that provides reasonable, reliable and actionable information to assess student writing levels and measure improvements while simultaneously evaluating the faculty member's role in guiding student writing improvement motivated the author to conduct this study.

4. METHODOLOGY

The issue addressed in this quantitative study was measuring the effect of instructor feedback on changes in student writing improvement of students writing their capstone papers to complete their business major. The Flesch-Kincaid Grade Level score was utilized to provide a quantitative measurement of student writing levels and indications of writing improvements in a Senior Capstone culmination-writing course.

This research project evaluated 76 students (21 students taught in a face-to-face format; 55 students taught in an online format) enrolled in a required Senior Project Business Capstone course taught at a rural regional university. The type of data collected was quantitative and acquired by the Flesch-Kincaid Grade Level score as a pre /post instrument to evaluate the writing levels of students after they submitted

their first assignment and the final submission of the Senior Project Business Capstone paper. The course required a minimum of 40-page paper with at least 20 quality references that evaluated a publically traded corporation or a work-related problem investigation/recommendation paper. There were three assignments essential to complete the Senior Project Business Capstone paper. This faculty member assessed each paper equally for content, analysis, correct use of APA 6 protocols, College formatting and clarity of writing. Students submitted their first paper without any prior input from this faculty member. The Flesch-Kincaid Grade Level tool was applied to establish a baseline grade level score for each student. This faculty member then read, evaluated, inserted corrections and comments into each paper and returned the paper to the class. For the second assignment, the same evaluation and feedback process as the first was used; however, no Flesch-Kincaid Grade Level score was assigned to this paper. For the third and final portion of the paper the Flesch-Kincaid Grade Level score was assigned prior to this faculty member's evaluation as a means of providing a post writing analysis score. Students were not graded on the results of their Flesch-Kincaid Grade Level score.

From the fall term, 2013 to the end of the spring term, 2014, the author used the Flesch- Kincaid Grade Level score available on MS Word to determine the writing levels of students enrolled in a face-to-face version of the Senior Project Business Capstone course and students enrolled in the online version of the same course. The objective was to ascertain if changes in writing level scores took place because of this faculty member's comments and corrections. The total subject sample was 76. No student names were included in the study.

4.1. Results of the Study

The data was analyzed using a t-Test: Paired Two Sample for Means to ascertain the significance of each subject's pre/post Flesch-Kincaid Grade Level score. On an individual class basis, each student's pre/post Flesch-Kincaid Grade Level score was analyzed to determine the significance level of changes in the writing level outcomes because of the faculty member's comments and corrections. All pre/post Flesch-Kincaid Grade Level scores by course and version of the course were placed in a master Excel file and the data was analyzed. The significance levels for the pretest and posttest were then compiled to determine the level of significance for all course offerings. A .05 level of significance was used to define significance.

The data derived from five Senior Project Business Capstone courses (76 subjects, 3 online courses, 2 face-to-face courses) indicated that statistically significant changes in writing scores occurred at the 0.03 significance level (Table 1) because of this faculty member's comments and corrections.

TABLE 1. RESULTS OF T-TEST: PAIRED TWO SAMPLE EVALUATING THE EFFECT OF INSTRUCTOR FEEDBACK ON CHANGES IN STUDENT WRITING IMPROVEMENT ON FACE-TO-FACE AND ONLINE VERSIONS OF THE SENIOR PROJECT BUSINESS CAPSTONE COURSE

Hypothesis	t Critical one-tail	P(T<=t) one-tail	T Stat	Decision
Hypothesis 1	1.66515	0.03	1.9051	Accept Research

A secondary goal of this study was to determine if differences existed in the writing level scores as determined by the Flesch-Kincaid Grade Level score and levels of writing improvement between students enrolled in the face-to-face version of the Senior Project Business Capstone course and students enrolled in the online version of the same course. Data resulting from pre and post writing level scores of the 21 students enrolled in the face-to-face version of the Senior Project Business Capstone course indicated there were positive changes (an average pre first assignment grade level average score of 12.37 to the post average score of 12.41) in the Flesch-Kincaid Grade Level scores; however these changes were not statistically significant ($p = .40$). In contrast, data from pre and post writing levels of 55 students enrolled in the online version of the same course indicated that statistically significant writing changes occurred at the .01 level of significance (Table 2).

TABLE 2. RESULTS OF T-TEST: PAIRED TWO SAMPLE EVALUTING DIFFERENCES IN CHANGES IN STUDENT WRITING IMPROVEMENT ON SENIOR BUSINESS CAPSTONE PROJECTS BETWEEN FACE-TO-FACE AND ONLINE VERSIONS OF THE SENIOR PROJECT BUSINESS CAPSTONE COURSE

Hypothesis	t Critical one-tail	P(T<=t) one-tail	T Stat	Decision
Hypothesis 2	1.67356	0.01	2.1674	Accept research
Hypothesis 3	1.72472	0.46	0.0995	Accept null

5. FINDINGS

The researcher used a t-Test: Paired Two Sample for Means to ascertain what if any differences occurred because of the researcher's comments and corrections provided after the first and second assignments were submitted and before the final paper was graded. The second step was to calculate average scores for each class's pre and posttest Flesch-Kincaid Grade Level scores according to the version (face-to-face or online) of the Senior Project Business Capstone course. The third step was to place the Flesch-Kincaid Grade Level scores from each version of the Senior Project Business Capstone course in a master Excel file and then subject the scores to a variety of tests to decide if three research hypotheses should be accepted or rejected. The decision whether to accept or reject the null hypothesis was determined by averaging the P one-tail scores of every class. A .05 level of significance was used to define significance. The results for the null hypotheses are shown in Table 2.

The data collected and analyzed for Hypothesis 1 (Table 1) was below the .05 level allowing the rejection of the null hypothesis and acceptance of the research hypothesis. The analysis indicates that there is a significant difference at the .03 level of significance between the pretest Flesch-Kincaid Grade Level scores (the baseline) and the post Flesch-Kincaid Grade Level scores (impact of this faculty member's intervention). Noticeably, a statistically significant change was found between the student's writing level upon entry into the course and improvements during the course as result of this faculty member's comments and corrections. The null research hypothesis was rejected concerning no changes in student writing level scores because of this faculty member's intervention and the research hypothesis accepted at the .03 significance level indicated that there would be a 97% chance of a type 1 error if the null hypothesis was accepted. A secondary goal of the study was to investigate if differences existed in the writing level scores as determined by the Flesch-Kincaid Grade Level scores between students enrolled in the face-to-face version of the Senior Project Business Capstone course and students enrolled in the online version of the same course. As noted above, the researcher used a t-Test: Paired Two Sample for Means to ascertain what if any differences occurred because of the researcher's comments and corrections provided after the first and second assignments were submitted and before the final paper was graded.

Data from the pre/post Flesch-Kincaid Grade Level scores for face-to-face Senior Project Business Capstone courses offered between 2013 and 2014 were examined. The data indicated there were positive changes (an average pre first assignment grade level average of 12.37 to the post level average of 12.41) in the Flesch-Kincaid Grade Level scores in the face-to-face versions of the course. The t-Test: Paired Two Sample was used to determine if the difference in the average scores for the pre/post Flesch-Kincaid Grade Level scores for all face-to-face versions of the Senior Project Business Capstone course in the study were statistically significant. As shown in Table 2, it was determined that these changes were not statistically significant ($p = .40$) for the face-to-face format. Data from the pre/post Flesch-Kincaid Grade Level scores for the online version of the Senior Project Business Capstone courses offered between 2013 and 2014 were examined. The t-Test: Paired Two Sample was used to determine if the difference in the average scores for the pre/post Flesch-Kincaid Grade Level scores for the online version of the Senior Project Business Capstone course in the study were statistically significant (Table 2).

6. DISCUSSION

A review of the data accumulated for this study indicated at the 0.03 level a statistically significant relationship exists between changes of grade writing levels between pre and post assignment submissions because of this faculty member's intervention. This study was conducted with a mixture of

students enrolled in an undergraduate Senior Project Business Capstone course at a rural regional university in the United States of America over the course of an academic year. Twenty-one students enrolled in the face-to-face version of the Senior Project Business Capstone course and 55 students were enrolled in the online version of the course. The distinction between the two instructional formats revealed an interesting dichotomy. The researcher expected the students enrolled in the face-to-face course to show greater Flesch-Kincaid Grade Level score improvement than their online counterparts due to: a) more support – individual counseling sessions were provided; b) an optional weekly “Study Night” was offered to enrollees in face-to-face courses to give research, formatting, writing and encouragement and c) the faculty member was available for assistance during regular office hours or by appointment. However, while there was improvement in the face-to-face Flesch-Kincaid Grade Level scores (an average pre first assignment grade level average of 12.37 to the post average of 12.41) these changes were not statistically significant ($p = .40$).

In contrast to the face-to-face students, online students enrolled in the same course exhibited significant differences in Flesch-Kincaid Grade Level scores. There was improvement in both the average pre first assignment grade level (12.71) to the post average (13.22) grade levels of online students, which was statistically significant at the .01 level. This researcher was surprised at the substantial disparity between the online students’ Flesch-Kincaid Grade Level scores and the face-to-face students’ scores because online students did not have the extensive support, as did their on campus colleagues. The reasons for this variance may be attributed to the maturity and advanced professional experience typical of many online students and the higher confidence levels of independent learners.

The Flesch-Kincaid Grade Level score is not a substitute for detailed and consistent faculty critique and constructive criticism. It would be tempting to assign grades merely based on differences between grade level differences. Allowing a *robotic* tool to appraise assignments defeats the purpose of the faculty-student relationship. The intent of the Flesch-Kincaid Grade Level score should be to guide both the faculty member and student towards continuous improvement in writing skills. However, another important consideration is to use the Flesch-Kincaid Grade Level score to upgrade analysis, synthesis and expression of ideas. A recommendation for further investigation would be to enlarge the scope of this study to compare the pre/post scores of a variety of student groups. It would be of interest to parallel the results of the Flesch-Kincaid Grade Level score between different types of course formats, genders, traditional and adult aged students, areas of a country (ex. east vs. west and etc.), ethnic groups as defined by a country’s census bureau or a university’s admission office and local students compared to foreign countries.

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A BUFFER GROUPING METHOD FOR MATERIAL HANDLING SYSTEM OF AN ASSEMBLY LINE BASED ON SIMULATION

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ABSTRACT

This paper proposes a buffer grouping method for Material Handling System (MHS) of the major electronics assembly line based on simulation. The suggested grouping method is a real-time method with consideration for the location of buffers and depots and the capacity of Material Handling Equipment (MHE). By the use of this method, the buffers and depots become a group which has to be supplied. And then we allocate each group to the supply workers and analyze the result using a simulation. Furthermore, we can adjust balance of the workers workload during simulation repetition. Although there have been numerous studies on similar topic, most of them deal with the automated material handling system rather than the manned material handling system. To implement the method, we categorized a manned material handling system into four simulation nodes (depot, feeder, buffer, route), and developed our production system simulator to analyze method. The proposed method has been implemented and tested with various examples from Korean assembly line based manufacturers.

Keywords: Production System Simulation, Simulator Development

1. INTRODUCTION

As the lifecycle of electronics has been shortening due to the technology advances and diversified customer needs, leading electronics companies must have sufficient product technologies and rapid production responsiveness to satisfy diversified customer needs. The product technologies enables the electronics companies to develop new product which reflects the customer needs, and the rapid production responsiveness enables the electronics companies to produce new products simultaneously with new products development and dominate the market in advance. In recent years, most of the leading electronics companies are able to achieve sufficient product technologies and rapid production responsiveness. However, they have problems which is occurring a monetary waste due to achieve goals. The monetary waste comes from the production layout redesign and the Material Handling System (MHS) operation policy.

The layout redesign problem is the conventional problem which has been studied for the last decades. Therefore, most leading electronics companies may have the standardized production processes and layout designs because inefficient production processes incurs huge monetary waste. These standardized production processes and layout designs are continuously improved by companies' experience. Then standardized production processes and layout designs are used to minimize a monetary waste when companies need production system alteration to produce the developed new product.

On the other hand, the MHS operation policy incurs a small monetary waste, but it is continuous waste that can be greater than the monetary waste comes from the production layout redesign, because the MHS is applied manned system in the electronics industry due to frequent product change. The manned MHS has the advantage of high flexibility to supply the parts, on the other hand it has disadvantage of unexpected situation and unfixed time factors rather than the automated MHS. The unexpected situations and unfixed time factors make a factory manager uneasy. Therefore, a factory manager decides to hire more supply workers than proper number of supply workers, because the factory manager is completely responsible for factory productivity. That is reason that the MHS operation incurs continuous monetary waste, because more supply workers can be operated than proper number of supply workers. As noted above, the MHS operation policy is clearly important problems in order to pursue the profits of the

company. Accordingly, the all electronics companies must have clear MHS operation policy to survive in a price competition.

We propose a buffer grouping method for MHS of an assembly line based on a simulation. Because, a buffer grouping is one of main issue in the MHS operation policy. The buffer grouping method is to determine the buffer group which has to be supplied at one go by supply worker. A role of supply worker is to supply the parts into an assembly line using a tow-train. The supply workers load up a wagon with the racks and the boxes in the depot and they drive a tow-train to the assembly line, and then unload the racks and boxes from the wagons. Each tow-train has maximum capacity it generally can pull five wagons. And a wagon can transport a parts rack and several boxes depend on size of box. The goal of MHS operation policy is to supply parts to the assembly line with minimum resource via schedule and route of supply workers. For this goal, this paper introduces a buffer grouping method of an assembly line based on a simulation.

The paper is organized as follows. A literature review are in the next section. Then, Section 3 introduces the grouping method for MHS of an assembly line based on a simulation. Section 4 introduces implementation result is presented with an example. Section 5 concludes the paper.

2. LITERATURE REVIEW

The existing research is regarding design and analysis of the MHS can be categorized as follows: (1) MHS simulation framework, (2) MHS analysis index proposal (3) MHS operation policy optimization (MHE routing and scheduling). The first category, MHS simulation framework pertains to research on MHS simulation model generation, MHS simulation model validation, alternative results evaluation. This field has been studied to generate a different simulation model of a MHS such as a coal mine (Chao Meng, 2013). Naturally, the area of study has been widely applied such as electronics and automobile (Juyoung Wya, 2011; Qi Hao, 2008; Thomas M. West, 1993). An automated material handling system has been studied (F.K. Wang, 2004; Chiung-Hsi Hsieh, 2012). However, as we mentioned above, a characteristic of the automated material handling system differ from manned material handling system.

The second category, the MHS analysis index proposal pertains to research on performance, reliability and congestion of the MHS (Benita M. Beamon, 1998). The MHS analysis index provides a criterion to judge a performance of MHS in an assembly. The MHS congestion on the assembly line prevents supply workers and vehicles from traveling freely on the assembly line (Benita M. Beamon, 1999). Rajan Suri (1997) proposed performance analysis of flexible manufacturing system with a single MHE. These index can be applied to general MHS, but it is not easy to be applied for particular purpose to judge performance of the MHS such as scheduling.

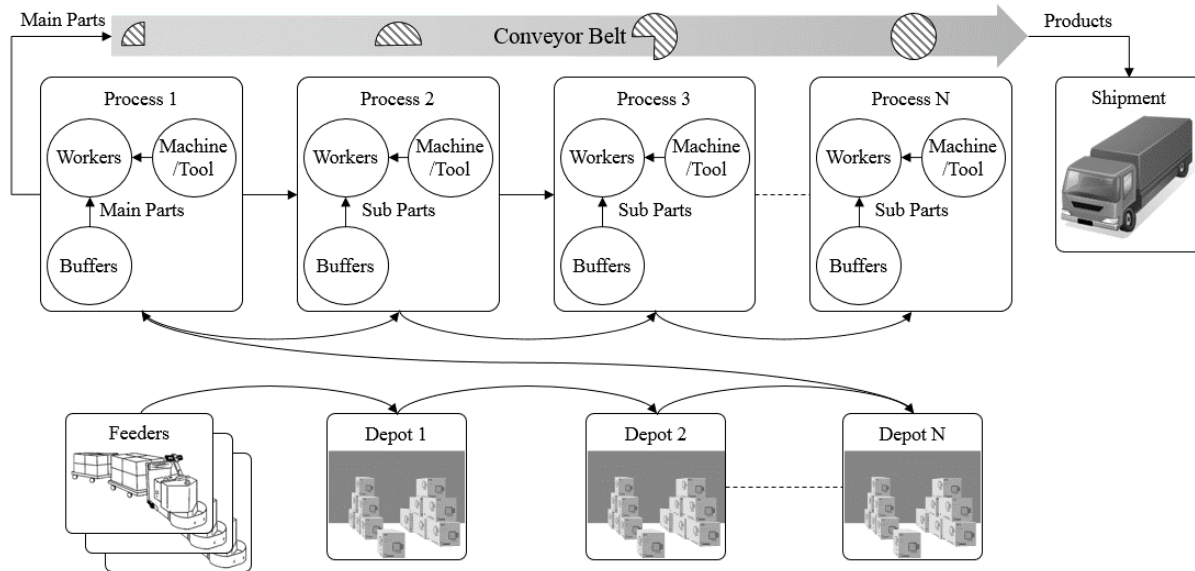
The third category, a MHS operation policy optimization pertains to research on the MHS routing problem, MHS scheduling problem and MHS policy optimization. The scheduling and routing problem is a NP-complete problem. Ant colony optimization algorithm is ideal to resolve the horizontal movement of something and ant colony optimization algorithm has been applied to many combinatorial optimization problems. Also, ant colony optimization algorithms has been applied vehicle routing problem (John E. Bella, 2004). Beside ant colony optimization, several mathematical approach has been applied to optimize the scheduling and routing of the MHE (James H, 1997; Ghada El Khayat, 2006). However, the mathematical approach has limitations which are needed some constraints to be applied. Accordingly, similar mathematical approaches have been applied to different domains such as automobile (A Agnetis, 1997; Simon Emde, 1997). The MHS can be different in accordance with the production method. A cell production system has many aisles to supply materials and the layout is fixed. So, the purpose of the MHS is efficient supply method with small number of AGV (A. Caumond, 2012). A flow production line has narrow and limited aisles. So, the purpose of the MHS is how to deliver material and use MHE efficiently (Daria Battini, 2009). Beside mentioned research, Xiugang Li (2010) studied feeder transit services in which transportation area. The transportation area has similar characteristic with the manned MHS.

3. GROUPING METHOD FOR THE MHS OF AN ASSEMBLY LINE BASED ON A SIMULATION

A conveyor belt based assembly line is a process of manufacturing that is better suited for mass production and product change because of its greater flexibility when compared to an automated system. The conveyor belt based assembly line has been adopted in the electronic appliances industry, which has

many product types and frequent process changes (Won. K Ham, 2014). A conveyor belt based general assembly line process is comprised of five factors: worker, machine, buffer, material and feeder. To manufacture, the buffers are not supposed to be empty, because the workers and machines have to use the material in the buffers. In brief the MHS, the feeders are checking frequently state of the buffers and coming in the depot to supply the material to buffers in an assembly line (FIGURE 1).

FIGURE 1. THE CONVEYOR BELT BASED ASSEMBLY LINE & MHS STRUCTURE



To supply the material, the feeders have to decide buffers which have to be supplied after checking state of buffers. When the feeders make decision, the grouping and routing algorithm is needed. However, most assembly line aisle has a direction and a path from buffer to other buffer mainly. So, feeder can determine the route to go through when the buffers is decided to be supplied.

3.1. Flow Diagram Of Grouping Method

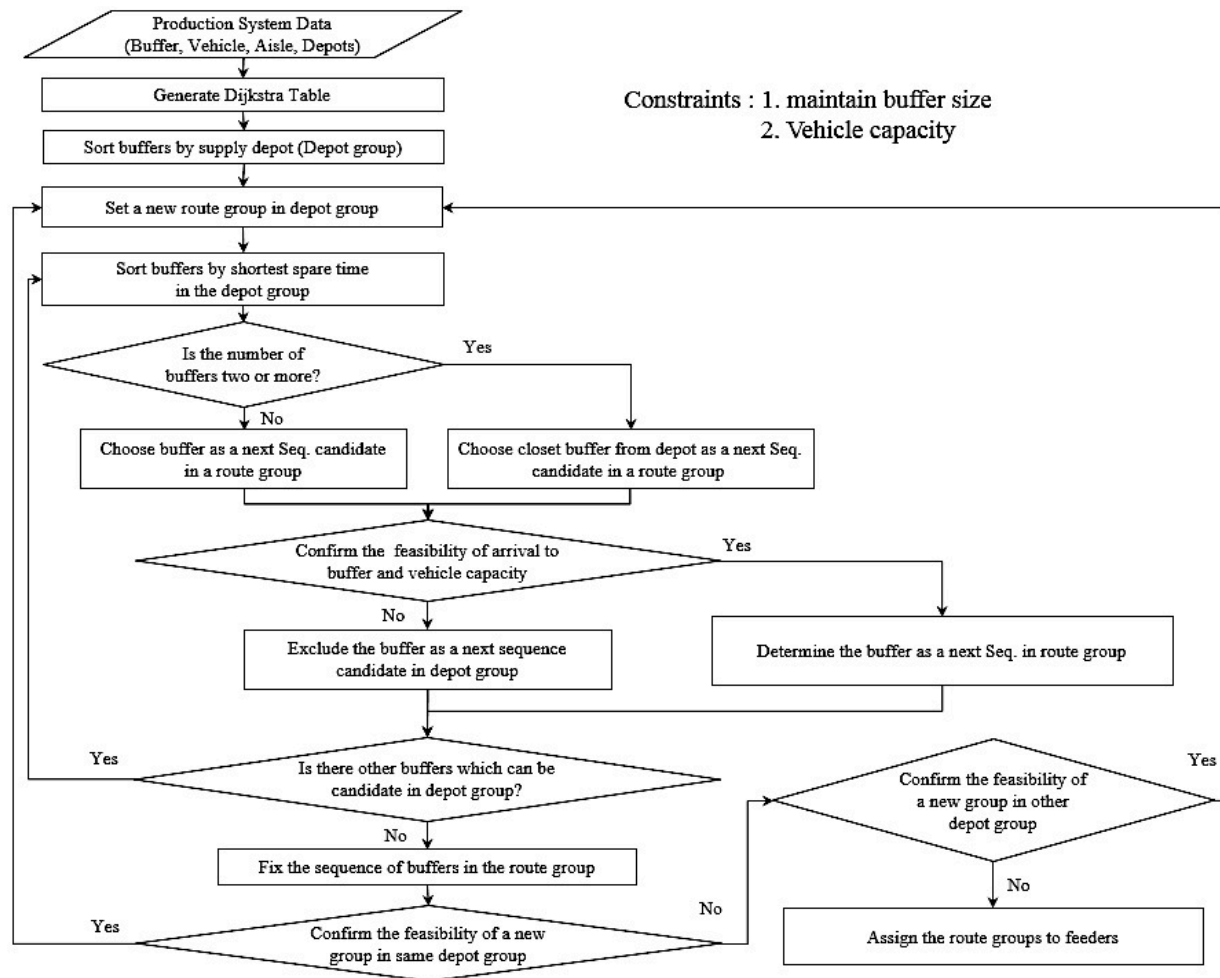
We need organize the production system data for the method of substitution to the grouping method. The production data is consist of 3 elements: 1) Production system layout data, 2) Production system operation data and 3) MHS data. The production system layout data is consist of 4 elements: 1) Buffer location, 2) Depot location, 3) Aisle layout (direction, lanes) and 4) Obstacles location. The production system operation data is consist of 3 elements: 1) Buffers-Parts-Depots relation, 2) Buffers size and 3) Target production speed. The Buffers-Parts-Depots relation shows that a buffer has to contain which parts and parts belong to which depots. The buffer size is capacity to store the parts depend on part during the production. The target production speed determines production and consumption cycle of buffers.

After organizing the data, we can generate the Dijkstra algorithm table which shown that shortest path from buffers to buffers (Yi-zhou Chen, 2014). Briefly, the Dijkstra algorithm table is "From-To" table. Then, the grouping method can be proceed as follows. FIGURE 2 shows the procedure of grouping method.

- 1) We sort out the buffers that have parts belong to same supply depot, and then we put the sorted buffers into a new group (depot group).
- 2) We sort out the buffers depend on the accessibility which is confirmed by the Dijkstra algorithm table, and then we put the sorted buffers into a new group (route group).
- 3) We sort out the buffers depend on shortest spare time in the depot group.
- 4) If the number of the buffers in the route group is more than two, determine the sequence of buffers in the route group.
- 5) We confirm the feasibility of arrival to buffers and vehicle capacity, and then determine the sequence of route group in depot group.

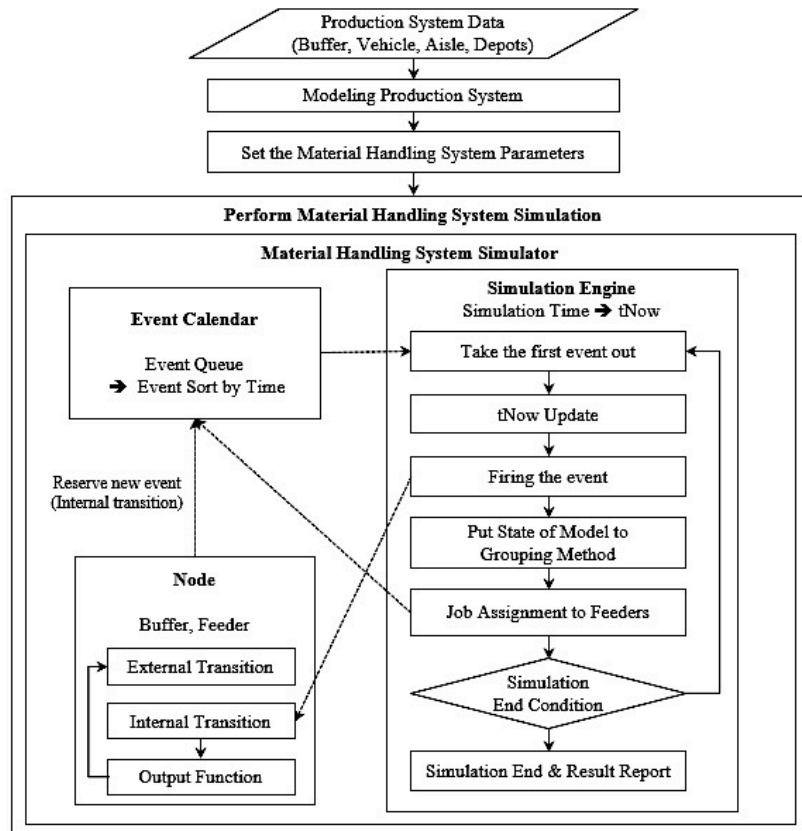
- 6) If there is buffers that haven't assigned into group, perform the procedure from number 3 repeatedly.
 7) We assign the route group to a feeder in real time.

FIGURE 2. THE PROCEDURE OF GROUPING METHOD



3.2. Simulation Structure

FIGURE 3. THE STRUCTURE OF THE MHS SIMULATION



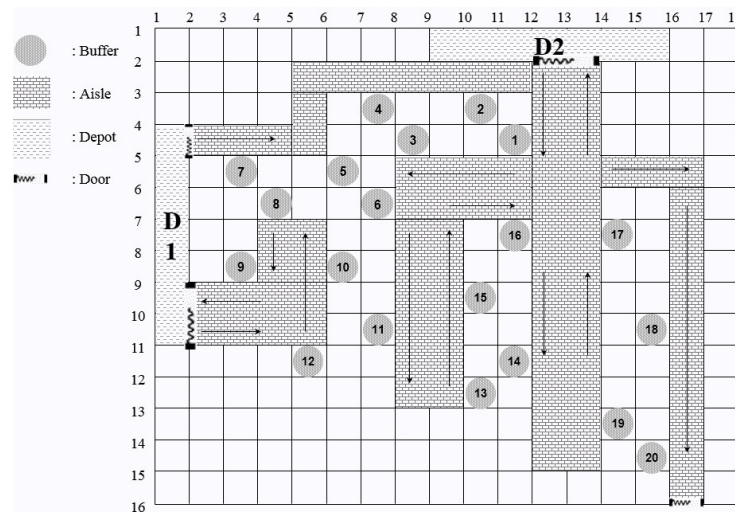
The structure of simulation is simple and similar with other simulator. The simulation engine takes a first event from the event calendar and updates the simulation time and then fires the event. Then, the internal transition of nodes (buffer, feeder) is called and reserve the other event in the event calendar. However, when every event is called and state of model is changed, the grouping method is performed using state of model. After performing the grouping method, the group is assigned to a feeder and then events of feeder are reserved in the event calendar. The simulation engine performs same job repeatedly. We can find feasibility of the production system model during the simulation. When the simulation is finished, we can confirm a simulation report, which shows how many feeders are used and the assembly line was operated well without starvation.

4. IMPLEMENTATION RESULT WITH AN EXAMPLE

In this section, we present implementation result with an example that simplified a refrigerator production system. The refrigerator production system has more than 100 processes, so it is too complex to use as example. However, the refrigerator production system has MHS problems that have to be solved. There is seven feeders are working for material supply in the refrigerator production line. But, the utilization rate and the cycle time variance of the feeders is very huge as shown table 1. So, this example is open to improve the MHS system.

TABLE 1. THE UTILIZATION RATE AND CYCLE TIME OF FEEDERS

Feeder Number	Cycle Time	Utilization
1	548.7	94.3
2	546.7	93.9
3	299.4	51.4
4	401.8	69.0
5	509.8	87.3
6	294.4	50.6
7	409.6	70.4

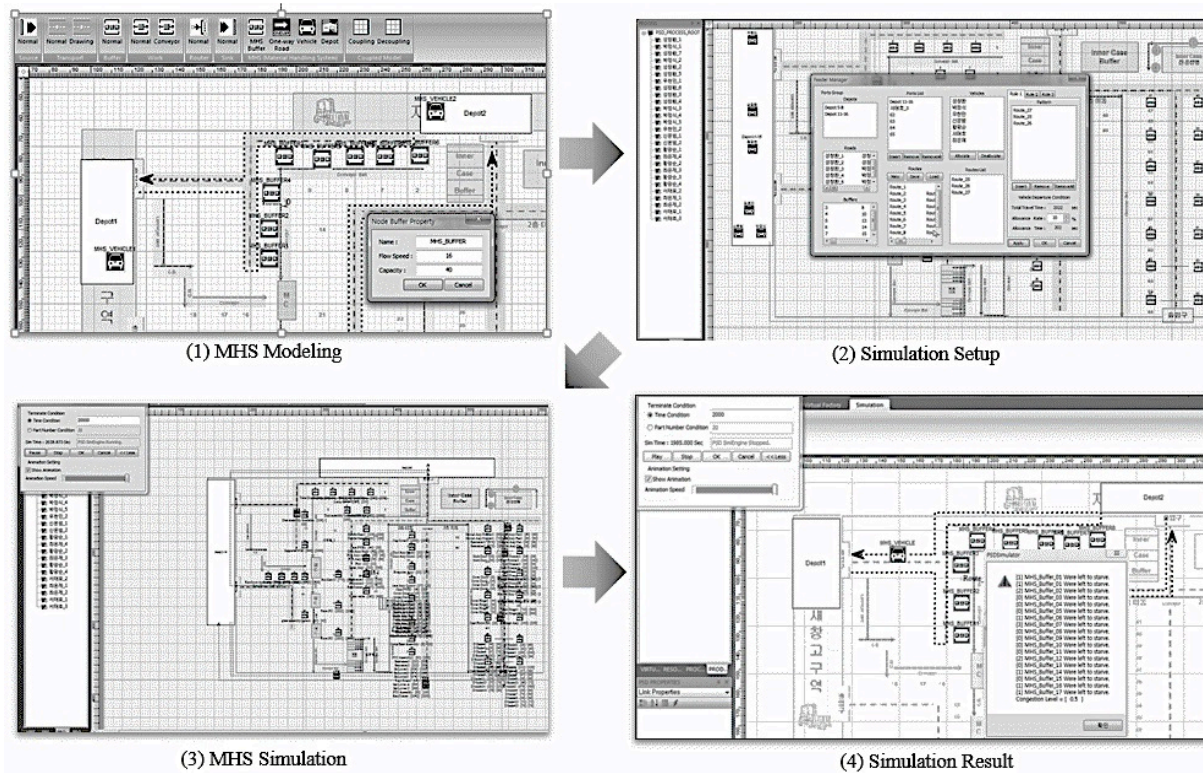
FIGURE 4. THE REFRIGERATOR PRODUCTION LINE LAYOUT

We simplified the refrigerator production line layout as shown Figure 4. The original refrigerator production line has more than 65 buffers. We remain the 20 buffers which locate each other closely. However, 20 buffers contain all parts that will use to produce product. Also, figure 4 shows Dijkstra table based on the refrigerator production line layout.

TABLE 2. DIJKSTRA TABLE BASED ON THE REFRIGERATOR PRODUCTION LINE LAYOUT

From \ To	D 1	D 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
D1	0	99	15	11	20	8	4	21	2	8	9	6	25	4	28	22	25	18	19	25	25	29
D2	99	0	3	99	8	99	99	9	99	99	99	99	13	99	16	10	13	6	7	13	15	17
1	99	3	0	99	5	99	99	6	99	99	99	99	10	99	13	7	10	3	4	10	10	14
2	99	3	4	0	9	99	99	10	99	99	99	99	14	99	17	11	14	7	8	14	14	18
3	99	10	9	99	0	99	99	1	99	99	99	99	5	99	8	10	5	4	7	15	13	19
4	99	6	7	3	12	0	99	13	99	99	99	99	17	99	20	14	17	10	11	17	17	21
5	99	9	10	6	15	4	0	16	99	99	99	99	20	99	23	17	20	13	14	20	20	24
6	99	9	8	99	3	99	99	0	99	99	99	99	4	99	7	9	4	3	6	14	12	18
7	99	11	12	8	17	6	2	18	0	99	99	99	22	99	25	19	22	15	16	22	22	26
8	4	99	99	99	99	99	99	99	0	1	2	99	4	99	99	99	99	99	99	99	99	99
9	1	99	99	99	99	99	99	99	99	7	0	5	99	3	99	99	99	99	99	99	99	99
10	4	99	99	99	99	99	99	99	99	2	3	0	99	4	99	99	99	99	99	99	99	99
11	99	13	12	99	7	99	99	6	99	99	99	99	0	99	4	13	2	8	11	19	16	23
12	4	99	99	99	99	99	99	99	99	4	3	2	99	0	99	99	99	99	99	99	99	99
13	99	14	13	99	8	99	99	7	99	99	99	99	3	99	0	14	3	9	12	20	17	24
14	99	10	9	99	12	99	99	13	99	99	99	99	17	99	20	0	17	6	5	15	3	19
15	99	11	10	99	5	99	99	4	99	99	99	99	2	99	5	11	0	6	9	17	14	21
16	99	7	1	99	4	99	99	5	99	99	99	99	9	99	12	6	9	0	1	11	8	15
17	99	6	4	99	7	99	99	8	99	99	99	99	12	99	15	5	12	3	0	10	8	14
18	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	0	99	4
19	99	11	10	99	13	99	99	14	99	99	99	99	18	99	21	4	18	7	6	16	0	20
20	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	0

In the table, number "99" means that feeder can't access and other numbers means distance between "From" to "To". We used C++ language in a Visual Studio environment and E-XD++ library for the graphical user interface (GUI). The implemented program supports drag and drop method and simple user interface (UI) to model the MHS to the user as shown Figure 5.

FIGURE 5. THE REFRIGERATOR PRODUCTION LINE LAYOUT

The figure 5-(1) shows the MHS modeling user interface and. The users can model the five nodes using five buttons on the toolbar and input the essential details such as the vehicle speed and buffer capacity through C++ dialog. The figure 5-(2) shows the simulation setup user interface. After route design, we can simulate the MHS model and confirm the movement of the vehicles through animation during the simulation, as shown in the figure 5-(3). We can confirm the simulation result by executing program with an MHS model, as shown in the figure 5-(4).

5. CONCLUSION

This paper presents a grouping method for the optimization of the feeder operation in an assembly line. The proposed grouping method has been tested using refrigerator assembly line example which is most problematic assembly line in the electronics assembly lines. After MHS simulation, we confirmed the possibility of feeder reduction. When utilization rate of feeders is close to 100%, we can reduce 2 feeders. However, there are not balance between feeders, and the report of the MHS simulation result is not intuitive. We need to do research about that. Furthermore, the research which classifies items to determine MHS operation policy is recommended.

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HOFSTEDE IN LUXEMBOURG – INTERCULTURAL COMPARISON LUXEMBOURG-FRANCE-GERMANY

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ABSTRACT

The purpose of this research is to find out where Luxembourg fits in on Hofstede's cultural dimensions - Individualism, Power Distance, Uncertainty Avoidance, Masculinity, Long-Term Orientation, Indulgence, and Monumentalism - in comparison with France and Germany. The design of the research is the replication of Hofstede's study by using Hofstede's methods: participant observation, interviews and original questionnaire, the values survey module VSM 2008 (Hofstede, 2008). Three hypotheses are offered. This is the first time Hofstede's studies are replicated entirely in Luxembourg, providing 134 filled-in questionnaires and a full set of results for Hofstede's cultural dimensions. The originality of this research lies in the separation into Lux.Nat. (Luxembourg with Luxembourgish nationality) and Luxembourg (including the foreigners), and the data found for Monumentalism. Implications of culture on practices, discussion and implications, future research and references follow.

Keywords: International management, Hofstede, cultural dimensions, intercultural comparison, language as identifier, Luxembourg

1. INTRODUCTION

This research investigates Hofstede's seven cultural dimensions Individualism, Power Distance, Uncertainty Avoidance, Masculinity, Long-Term Orientation, Indulgence, and Monumentalism of Luxembourg in comparison with France, Germany, Europe and the world. The purpose is to find out where Luxembourg fits in on Hofstede's cultural dimensions today, with the aim to explain to managers, expatriates, as well as their spouses and family, coming for work to the Grand Duchy of Luxembourg, trying to cope with the cultural and linguistic specificities, especially in the HR domain the impact of these cultural dimensions on (HR) practices in Luxembourg. The design of the research is: (1) literature review on dimensions of culture, (2) Luxembourg, trilingualism and Luxembourgish, (3) replication of Hofstede's study. Hofstede's methods were used: participant observation, interviews and original questionnaire, the values survey module VSM 2008 (Hofstede, 2008), by administering it to employees in one company in Luxembourg, France, Germany, providing 134 filled-in questionnaires to measure the cultural dimensions today and comparing them to Hofstede's data for Luxembourg, France, and Germany. It is important to note that Hofstede only holds estimates for Luxembourg and no data for Monumentalism. Three hypotheses are discussed. The originality of this research lies first in the separation into Lux.Nat. (Luxembourg with Luxembourgish nationality) and Luxembourg (including the foreigners) that replies to Hofstede's critique, nations are not the best units for studying cultures; and second in the fact that this is the first time Hofstede's studies are replicated entirely in Luxembourg, providing a full set of results for Hofstede's cultural dimensions, as Hofstede bases his research on Luxembourg on estimates. Third, Hofstede holds no data for the cultural dimension Monumentalism in Luxembourg.

2. LITERATURE REVIEW ON DIMENSIONS OF CULTURE

Since the late 1960s more intercultural research has been published than ever before. This trend was initiated by Geert Hofstede (1980, 2001) with his meticulous research on culture at IBM worldwide and continued by thousands of replicants. Culture is found to have dimensions, the question is not if, but how many. Hofstede initially came up with four dimensions (Individualism versus Collectivism, Uncertainty Avoidance, Power Distance, Masculinity versus Femininity), added a fifth later (Long-term versus Short-term Orientation) and a sixth (Indulgence versus Restraint) and a seventh (Monumentalism). Hofstede brought an end to the era of well-known researchers and their theories. Hofstede (1980) defines culture as the "collective programming of the mind which distinguishes the members of one human group from another". After Hofstede many intercultural studies were started in North-America, the GLOBE by House et al. (2004), Mintzberg (1993), Schwartz (1990), Smith (2002, 2006), Triandis (1995), Schein (2009), just

like before Hofstede, but others started in Europe (Trompenaars and Hampden-Turner (1997), and in Asia (Bond et al., 2004).

The most famous replications are the Chinese Value Survey by Bond et al. (2004), the European Value Survey and the World Value Survey by Inglehart et al. (2008) and Inglehart (2011), and the GLOBE by House et al. (2004). Peter Smith's 2006 article "When elephants fight, the grass gets trampled: the GLOBE and Hofstede projects" is a summary of the exchange of opinions between the GLOBE and Hofstede. Triandis (1995) concentrated his research on the Individualism dimension. Kirkman et al (2006), Minkov (2011; 2013) and Schinzel (2013) summarize the most important replications.

Geert Hofstede's research has not only been subject to enthusiasm (Triandis, 1982), or to reviews (Smith, 2002) but also to criticism, contestation and controversy (McSweeney, 2002; S ndergaard, 1994).

Hofstede states: "I made a paradigm shift in cross-cultural studies, and as Kuhn (1970) has shown, paradigm shifts in any science meet with strong initial resistance" (Hofstede et al., 2002). The five main criticisms of Hofstede's approach have been enumerated by Hofstede et al. (2002) himself:

"(1) Surveys are not a suitable way of measuring cultural differences; (2) Nations are not the best units for studying cultures; (3) A study of the subsidiaries of one company cannot provide information about entire national cultures; (4) The IBM data are old and therefore obsolete; and (5) Four or five dimensions are not enough."

This study takes on the second challenge of Hofstede's criticism, namely, that national boundaries are not the best unit of analysis of studying culture, and uses the example of Luxembourg to demonstrate that language – Lux.Nat. – is a better identifier of culture rather than geographical boundaries of nations. It compares data collected in three subsidiaries of one company in Germany, France and Luxembourg, to demonstrate that Luxembourg's dimensions of culture are not proxies for the average values found by Hofstede in France and Germany, but rather are unique and a result of Luxembourgish, which, along with French and German, is one of the official languages of the Grand Duchy.

Hence, the next section delineates background information about Luxembourg, such as geographical, economic, historical, and social, as well as some reflections on the linguistic peculiarities of Luxembourgish and trilingualism, followed by a set of hypotheses.

2.1. Luxembourg, Luxembourgish And Trilingualism

The official designation is Grand Duchy of Luxembourg (statec, 2013), the only remaining Grand Duchy in the world. The form of government is a representative democracy in the form of a constitutional monarchy, the Chief of State is H.R.H. Grand Duke Henri and the Prime Minister is Xavier Bettel (formerly Jean-Claude Juncker). The territory is 2,586 km² with 549,680 inhabitants on 1st January 2014 (see <http://statec.lu>). On 1st of January 2014, the Luxembourgish population was composed of 300,766 (=54.7%) Luxembourgers and 248,914 (=45.3%) foreigners: 90,764 (=16.5%) are Portuguese, 37,158 (=6.8%) French, 18,773 (=3.42%) Italians, 18,159 (=3.3%) Belgians and 12,659 (=2.3%) Germans. Domestic employment (379,000) is characterized by a high percentage of cross-border workers (156,900 = 41.4%), coming for work during the day from France (20.55%), from Belgium (10.42%), and from Germany (10.43%) (statec, 2013). Luxembourgers are in good shape and feel healthy. Luxembourg was one of the founding members of the CECA, the Treaty of Rome, EEC, EURATOM and the EU. Schengen, the 'Europe without borders', is a small village in Luxembourg's Mosel valley. The European Investment Bank, European Union Publications Office, Eurostat, European Investment Fund, Parliament (secretary), Court of Justice, Council (2nd), and Court of Auditors are among the European Institutions in Luxembourg. IPSE (2010) criticizes money laundering, bank secrecy, fiscal criminality and high level of civil servants. The national language is Letzebuergesch, administrative languages are French, German and Luxembourgish (statec, 2013). This tri-lingual situation is founded in the history of Luxembourg's language(s). Luxembourgers find their identity in both, in their Luxembourgish language and their trilingualism (Fehlen, 2013; Information Press and Service of the Luxembourg Government, 2004, 2008a, 2008b), distinguishing the 'in-group' from the 'out-group' (Briley et al., 2005; Minkov, 2013; Spizzo, 1995).

2.2. Hypotheses

Following the description of Luxembourg and its culture, it is argued that Luxembourg's dimensions of culture are not proxies for the average values found by Hofstede in France and Germany, but rather are unique and a result of Luxembourg's language. The following three hypotheses are offered:

*Hypothesis 1: Native Luxembourgers scores on the **PDI, UAI, IDV, MAS, LTO, IVR, MON** cultural dimensions are significantly different from the scores of non-Luxembourgers in Luxembourg.*

If hypothesis 1 is corroborated then the scores on Hofstede's dimension should reflect a tendency of Luxembourgish native language speakers to score differently than the scores of French, German and foreigners in Luxembourg. The following hypothesis is offered:

*Hypothesis 2: There are significant differences between Hofstede et al.'s (2010) **PDI, UAI, IDV, MAS, LTO, IVR, MON** cultural dimensions estimates for Luxembourg and the empirical values found in this study for Luxembourgers with Luxembourgish Nationality.*

Hypothesis 3: Luxembourgers are happy because they use their language(s) as identifier.

3. METHODS

Participant Observation. The author participated in many seminars, meetings, fairs as covered participant, taking notes and pictures.

Interviews. The author replicated Hofstede's original interview with HR managers.

Questionnaires. Hofstede's (2008) original questionnaire, the values survey module VSM 2008, has been used to measure his cultural dimensions in Luxembourg, France, and Germany and his original calculation formulas to calculate the means per question.

4. RESULTS

Results from the Participant Observation are: Luxembourg prefers private meetings, in person, has a vivid culture of meetings, conferences, events, and fairs.

Results from the Interviews are: Symbols are: excellence, and ethical behavior. Values are: responsibility, trust, team work, tolerance, respect, quality, and punctuality. Heroes are: the directors and the Grand Ducal family. Rituals are: diverse sport and other events, Christmas party, and get-together events.

Results from the Questionnaires are: Using Hofstede's calculation formulas from the original VSM 2008 questionnaire, the results are shown, – the means – found by the author in Luxembourg, Lux.Nat., France, and Germany by simply adding up all questionnaires' responses and dividing by the number of respondents, to get the mean for all 4 nationalities shown in table 1 and 2.

TABLE 1. COMPARISON LUXEMBOURG – LUX.NAT. – FRANCE – GERMANY

	Luxembourg	Lux.Nat.	Hofstede's estimates on Luxembourg	France	Hofstede's France	Germany	Hofstede's Germany
PDI	36	29	40	32.5	68	37	35
UAI	97	95	70	28.8	86	67.5	65
IDV	51.5	34	60	41	71	65.5	67
MAS	47	54	50	43.5	43	64.5	66
LTO	69	65	64	37	63	84.5	83
IVR	53.5	55	56	80	48	46	40
MON	10	24	-	31	16.5	6.5	9.9

The results show the differences from Hofstede's estimates. The Lux.Nat. indices diverge from the Luxembourg indices, confirming the difference in culture in PDI, UAI, IDV, MON. Compared to Hofstede's estimates on Luxembourg, the indices are especially different for Uncertainty Avoidance and

Individualism-Collectivism. For France, the divergence in data is even more striking, showing a low PDI, alongside with low UAI, low IDV, and low LTO. Germany's data are identical, except for Monumentalism.

TABLE 2. LUX.NAT. IN COMPARISON

	Lux.Nat.	France	Germany	UK	Belgium FR	Belgium NL	Italy	NL	China	USA	Japan
PDI	29	68	35	35	68	61	50	38	80	40	54
UAI	95	86	65	35	93	97	75	53	30	46	92
IDV	34	71	67	89	71	78	76	80	20	91	46
MAS	54	43	66	66	60	43	70	14	66	62	95
LTO	65	63	83	51	82	82	61	67	87	26	88
IVR	55	48	40	69	57	57	30	68	24	68	42
MON	24	16.5	9.9	35.4	-	-	35.2	11.9	0	57.2	4.0

The results in table 2 show the cultural difference between Hofstede's estimates and Lux.Nat., Luxembourg (with the foreigners) and France, Germany, UK, Belgium FR, Belgium NL, Italy, the Netherlands, China, USA, and Japan.

The previous two tables show the place that Lux.Nat., Luxembourg, France and Germany hold. Lux.Nat. score low on PDI (29), low on IDV (34), and high on UAI (95), contrary to Hofstede (40, 60, and 70). France scores low on PDI (32.5), IDV (41), and UAI (28.8), contrary to Hofstede (68, 71, and 86). Germany scores low on PDI (37), high on IDV (65.5) and high on UAI (67.5), unchanged to Hofstede (35, 67 and 67).

The below correlation matrix shows that Luxembourgers are characterized for being long term oriented, they indulge in life, they are uncertainty avoidant, and they are happy.

TABLE 3. CORRELATIONS AMONG ALL VARIABLES (N=134)

	PDI	UAI	IDV	MAS	LTO	IVR	MON	HAPPY	GENDER	AGE	EDUCATION
PDI	-										
UAI	-.021	-									
IDV	.135	-.011	-								
MAS	.206*	-.060	.517**	-							
LTO	.138	.059	.030	.000	-						
IVR	.031	.043	.318**	.272**	.042	-					
MON	.068	.023	.245**	.129	-.089	.244**	-				
HAPPY	.038	.160	.045	.014	.268**	.293**	.001	-			
GENDER	-.030	.073	-.041	-.012	.004	-.029	-.105	.029	-		
AGE	-.117	.031	-.059	.022	-.076	.108	-.312**	.040	-.128	-	
EDUCATION	.037	-.155	.106	.094	.119	.112	.060	.082	.120	-.025	-
RANK	.230**	.210*	-.001	.016	.080	-.043	.090	.006	.162	-.490**	-.084

p<.05; ** p<.001

5. IMPLICATIONS OF CULTURE ON PRACTICES

Lux.Nat. hold a unique position on Hofstede's cultural dimensions. There is no other country in the world like Lux.Nat. with high Collectivism (66) (weak Individualism (34)), low Power Distance (29) and strong Uncertainty Avoidance (95). Contrary to the belief that Luxembourg is culturally close to France and linguistically to Germany, Hofstede's cultural dimensions show the limitations of this.

Power Distance is found low for Lux.Nat. (29), similar to UK (35) and USA (40), different from France (68) and China (80). Luxembourg being small, hierarchy is not felt that much, boss and employees meet in the same sport clubs, supermarkets, bars, and events.

Uncertainty Avoidance is high (95), compared to China (30), UK (35), and USA (46), similar to Japan (92). Lux.Nat. avoid uncertain and unknown situations, a secure, regulated, clear life without surprises is preferred. Lux. Nat. are afraid of any uncertainty. For Lux. Nat. everything must be planned, organized, regulated, restricted and foreseen. Nothing has been left to surprise. They prefer that every day is the same and every year brings the same events with always the same people at the same place and the same procedure. They distinguish themselves from their mighty neighbors Germany, France, Belgium, and they created their own language (Briley et al., 2005; Hong et al., 2000), habits (Spizzo, 1995), and peculiarities (IPSE, 2010; Haag, 2011), that they hold to strongly as if they were their identity savers or their rescue plan (Hermans and Kempen, 1998).

Individualism is low (34), means Collectivism is high (66), compared to USA (91), UK (89). Lux.Nat. are highly collective people preferring the well-being of the group and country to the individual pleasure.

Masculinity is medium (54), compared to UK (66), USA (62), Japan (95), Italy (70). The characteristics of a masculine dominant country (competition and success) and those of a feminine dominant country (caring for others, quality of life) are equally distributed.

Long-Term Orientation is high (65), compared to USA (26), UK (51), but not as high as in Germany (83), and is characterized for foreseen, and planned events and by perseverance and thrift.

Indulgence versus Restraint is medium (55/100), compared to UK (69), USA (68), Italy (30), China (24), Lux.Nat. in general indulge in life, love profiting from the benefits of life, and enjoy life. Concerning the cultural dimensions Indulgence versus Long-Term Orientation, Luxembourg is culturally close to France.

Monumentalism for Lux.Nat. is low (24/100), compared to USA (54.2), UK (35.4), Italy (35.2), but high compared to Germany (9.9), France (16.5) or Japan (4). Lux.Nat. love their national traditions and nationality, the Grand Ducal family, National Day, National Hymn and are living their national identity.

One must genuinely accept and understand the meaning of "Mir welle bleiwe wat mir sinn" – "We want to remain what we are". If one does not make an effort to integrate into Luxembourg's specific business culture, success in Luxembourg may never be possible.

The Grand Duchy's political, social and economic stability allows people to plan for the long term, thereby providing support for people's need for security and life predictability. It is possible that this is the key for the high scores on Long Term Orientation and Happiness in Luxembourg found in this study. To validate this argument it is worth citing Hofstede himself: "At 70 Luxembourg has a high score on uncertainty avoidance which means that as a nation they are quite reluctant to test unknown territories. Security is a key word in Luxembourg: there is not one activity which is not depending on some sort of security control from authorities; from banker's money to safety exits in a restaurant. It makes life in Luxembourg very safe, but some would argue a bit boring. New ideas, new methods, new management techniques must first be proven to work in other countries in order to be accepted in Luxembourg. Historically more "farmers" than "traders" the inhabitants kept that good old "common sense" made of cautiousness which has proven to be profitable for a country that managed not to be at war since Napoleonic times! (<http://geert-hofstede.com/luxemburg.html>).

France scores low on Power Distance (PDI=32.5), low on Individualism (IDV=41), and low on Uncertainty Avoidance (UAI=28.8). France's divergence from Hofstede's France is due to the migration background.

Germany is a country whose inhabitants feel threatened by uncertainty and ambiguity, they try to avoid these situations. It has a flat hierarchy and individualistic people who accept that power is distributed unequally.

6. DISCUSSION, IMPLICATIONS AND FUTURE RESEARCH

This research investigated Hofstede's dimensions Individualism, Power Distance, Uncertainty Avoidance, Masculinity, Long-Term Orientation, Indulgence Versus Restraint, and Monumentalism of Luxembourg in

comparison with France, Germany, Europe and the world. Hofstede's original research was replicated successfully in Luxembourg, France and Germany.

Hypotheses 1, 2, 3 were confirmed because Luxembourgish nationals score high on 'Uncertainty-Avoidance', Collectivism, 'Long-Term-Oriented' and 'Happiness', they score low on Power Distance, low on IDV (high on COL), medium on MAS (medium on FEM), high on LTO, high on IVR, high on MON and use their language(s) as identifier. Luxembourg is a multinational, multicultural, multilingual environment; has a vivid culture of meetings, events, fairs, outings, parties, breakfasts, and presentations, all in person; prefers private contacts; traditional HR practices remain mainly unchanged: advertisement, CV screening, contact candidate, interview – after the recruiting: discussion in person, annual performance evaluation, training; HR managers are happy with the current situation, which explains the rejection of change. Luxembourg is a small country, where the whole world lives and works. It is reluctant to accept any change, historically explained by the aim of defense of their own identity. It has developed its own specific language and culture with the aim to distinguish itself from its neighboring countries.

France scores low on Power Distance and Uncertainty Avoidance, Individualism and Long-Term Orientation, and high on Indulgence and Monumentalism. Germany scores high on Uncertainty, high on Individualism, and low on Power Distance.

In this world, where millions of people communicate via social networking technologies, Facebook, email, mobile phones, the ability to maintain a culture of non-digital social networking is a challenge, but thus far successfully defended in Luxembourg.

Future studies could link cross-cultural research with new media, new technologies, strategies and challenges of global human resource management, communication and with other subjects such as marketing (De Mooij, 2011), with psychology (Leung et al. 2011), and with language research (Lewis, 2006). Future studies could focus on the replication of Hofstede's research, investigating his cultural dimensions PDI, UAI, IDV, MAS, LTO, IVR, MON in more companies in Luxembourg, France, Germany and other European countries – to validate the cultural shift that has happened since Hofstede's initial research in the 1960s – see DeLorenzo et al. (2009) who confirmed the cultural shift of the Slovak Republic. Culture is moving and mixing (Hermans and Kempen, 1998), culture changes over time, and is not fixed and nations are not the best units for studying cultures.

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CORPORATIZING THE 'INTELLECTUAL MACHINERY' OF GOVERNMENT: THE CASE OF NATIONAL EDUCATION POLICY IN AUSTRALIA

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ABSTRACT

This article analyses what it describes as the corporatization of the 'intellectual machinery' of government: the theories, knowledges, research and 'know how' utilized by political authorities to render the world thinkable, programmable and subject to intervention. Through an analysis of two key nodal points in national policy on teacher professional standards in Australia over the last decade, the article discloses a shift in the relation between expertise and politics. This is manifested, it is argued, in an increased reliance by policy authorities on corporatized forms of research produced by national and international private consulting firms, Think Tanks, and 'policy entrepreneurs' and a concomitant decrease in their reliance on free research produced largely by academics in institutions of higher education. The article seeks to account for this shift in terms of the 'advanced liberal' formula for rule which now characterizes government in contemporary Western polities.

Keywords: Governmentality, Social policy; Advanced Liberalism, Educational policy

1. INTRODUCTION

Managing a social sphere, domain or institution requires a knowledge and understanding of the sphere to be governed (Miller and Rose, 2008: 62). Nowhere is this more the case than in contemporary liberal polities where government has, since the late eighteenth century, conceived of a natural, 'autonomous' realm of freedoms and activities outside the legitimate sphere of politics. This 'civil society' has, at one and the same time, limited the scope of political authority-exercising a vigilance over it-while obliging such authority to shape and nurture the very freedoms and activities which provide a counterweight and limit to its power (cf. King and Kendall, 2004: 192; Miller and Rose, 2008: 59). The exercise of political power in liberal polities is thus confronted by subjects equipped with rights that *must not* be interdicted by government. Conversely, liberal government addresses a demesne of processes that it *cannot* govern by the exercise of sovereign will alone because it lacks the requisite knowledge and capabilities. Liberal government, then, necessarily reformulates its objects, techniques and tasks with reference to this domain of civil society with the aim of optimizing its functioning in terms of specific understandings of national growth, prosperity, tranquillity, peace and so on (cf. Dean, 2010: 30; King and Kendall, 2004: 190-196).

The knowledge on which liberal forms of government have relied in order to realize their multifarious ambitions and goals and to justify the exercise of power this involves (cf. Rose, 1999: 28) have tended to be drawn from the theories of the social sciences (cf. Rose, 1996: 45). Theories from disciplines such as economics, sociology, and psychology have provided what Miller and Rose (2008: 62) describe as the 'intellectual machinery' of liberal government: 'procedures for rendering the world thinkable, taming its intractable reality by subjecting it to the disciplined analyses of thought' (Miller and Rose, 2008: 62). The expertise of the professions, in particular, has provided liberalism not only with the technical means and apparatus for governing civil society 'at a distance' (Rose, 1996: 46), but with the theories, knowledge and 'know-how' that promise to render docile and governable the unruly domains over which government is to be exercised. Of course, such relations have been reciprocal. While liberal government has depended upon professional knowledge and expertise for its languages and calculations, so too have professionals thrived on the problems of government, the demand for results and solutions, and the attraction of research approaches and explanations which hold out the promise of making the social field amenable to governmental intervention (cf. Miller and Rose, 2008: 63).

Of key significance in providing authorities with the requisite knowledge, expertise and strategies to govern has been the profession of academic research and scholarship. The basic or 'free' research (Rider, 2009: 90) undertaken by academics in universities has proved a vital resource for liberal

government in representing and depicting social spheres in such a way that both grasps their truth and re-presents them in a form in which they can enter into the scope of conscious political calculation (cf. Miller and Rose, 2008: 62). With the growth of liberal democratic polities over the course of the twentieth century and their re-orientation to a formula of 'welfare' (Rose, 1996: 48), academic research has been increasingly invoked in social policy initiatives to inform and rationalize governmental endeavours in spaces constructed as problematic-from families, communities and clinics to schools, prisons and workplaces. Today, however, a fundamental shift in the relation between government and professional expertise can be detected. The authority of expertise on which government now depends and the forms of knowledge on which it now relies appear less likely to obtain from the neutral, autonomous agency of rigorous, disinterested investigation associated with the professions in general and university research in particular. Instead, more corporatized forms of research produced by private consulting firms, 'Think Tanks', and 'policy entrepreneurs' appear to be the preferred source of information by policy types. The practice of commissioning research-from the corporate sector but also from the university-is an associated development in this trend.

This article seeks to account for what it describes as the corporatization of the 'intellectual machinery' of government in liberal polities today. First, it contrasts the knowledges which inform two key national policy endeavours to introduce professional standards for teachers in Australia-the *National Framework for Professional Standards for Teaching* (the 'National Framework') released by the Ministerial Council on Education, Employment, Training and Youth Affairs (McEetya) in 2003, and the *Australian Professional Standards for Teachers* (the 'Australian Standards') launched by the Australian Institute for Teaching and School Leadership (AITSL) in 2011. The article argues that these two policies represent significant 'nodal points' in the shift in relation between government and academic expertise in Australia over the course of the last decade or so. Analysis of the knowledges which inform these 'programmes of government' (Miller and Rose, 2008: 61)-via a 'surface reading' (Triantafyllou, 2012: 27; cf. Foucault, 1991) of their citations and references lists-discloses much about the respective 'epistemes' of government (Dean, 2010: 42) in which the programmes are located and produced. It is this particular 'stratum' of knowing with which this paper is concerned, rather than the success or not of the 'implementation' of the policies themselves. While the Australian Standards may have become the first, nationally-agreed upon set of standards for teaching and teacher education to be implemented in all Australian States and Territories, such complete and widespread implementation was never the object of the National Framework. Rather, it sought only to establish the standards it identified-of professional 'knowledge', 'practice', 'values' and 'relationships' (McEetya, 2003: 11)-as a set of guidelines for others who were to work on the development of standards for teaching at the time (McEetya, 2003: 1).

Second, the article seeks to account for this shift in the relation between government and academic expertise by investigating the contemporary liberal 'governmentality' (Dean, 2010; Foucault, 1991; Rose, 1999) which such practice arises from and informs. It will be seen that the governmentality of 'advanced liberalism' (Dean, 2010; Foucault, 1991; King and Kendall, 2004; O'Brien, Osbaldiston and Kendall, 2014: 289; Rose, 1999) which characterizes western liberal polities today not only relies on more corporatized forms of knowledge generated by the activity of advanced liberal government itself, it actively seeks to create a distance between the decisions of formal political institutions and the very professions-including the academic profession-whose knowledge, theories and frameworks have, until now, been so integral to the exercise of this form of power.

2. POLICY NODES

The National Framework was released by McEetya in November 2003 after endorsement by Australia's State, Territory and Federal education ministers. This joint ratification gave the National Framework an authority akin to that of *primus inter pares*- 'first among equals'-in relation to the multiplicity of standards for teachers being developed and deployed at the time by State and Territory teacher employing bodies, teacher professional associations, and regulatory agencies across the federation. The policy itself makes this point quite cogently:

The significance of this endorsement by Ministers cannot be overstated and other groups such as employers and professional associations who are undertaking or will undertake work on standards for teaching need to recognise the imprimatur that the National Framework has and refer to it as a guide and key point of reference. (McEetya, 2003: 1)

In this respect, the National Framework can be understood as effort by political authorities-not least those at the Federal level in an area of predominantly State responsibility-to assert a degree of uniformity over what constituted appropriate pedagogical knowledge, practice, values and relationships for teaching in Australia. Through the mechanism of the ministerial council, some effect was given to the endeavour to govern teachers on a national scale within a federal context. The exercise of power by political authorities-and chiefly the Commonwealth in this instance-was rationalized by a language of 'national collaboration' and 'teacher quality' (McEetya, 2003: 1) inscribed throughout the policy document itself. A not insignificant contribution to this 'political rationality' (Miller and Rose, 2008: 58-61) was provided by the free research into teaching and school leadership produced by academics.

An analysis of the policy document's References section according to reference type discloses much about the authority and knowledge used to inform and justify this 'programme of conduct' (Foucault, 1991: 75). Such analysis, it should be pointed out, is a research technique in keeping with analyses of governmentality. It is part of the 'surface reading' (Triantafillou, 2012: 27) of programmes of government by which 'we map and unravel the kinds of problematizations and rationalities of government that the stated aims and intentions are at once forming and indebted to' (Triantafillou, 2012: 27). The first finding of note revealed by analysis is the actual number of references or sources upon which this policy relies: thirty-eight in total for an eleven page document. In comparison with other policy initiatives on standards for teachers in play at the time-many of which are cited in the References section and summarized in the second Appendix to the policy (McEetya, 2003: 17-20)-this figure is considerable. Given the 'imprimatur' that the policy claims for itself, however, it is perhaps not surprising that it seeks to muster 'allies' for its initiative. Of course, of even more significance for this article are the *forms* of such knowledge-particularly the nature and extent of free research employed in the governmental programme.

Of the thirty-eight references listed in the References section of the National Framework, twelve (32%) are published academic works. The other references comprise OECD reports; Commonwealth and State policies on teaching and schooling; an Australian Council of Deans of Education report; and professional (curriculum) association reports. As one would expect of a programme of government of the nature of the National Framework-for reasons which have to do with the knowledge made available by the operations of the institutions involved in instances of governance (cf. Hunt and Wickham, 1994: 91)-the academic knowledge employed by the National Framework can be described as largely 'progressivist' in orientation. That is to say, it is produced by an intellectual practice which 'proposes a model of social progress through the teleology of reason, technology, production, and so on' (Dean, 1994: 3). The work of Ingvarson (2002)-referenced in the National Framework (McEetya, 2003: 12-14)-is representative of this epistemological type. Perhaps somewhat surprisingly, the policy also employs academic knowledge which may be described as 'socially critical' in orientation. This is research produced by an intellectual practice which 'proposes a dialectic in which the present forms of reason and society are both negated and retained in a higher form' (Dean, 1994: 3). In a clear instance of the operation of institutions involved in governance making certain knowledges available, the policy draws on such research because the research finds standards to be a more professional and nuanced measure of performance rather than competencies (cf. Mayer, Mitchell, Macdonald, Land and Luke, 2003: 4). This is a finding which aligns with the National Framework's own position. The policy notes that 'critics [of competencies] argued that defining teachers' work through competencies not only deskilled teachers but also reinforced teachers' practices as reproductive of schooling rather than being transformative' (McEetya, 2003: 2). Socially-critical research-such as that of Porter, Rizvi, Knight and Lingard (1992)-is thus employed by the National Framework (McEetya, 2003: 12-14) not only to inform its understanding of standards but also to bolster its own position in relation to its programmatic goals.

Free research, then, conducted by academics can be said to have informed the National Framework. Such knowledge-comprising nearly a third of the references listed within the document's References section and derived from two distinct epistemological and political traditions-was employed to depict teaching in a way that both grasped its truth and re-presented it in a form in which it was able to enter the sphere of conscious political action (cf. Miller and Rose, 2008: 62). Other policies of the day and their associated 'grey literature' also sought similar recourse-in terms of both the extent of the uptake and diversity of epistemological type-to knowledge produced through free research (e.g. Mayer et al., 2003). Less than a decade later, however, the relation between politics and expertise would shift such that a new programme seeking to govern the domain in new, if not more regulatory ways through national standards would emerge.

In 2011, the newly formed quango, AITSL, launched the Australian Standards after their endorsement by the Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEECDYA) in December, 2010. Unlike the National Framework which provided a 'guide' and 'key point of reference' (McEetya, 2003: 1) for groups seeking to undertake work on standards for teaching, the Australian Standards are definitive: they alone are the standards by which all other authorities in all jurisdictions and sectors have now to abide. The policy itself makes this clear in a statement outlining the purpose of the standards:

The [Australian] Professional Standards for Teachers are a public statement of what constitutes teacher quality. They define the work of teachers and make explicit the elements of high quality, effective teaching in 21st century schools which result in improved educational outcomes for students. (AITSL, 2011a: 2)

From a political standpoint, then, the Australian Standards can be seen as a shift in power towards the 'centre' of Australia's federated system of government. From a governmental standpoint, however, they represent a new problematization of teaching and a new way of acting upon it: one characterized by an endeavour to stimulate teachers' agency, activity and self-steering capacities all of which have been found wanting and under-utilized (O'Brien, in press: 1).

An analysis of the References section of the Australian Standards once again discloses much about the authority and knowledge used to inform and justify this policy as a programme for the reformation of teachers' conduct. The first finding—once again in relation to the number of references or sources upon which the policy relies—reveals ten references in total for a twenty-four page document: less than a third of the number included in the National Framework for a detailed policy over twice as long. One response to this finding could be that the Australian Standards have a better purchase on teaching after nearly a decade by policy authorities of inscribing, visualizing, tabulating, modelling, and calculating the domain to be governed. Another could be that the sovereignty of the Australian Standards, vis-à-vis other such efforts across the federation, means they require less authority for their authority (cf. Rose, 1999: 27). Of more significance, however, from the standpoint of this article is the form of such knowledge and, once again, the nature and extent of free research employed in the programme.

Of the ten references listed in what is a combined endnotes and references section of the Australian Standards, only one (10%) is a published academic article. This work by Yinger and Hendricks-Lee (2000; cf. AITSL, 2011a: 22) - is employed to support a secondary purpose of the professional standards: teacher professional learning. As the document itself points out: 'Teacher standards also inform the development of professional learning goals and provide a framework by which teachers can judge the success of their learning and inform their self-reflection and self-assessment' (AITSL, 2011a: 2). Epistemologically, the work by Yinger and Hendricks-Lee (2000) may be described as progressivist in orientation. The other references in the policy document comprise two OECD reports; two Commonwealth government policies; and, significantly, two national private think tank reports (from the ACER and the Grattan Institute respectively) and a report from a large international private consulting firm (McKinsey and Company) (AITSL, 2011a: 22). The importance of these latter, corporatized knowledge sources should not be underestimated: Their use both reconfigures the governmental problematization of the domain and rationalizes the course of action proposed by the programme itself. Specifically, the problematization involves a shift away from (professional standards for) *teaching*—as inscribed in the title of the National Framework—to a concern with (professional standards for) *teachers*, as inscribed in the title of the Australian Standards. The corporatized forms of knowledge are used to justify the shift onto the teacher as 'the greatest resource in Australian schools....far outweighing the impact of any other education program or policy' (AITSL, 2011a: 1; cf. Jensen [the Grattan Institute], 2010) and 'instruction because of its direct impact upon student achievement' (AITSL, 2011a: 1; cf. Barber and Mourshed [McKinsey and Company], 2007). Such knowledge, of course, also brings the very domain of teaching and school education into being (cf. Miller and Rose, 2008: 62) in such a way that teachers themselves—their 'knowledge, practice and professional engagement' (AITSL, 2011a: 3)—become the primary object of governmental attention and intervention rather than, say, curriculum, assessment, educational resources or the built environment of schools and classrooms.

The displacement of knowledge developed from free research by that fashioned from more corporatized forms is a practice which extends beyond the Australian Standards themselves. Other national policies subsequently introduced by AITSL in cognate areas such as principal standards (AITSL, 2011b),

professional learning (AITSL, 2012a), and teacher performance and development (AITSL, 2012b) reveal an increase in the trend towards the corporatization of the intellectual machinery of government discussed above. Endeavouring to make sense of this shift is undertaken in the next section of the article.

3. ACCOUNTING FOR THE SHIFT

Accounting for the increasing reliance by policy makers and politicians on research produced by national and international private consulting firms, Think Tanks, and policy entrepreneurs over the basic or free research produced by academics is best undertaken, this article argues, in terms of the transformations in the rationalities and practices of government we associate with advanced liberalism. This is a new diagram of the relation between government, expertise and subjectivity which requires, at its core, the re-organization of all features of national policy 'to enable a market to exist, and to provide what it needs to function' (Rose, 1999: 141). It may be said to be characterized by a distance between the decisions of political institutions and other social actors; by a conception of such actors as subjects of responsibility, autonomy and choice; and by governmental action which seeks to work through such actors' freedom (cf. King and Kendall, 2004: 201; Rose, 1996: 53-54). The present shift in the forms of knowledge upon which government now relies can thus be understood in this context as part of the extension of a market rationality to all spheres and a concomitant 'complexification' of the mentality and activities of liberal rule over recent decades (cf. Rose, 1999: 142).

Under earlier forms of liberal rule, expert conceptions of governmental domains such as teaching and schooling were directly transcribed into the apparatus of political government. The National Framework, for instance, was-as late as 2003-still relying largely on free research on teacher standards produced by academics. Knowledge from such research can be seen to have played an important role in providing the necessary expertise in the government of that field. The autonomy of such experts, however, effectively insulated them from political attempts to govern their decisions and actions. New measures to regulate these 'expert machines' (King and Kendall, 2004: 208) in the form of 'market tests' drawn from accountancy and audit were, therefore, adopted by political authorities to exercise critical scrutiny over academic and other forms of expertise drawn, principally, from the social sciences (cf. Dean, 2010: 197; King and Kendall, 2004: 208). The political salience of expertise has thus become reconfigured in advanced liberalism. Free research is 'de-centred' from the machinery of government as government itself is 'de-statized', resulting in the proliferation of a whole new series of quangos (King and Kendall, 2004: 209; Rose, 1996: 56)-such as AITSL itself-which seek to govern 'at a distance' (Rose, 1999: 49) from political rule. With academic experts now subject to claims made upon them other than those of their own criteria of truth and competence, their free research thus becomes but another knowledge source in the 'market place' of ideas-a place from which advanced liberal government assembles its intellectual technology. Indeed, the trust once accorded to professional and academic credentials by formulae of liberal government is replaced by forms of audit (Rose, 1996: 55) such as the 'commissioned research'-from the corporate sector but also the academy-sponsored by AITSL (e.g. AITSL, 2012a: 7; 2012b: 9).

4. CONCLUSION

The increased reliance by policy makers and politicians on research produced by national and international private consulting firms, Think Tanks, and policy entrepreneurs over basic or free research produced by academics may be understood, this article has argued, as a shift in the relation between expertise and politics characteristic of the advanced liberal formula for rule. Through an analysis of two key nodal points in national policy on teacher professional standards in Australia over the last decade, the article pointed to the increasing utilization by political authorities of corporatized forms of research and knowledge. Conversely, the employment of free research was seen to decline. The subjection of free research to the rationality of the market, however, does not simply relegate it to the market place of ideas and into competition with its corporatized rivals. Instead, the advanced liberal formula for rule seeks the reconstitution of free research itself. As Rider (2009) points out in her critique of the modern European university: 'The freedom to form research questions is increasingly circumscribed, via economic steering, to the freedom to formulate methods for solving policy-defined problems' (2009: 87). The implication for free research, therefore, is clear: for it to remain on the discursive field from which intellectual technologies are assembled-and thus a potential source of neutral and independent knowledge for governmental programmes-its integrity and, by extension, that of the university must be preserved so that a continuity and tradition that guarantees principles of 'communalism', 'universalism', 'disinterestedness',

'originality', and 'scepticism' in research (Rider, 2009: 87) remains in place well into the future when a new mentality of government and attendant political rhetoric prevails.

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PROSPECTS AND CHALLENGES OF TRANSPORT AND LOGISTICS COOPERATION IN THE EURASIAN ECONOMIC UNION (EEU)

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ABSTRACT

On January 1st 2015 Russia, Kazakhstan and Belarus are to reach a historical integrative milestone – formation of the Eurasian Economic Union (EEU). In capturing this moment the research has shortened the existing knowledge gap, as there has been insufficient emphasis put either on peculiarities of regional transport and logistics complex of the three or on corresponding integrative practices and policies set on greater convergence. In this essence, Eurasianist concept laid in the basis of the project by its distinguished advocate and pioneer president of Kazakhstan Nursultan Nazarbayev needs thorough rethinking. Arising warnings of western scholars and policy-makers on the attempts to somehow reincarnate the Soviet Union in a form of EEU should be also carefully studied, though some of them are obviously politically and ideologically driven. And it is here where integration-induced mechanisms should come into the scene to mark the economic logic of the project.

The paper strongly believes that it is transport and logistics (T&L) cooperation that should act as a locomotive of such benevolent integrative impulse. With profound economic benefits to come already by the end of 2015 provided the integration operate on a full mode forming common transport policy of the three needs to be critically reviewed in the light of institutional weakness, ailing infrastructure, underutilized transit potential and failing governmental efforts on embarking regional transport and logistics complex onto a sustainable path.

Keywords: Eurasian integration, Eurasian Economic Union of Russia, Kazakhstan and Belarus, Eurasianism, regional transport and logistics complex

1. INTRODUCTION

On April 28, 2014 marking the 20th anniversary of his pioneered Eurasian project president Nazarbayev made it clear again that the formation of Eurasian Economic Union (EEU) had no intentions to somehow restore the Soviet Union. Moreover, he stressed that by any means it would be impossible and worthless pointing at three reasons. First, as of today Russia, Kazakhstan and Belarus have completely abandoned Soviet institutional practices. Second, nations of the three have already built solid independent statehood frameworks. Third, former economic and social policies have become archaic.

By arguing pivotal economic rational for the EEU president Nazarbayev has again demolished uprising concerns on its politically dictated grounds and mainly Russia's vigorous attempts to reintroduce its hegemony in the nearby (Spechler & Spechler, 2013; Bohr, 2004; Jayashekar, 1993). On the contrary, as Glazyev (2012) puts it, post-Soviet space is doomed to regional cooperation mainly due to strong economic links, common historical and social background. Being in the same vein, Gleason (2010) reveals economic motive for integration by doubting that national elites of the three would ever surrender their independence in favour of any politically formed supranational body.

Nonetheless, Eurasian integration is already a given reality and, thus, deserves non-biased, *albeit* critical, analysis.

2. RETHINKING EURASIANISM: CASE OF KAZAKHSTAN

The springboard to the notion of Eurasia should be found in the theory of geopolitics. One of the concept's founding fathers Mackinder named this profound landmass in between Europe and Asia as the *Heartland* stressing that the one who rules it commands the world (Gray, 2004). Being in the same vein, Ferguson (2007) stressed that the state that controls the *Rimland*, Eurasian peripheries *per se*, masters Eurasia itself, and consequently owns the world. Such approach became very popular in the late era of

detention between the US and the Soviet Union, when Atlantic allies politically and economically rushed into the *Rimland* to establish western hegemony over the region given ailing Soviet regime.

In conceptual terms Eurasia remains highly contestable term with challenging implications in time and space from geopolitical, philosophical and ideological perspectives. As Mostafa (2013) puts it, *Eurasianism* is more about politics and induced ideologies used by scholars, policy-makers and nationalists to justify their deeds in pursuing goals and aspirations locally and worldwide. However, despite such theoretical diversity the paper reveals the key conceptual consensus that Eurasianism emerged in the Russian Empire and continues to carry a lasting influence on its foreign policy (Sengupta, 2009).

The roots of this notion go back to the 1860-s when Russian philosopher N. Danilevsky constituted Eurasia as an idiosyncratic entity separated from both Europe and Asia. Eurasian ideology as a solid theory was built by outstanding Russian intellectuals N. Trubetskoi and P. Savitsky regarded as first self-conscious eurasianists emphasizing Russia's historical, spiritual and civilizational alternative development path blended into the theory of a *third way* (Tsygankov, 2003).

During the Soviet time, Eurasianists supported the creation of the Soviet Union incorporating Central Asian and Caucasian regions, however, according to Mostafa (2013), the Eurasianist idea was vanished in the dominant communist ideology. One of the key proponents of Eurasianism of that time Gumilev justified Russia's geopolitical dominance in Eurasia as a tool to counter-balance interests of Europe and Asia. It was also believed that Russia had taken more from Asia rather than Europe in national, ideological and philosophical ways. He went even further by introducing the term of *passionarity* applicable solely to Eurasian nations. As Gumilev explains it, Eurasian inhabitants unlike Europeans are more prone to spiritual and sacrificial behavior in the aim of historically superior goals rather than temporal materialistic ones.

With the dissolution of the Soviet Union *Eurasianism* as a concept did not evaporate, on the contrary, it was seen as unifying point for saving broken economic, political and cultural links. In rethinking contemporary *Eurasianism* Rangsimaporn (2006) and Sevim (2013) have identified three main groups of thought: *pragmatic Eurasianism*, *neo-Eurasianism* and *intercivilizational Eurasianism*. The nature of pragmatism does not deny the benevolence of Russia's cooperation with Europe brining on the agenda economic, cultural and security issues. At the same time, *sin qua non* status of Russia as a regional hegemon does not exclude multi-vector policies of Astana and Minsk trying to balance on the world arena.

Neo-Eurasianism deals with geopolitics stressing that confrontation between Eurasia and the West is unavoidable. As Bassin (2008) captures it, citing one of the hawks of neo-Eurasianism Dugin the pivotal historical task of neo-Eurasianism is to provide the world with a competitive politico-ideological platform to combat Atlanticism. To put it differently, under such approach Europe is seen as an ally or at least a neutral player rather than an enemy, whereas the US being the beacon of Atlanticism should be severely opposed on its way to global hegemony.

In their turn, intercivilizationists search for similarities between Eurasia, Europe and Asia in identical, cultural, historical and behavioral patterns. Rangsimaporn (2006) finds such concept relatively illusory pointing at rising political and religious disputes worldwide on the one hand, and on the other – continuous fragmentation of world trade with cropping up regional trade blocks.

In tracking the evolution of the *Eurasianism* the paper has endeavoured to interpret the concept as of today. *Eurasianism*, as a theory *per se*, has seen no progress since Gumilev's studies raising criticism from scholars and misunderstanding of general public (Mostafa, 2013). Being in the same vein, Laurelle (2004) refers to *Eurasianism* as a hidden form of state-oriented nationalism not subject to pure academic research. However, an idiosyncratic look at modern *Eurasianism* could be captured from the Kazakhstan's case.

Kazakhstan's understanding of *Eurasianism* is centered around the issues of multi-ethnicity, multi-faith, multi-linguistics and multi-vector policies. At first glance these Eurasian values imply embracing tolerance and respect of customs and traditions of people inhabiting this space. In fact, they have deeper habitual

and philosophical roots of not something abstract but very much vibrant and incorporated into the daily economic, political and social life.

First, uniquely placed in the heart of Eurasia the new capital of Kazakhstan city of Astana logically presupposes its status as the platform for summits, roundtables, academic conferences and other discussion formats on *Eurasianism*.

Second, Kazakhstan's *Eurasianism* is totally and enthusiastically inspired by president Nazarbayev's policy. In 1994 tackling the socio-economic shock of the USSR's demise he pioneered the necessity of Eurasian integration with the motto: *economics first, politics later*. However, at that time cooperation was possible only in the format of the Commonwealth of Independent States (CIS), which, according to Libman (2007), was just an instrument of civilized divorce imitating cooperation but with no future for real integration. In the circumstances of post-Soviet integrative turbulence Russia, Kazakhstan and Belarus only in 2010 launched the Customs Union of the three, in 2012 upgraded this entity into the Single Economic Space and in 2015 are to reach the highest form of integration – EEU. Throughout this integrative journey it was president Nazarbayev who has been constantly and consequently pushing the Eurasian integration through on the grounds of parity and pluralism.

Third, multi-ethnicity of Kazakhstan's population is cemented with the lingua franca – Russian – sharing its status both domestically and regionally. According to the latest census, 30% of the population of Kazakhstan is ethnically Russian and almost 95% of the overall population has fluent command of the language (Shilibekova, 2010). Simultaneously, Kazakhstan's authorities are constantly cultivating the culture of multi-linguistics having recently introduced trilingual policy – command of its population of state Kazakh, official Russian and English.

Fourth, various social and state organizations of Kazakhstan have direct reference to *Eurasianism*. Namely, one of the leading national universities headquartered in Astana is named after Gumilev and has the prefix of Eurasian. Furthermore, Eurasian focus is also present in the banking sector, i.e. Eurasian Bank of Development, media, i.e. Eurasian Media Forum, and business, i.e. Eurasian Business Forum.

To recapitulate, the paper has rethought the concept of *Eurasianism* placing its Kazakhstan's version in the centre of the research. As Pak (2014), Vinokurov (2012) and Hartwell (2013) stress it, Kazakhstan's *Eurasianism* ideally matches its global multi-vector policy: internationally for establishing friendly relations with major players and integrative entities, regionally as a tool to foster and deepen integrative processes and domestically to consolidate and tolerate multi-ethnic population.

3. PROSPECTS AND CHALLENGES OF EURASIAN COMMON POLICIES: TRANSPORT AND LOGISTICS FOCUS

The creation of EEU is generally regarded as the triumph of the *Eurasianism* ideology on the one hand, and a real breakthrough in the regional agenda of the post-Soviet space on the other. However, the trade off between integrative prospects and drawbacks is still not clearly defined and contains polarized implications.

According to the estimates of the Russian Academy of Sciences, by 2030 the overall trade volume between Russia, Kazakhstan and Belarus is to reach historical \$400 bn., GDP of the three overlap \$2.4 trln. with a 15% increase already by 2015 (Glazyev, 2012). In its turn, by 2030 Eurasian Bank of Development (EABD) and Eurasian Economic Commission (EEC) expect the cumulative integrative effect to be \$632 bn. for Russia, \$106.6 bn. for Kazakhstan and \$170 bn. for Belarus (Chufrin, 2012). In studying Union's intra-trade picture Pak (2014) indicates a 39.9% increase in the overall volume since 2010 with Russia-Kazakhstan mutual trade having peaked at \$24 bn. and Russia-Belarus trade turnover having rocketed by 50%.

Inherited from the USSR sound manufacturing and mining sectors as well as relatively competitive agricultural complex are named to be the most winning from integration industries. Assessing the economic rational for Belarus Plaschinsky (2011) stresses that country's agricultural exporters have significantly benefited from the harmonization of sanitary, veterinary and phytosanitary norms with Russia, keeping in mind the 'milk and meat wars' of 2009 and 2010. Besides, in 2011-2012 Belarus

tripled its exports of frozen meat and dairy products to Kazakhstan (EEC, 2011). In its turn, in 2011 alone Kazakh mining industry's has shown a 170% growth in exports to Russia (EEC, 2011)

Common energy sector of the three is to be fully framed by 2025. Yet, as of today, Kazakhstan's entering the integrative process has already opened new horizons for national oil and gas companies. First, it has forced national oil refineries to reduce costs and increase depth of oil refinery in order to compete with their Russian counterparts. Second, and more strategically Kazakhstan's Pavlodar Refinery has acquired access to now duty-free Siberian oil to saturate the domestic market with Russian-origin petrochemicals of higher quality. Third, Kazakhstan and Belarus are already negotiating the prospects of exporting Kazakh oil to Belarus in 2-3 years. On the Russia-Belarus side, Belarusian export of refined petrochemicals brought additional \$1.7 bn. to the national budget and totaled at \$4.6 bn. in annual direct and indirect subsidies from Russia (Belyaev, 2012). Furthermore, Putin and Lukashenko agreed on a special 'integration reducing' coefficient on gas for Belarus starting from 2012 as well as introduction of Russia's domestic gas prices from 2014. So, already in 2012 Belarus has started to import Russian oil and gas at the price of \$164 (tcm) compared to the price for European customers of \$415 (tcm)

The choir of critics becomes even quieter when viewing T&L complex as a functional area of cooperation that can make the economies of the Russia, Kazakhstan and Belarus substantially better off.

Vast territories and export-oriented economies, namely Russia and Kazakhstan's, logically predetermine sustainable development of regional T&L complex. Rapidly growing East-West trade gives EEU member-states a unique opportunity to modernize their infrastructure as well increase transit revenues. Tracking transit profile of the three Rogov (2013) found out that as of today they account for less than 1% of the East-West trade volumes, whereas in 1982 Soviet Union secured a substantial share of 20%. Consequently, transit potential of Russia, Kazakhstan and Belarus is severely underutilized. As Tsvetkov, Zoidov and Medkov (2013) assess it, with the annual transit capacity of 230 mln. tones EEU-members take benefit of roughly 20%.

Another rational for integration could be found in the weaknesses of corresponding institutions of the three facing similar challenges as well. Ailing infrastructure, obsolete rolling stock, excessive red tape in document turn over and lack of high-tech logistics facilities hamper the states' development policies. According to Vinokurov (2012), inadequate transport policy coupled with the fact that almost 70% of the rolling stock is outdated logically results in incredibly high transport component in the regional cost of goods sold (16-20%) and low level of containerization: 37 containers per 1 thousand people.

And it is here, where the mechanisms of Eurasian integration come into the discourse. In the format of EEU Russia, Kazakhstan and Belarus have made free movements of goods, services, labour and capital possible with functional economic policies coordinated by the supranational body of the EEC. Thus, EEC has launched sound institutional package to tune common transport policy of the three. First, massive attention is being paid to the harmonization of regulations and safety standards on all means of transport. In 2013 ECC assured of the forthcoming policies cohesion in railway, auto, maritime and air industries. Specifically, it has been recently agreed to back up piggyback shipments via Saint-Petersburg leading to the reduction of delivery costs for a EEU-based company by 15-20%. Second, in the face of the ailing rolling stock Russia, Kazakhstan and Belarus have initiated the set-up of several joint ventures to manufacture modern locomotives and wagons in Kazakhstan with Canadian Alstom and American General Electric as third parties.

Third, ITLC to be put into full operation mid-2014 is aimed at providing customers with straight-through transport services across the Single Market, increasing its transit share and strengthening its presence elsewhere. According to the estimates of Libman (2012) and Vinokurov (2012) by 2020 the creation of ITLC will generate additional \$5 bln. for Russia, \$5.3 for Kazakhstan and around \$1 bln. for Belarus. Also, by 2020 ITLC has the potential to count for the overall freight turnover of 4 mln. TEU, the majority of which is containerized goods passing through the eastern gateways of the EEU – Kazakh terminals of Dostyk and Khorgos. As Pak and Sarkisov (2014) forecast it, by 2020 Dostyk will be able to service flows of 616 000 TEU and Khorgos accounting for 232 000 TEU. However, such expansion requires massive investments estimated for Kazakhstan alone at the level of \$36 bln. by 2020. Furthermore, by absorbing the assets of the Russian container operator TransService, ITLC has internationally inherited a 10%

share with an option for 25% in an Austrian logistics company Far East Land Bridge Est. providing services to BMW, Samsung and LG.

Finally, additional emphasis is paid to the completion of the promising international auto corridor '*Western Europe – Western China*' which will facilitate trade flows not only from China to the EU through Kazakhstan and Russia, but will also link it to the South Asian direction via Uzbekistan and Kyrgyzstan. With the overall length of the corridor of 9 000 km., Kazakhstan will cover 2787 km. and Russia around 3 000 km. Expected to be put into operation in 2018 it will shorten the delivery dates for a shipment from China to Europe to 10-12 days, whereas delivering it seaborne takes 45 days and railborne via Trans-Siberian Railway Line (Transsib) lasts for 14 days (Tsvetkov *et al.*, 2013). Moreover, corridor's construction logically involves creation of so needed multifunctional logistics complexes of 3 and 4 PL class and introduction of efficient surveillance systems.

All in all, it is fair enough to question the short-term results of the introduction of common transport policy pointing at little efficiency of its mechanisms. However, only 2 years have passed since the announcement of the coordination of transport initiatives of the three, whereas in the EU this topic was first mentioned in 1961 and is still on the burning agenda. As of today the most advanced cooperation within the transport complex of Russia, Kazakhstan and Belarus has been achieved in the railway sector, where common institutional framework is twofold. First, on January 2013 the states introduced common railway tariff to lay the first convergence basis. Second, on January 2014 the EEU passed the bill granting equal access to the common railway grid to any transport company of the three. With the ascendancies of railway transport to the economies of EEU, namely Russia and Kazakhstan, where it accounts for 86% of their overall freight turnover, such decision might be a good step on to the long integrative road (Pak & Sarkisov, 2014).

4. CONCLUSION

For the last 20 years post-Soviet space has seen various integrative initiatives, out of which EEU of Russia, Kazakhstan and Belarus represents a first sound body to strengthen and deepen regional economic cooperation on completely different economic and institutional grounds.

On the theoretical part the paper has claimed the uniqueness of EEU to the whole wisdom on regional integration drawing distinctive features of economic rather than political unifying rationales. In fact, these are the *Eurasianist* roots that lay commonly recognized basis for integration from civilizational, social, cultural and philosophical perspectives. Given a cherished *Eurasianist* conceptual heritage its modern implications should be captured from Kazakhstan's case, where corresponding theories and practices have not become something ephemeral but are reflected in the overall state policy with concrete socially constructed framework.

The paper has identified T&L as one of the most crucial functional areas on the way to the next integrative milestone – Eurasian Economic Union to be formed in 2015. Common transport complex of the three has all the essentials to become the locomotive of innovative growth and source of lavish revenue flows should the authorities of Russia, Kazakhstan and Belarus conduct consistent and adequate common policies.

To recapitulate, such focus on T&L cooperation and induced new economic horizons has stressed the necessity of further research on the economic integrative rationales beneficial for all stakeholders of Russia, Kazakhstan and Belarus.

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A STUDY OF INTERVAL ESTIMATION METHODS FOR EFFECT SIZE MEASURES IN MEDIATION MODELS

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ABSTRACT

Effect size measures are important for researchers to communicate the practical implications of mediation effects. In this study, two relatively new interval estimation methods are developed and demonstrated. The first method is based on the concept of variance estimates recovery, and the second method is based on the concept of generalized pivotal quantity. The new approaches are then compared to two other approaches—the delta method and the percentile bootstrap method. The confidence intervals generated by these methods are evaluated in terms of coverage probability and expected length through simulation studies. An empirical example is also analyzed to compare the performance of these interval estimation approaches. A discussion on the estimation method most appropriate under various conditions is presented.

Keywords: Confidence interval, Effect size, Interval estimation, Mediated effect.

1. INTRODUCTION

To determine how three variables are related statistically is crucial for quantitative data analysis in various disciplines. Mediation is a ubiquitous concept in social and behavioral science research, and it is one way to investigate the correlational relationships among three variables. In mediation, the emphasis is on the mechanism that operates between independent and dependent variables. The well-known stimulus-organism-response (S-O-R) model in psychology is a classic mediation model in which the organism was affected by the stimulus and then created a response. In this model, the organism is the mediating variable (or mediator).

In recent years, research work and the literature on mediation models have mushroomed in various disciplines. Different methods (Sobel, bootstrapping, Bayesian, etc.) have been applied to estimate mediated effects under various mediation models (single mediator model, multiple mediator model, multilevel mediation model, etc.). For example, Yuan and Mackinnon (2009) applied the nonparametric Bayesian method to estimate multilevel mediation models. Yet, despite recent advances in the estimation and testing of mediation effects, little attention has been paid to effect size measures for mediation models. The purpose of this study is thus to investigate and compare various effect size measures for the single mediator model. Let Y denote the dependent variable, X denote the independent variable, and M denote the mediating variable, then the single mediator model can be expressed by three regression equations. For all $i=1,2,\dots,n$,

$$Y_i = cX_i + \varepsilon_1, \quad (1)$$

$$Y_i = c'X_i + bM_i + \varepsilon_2, \quad (2)$$

$$M_i = aX_i + \varepsilon_3, \quad (3)$$

where parameter c denotes the total effect -which is the relation between the independent and dependent variables, parameter c' denotes the direct effect -which is the relation between the independent and dependent variables adjusted for the effects of the mediating variable, parameter a is the relation between the independent and mediating variables, and parameter b is the relation between the mediating and dependent variables adjusted for the independent variable.

Equation (1) is a linear combination of Equations (2) and (3). Assumptions regarding Equations (2) and (3) are that the error terms ε_2 and ε_3 are identically and independently distributed normal random

variables with variance σ_2^2 and σ_3^2 , respectively. If we plug equation (3) to equation (2) and compare the resulting equation with equation (1), then the error term in Equation (1) is comprised of the error terms in Equations (2) and (3), $\varepsilon_1 = b\varepsilon_3 + \varepsilon_2$. We can then derive $\sigma_1^2 = b^2\sigma_3^2 + \sigma_2^2$. Since the intercept terms are irrelevant in the calculation of the mediated effect, they may be omitted.

The parameter ab is called mediated effect, which is also known as the indirect effect. Because X affects Y indirectly through M , the mediated effect also equals the difference in the total and direct effect, that is,

$$ab = c - c'. \quad (4)$$

Namely, the indirect effects $c - c'$ and ab are equivalent (MacKinnon et al., 1995; MacKinnon, 2008, pages 50-51).

The necessity of reporting effect size measures in quantitative studies is almost universally accepted. MacKinnon, Fairchild, and Fritz (2007) pointed out that additional studies on effect size measures for mediation analysis are required. Few studies have investigated or provided confidence interval (CI) estimation of effect size measures for mediation models. The determination of the CIs of effect size measures is recommended because the CIs provide not only an indication of statistical significance, but also plausible intervals for population effect size values. The aim of the present study is to construct CIs for two ratio measures of effect size: $ab/(ab + c')$, and c/a . The ratio $ab/(ab + c')$ is one of the most commonly used effect size measures, and it represents the ratio of the mediated effect to the total effect. The ratio c/a measures the success of a surrogate endpoint (Buyse and Molenberghs, 1998) and its value is expected to be one if X predicts M to the same extent that it predicts Y . Because it is not easy to derive the exact distributions of $ab/(ab + c')$ and c/a to construct CIs under finite samples, Tofighi, MacKinnon, and Yoon (2009) applied the multivariate delta method to derive standard errors of the effect size measures in the single mediator model. However, the delta method is based on the assumption of normally distributed parameters, and therefore, the violation of normality may affect the estimation accuracy, particularly so with small samples.

Some researchers have suggested using bootstrapping CIs (MacKinnon, Lockwood, and Williams, 2004; Shrout and Bolger, 2002) to overcome this problem, for example, Bauer et al. (2006) suggested using the parametric bootstrap method to construct CIs and to calculate standard errors for complex functions of parameters. Zou (2007) presented a general approach to constructing approximate confidence intervals for differences between two parameters with asymmetric sampling distributions. This method is an extension of the traditional asymptotic method, and it is called the method of variance estimates recovery (MOVER). The method was found to provide satisfactory results for small to moderate sample sizes (Zou, 2007), and it has been applied in many fields, such as epidemiological, psychological, and environmental studies. Yu and Tsai (2012) developed an approach based on the concept of generalized pivotal quantity (GPQ) to construct CIs for mediated effects. Their results show that the GPQ-based and percentile bootstrap methods outperform other methods when mediated effects exist in small and medium samples for some parameter configurations. The MOVER and GPQ-based methods are two relatively new estimation methods, and both have not been applied to estimate the effect size measures in the context of mediation analysis.

The main purpose of this study is twofold: first to apply the concepts of GPQ and MOVER to construct CIs for effect size measures in single mediator models. The second purpose is to compare several interval estimation methods for effect size measures in terms of their empirical coverage probabilities and expected lengths. Four estimation methods (the MOVER, GPQ-based, delta and percentile bootstrap methods) and two ratio measures of effect size ($ab/(ab + c')$, and c/a) are investigated in the current study. Thereafter, practical recommendations for using these methods under various conditions are provided. The remainder of this article is organized as follows. In Section 2, we derive and construct the confidence limits based on the MOVER and GPQ concepts. In Section 3, an analysis of a real example is presented for comparing the results of effect size measures estimated by different interval methods. In

Section 4, we compare and discuss the expected lengths and coverage probabilities of these interval methods based on a Monte Carlo simulation. Finally, in Section 5, we conclude with some practical suggestions based on the findings.

2. INTERVAL ESTIMATION FOR RATIO MEASURES OF EFFECT SIZE

In this section, we first introduce the MOVER and then derive its associated confidence limits for ratio measures of effect size under a single mediator model; this is followed by the derivation of CIs for the GPQ-based method.

2.1. The MOVER Approach for Ratio Measures of Effect Size

Zou and his colleagues have published several papers on the development of the MOVER, and they have applied this method in various fields. For example, Zou (2007) found that the MOVER provided very satisfactory results for small to moderate sample sizes. Moreover, Zou and Donner (2008) applied the MOVER to obtain CIs for a risk ratio and a lognormal mean, and their results showed that this procedure outperformed existing methods, including the bootstrap method. Zou and his colleagues showed that the MOVER is highly effective for a composite parameter, provided that the CIs for each component parameter perform well. Advantages of this approach, by contrast to the delta method, are that (1) the variance estimates are allowed to change with underlying parameter values, and (2) CIs for a linear function of parameters are allowed to be asymmetric (Li et al., 2010).

Let θ_1 and θ_2 be the parameters of interest for population and ρ be the correlation of θ_1 and θ_2 , with point estimates $\hat{\theta}_1, \hat{\theta}_2$, and $\hat{\rho}$ respectively. As a results of Li et al. (2010, page 2525), a $100(1-\alpha)\%$ confidence interval (L, U) for $\theta_1 - \theta_2$ when $\text{corr}(\hat{\theta}_1, \hat{\theta}_2) = \hat{\rho} \neq 0$ is given by

$$L = \hat{\theta}_1 - \hat{\theta}_2 - \sqrt{(\hat{\theta}_1 - l_1)^2 + (u_2 - \hat{\theta}_2)^2 - 2\hat{\rho}(\hat{\theta}_1 - l_1)(u_2 - \hat{\theta}_2)}, \quad (5)$$

$$U = \hat{\theta}_1 - \hat{\theta}_2 + \sqrt{(u_1 - \hat{\theta}_1)^2 + (\hat{\theta}_2 - l_2)^2 - 2\hat{\rho}(u_1 - \hat{\theta}_1)(\hat{\theta}_2 - l_2)}. \quad (6)$$

where $l_1 = \hat{\theta}_1 - z_\alpha \hat{\sigma}_{\theta_1}$, $u_1 = \hat{\theta}_1 + z_\alpha \hat{\sigma}_{\theta_1}$, $l_2 = \hat{\theta}_2 - z_\alpha \hat{\sigma}_{\theta_2}$, $u_2 = \hat{\theta}_2 + z_\alpha \hat{\sigma}_{\theta_2}$, and z_α is the $100(1-\alpha/2)$ percentile of the standard normal distribution. This method may be extended in several ways. For example, noting the CI for $-\theta_2$ is given by $[-u_2, -l_2]$, we obtain a $100(1-\alpha)\%$ CI for $\theta_1 + \theta_2$ given by

$$L' = \hat{\theta}_1 + \hat{\theta}_2 - \sqrt{(\hat{\theta}_1 - l_1)^2 + (\hat{\theta}_2 - l_2)^2 - 2\hat{\rho}(\hat{\theta}_1 - l_1)(\hat{\theta}_2 - l_2)}, \quad (7)$$

$$U' = \hat{\theta}_1 + \hat{\theta}_2 + \sqrt{(u_1 - \hat{\theta}_1)^2 + (u_2 - \hat{\theta}_2)^2 - 2\hat{\rho}(u_1 - \hat{\theta}_1)(u_2 - \hat{\theta}_2)}. \quad (8)$$

We can also construct a $100(1-\alpha)\%$ confidence interval for the ratio $R = \theta_1 / \theta_2$ by noting that all values of R must satisfy $\theta_1 - R\theta_2 = 0$. Assuming that $R > 0$, application of equations (5) and (6) to $\theta_1 - R\theta_2$ yields

$$L'' = \hat{\theta}_1 - R\hat{\theta}_2 - \sqrt{(\hat{\theta}_1 - l_1)^2 + (Ru_2 - R\hat{\theta}_2)^2 - 2\hat{\rho}(\hat{\theta}_1 - l_1)(Ru_2 - R\hat{\theta}_2)},$$

$$U'' = \hat{\theta}_1 - R\hat{\theta}_2 + \sqrt{(u_1 - \hat{\theta}_1)^2 + (R\hat{\theta}_2 - Rl_2)^2 - 2\hat{\rho}(u_1 - \hat{\theta}_1)(R\hat{\theta}_2 - Rl_2)}.$$

Then solving $L'' = 0$ and $U'' = 0$, we have

$$R_l^* = \frac{\hat{\theta}_1 \hat{\theta}_2 + \hat{\rho}(l_1 - \hat{\theta}_1)(u_2 - \hat{\theta}_2) \pm \sqrt{[\hat{\theta}_1 \hat{\theta}_2 + \hat{\rho}(l_1 - \hat{\theta}_1)(u_2 - \hat{\theta}_2)]^2 - l_1 u_2 (2\hat{\theta}_1 - l_1)(2\hat{\theta}_2 - u_2)}}{u_2 (2\hat{\theta}_2 - u_2)}, \quad (9)$$

$$R_u'' = \frac{\hat{\theta}_1 \hat{\theta}_2 + \hat{\rho}(u_1 - \hat{\theta}_1)(l_2 - \hat{\theta}_2) \pm \sqrt{[\hat{\theta}_1 \hat{\theta}_2 + \hat{\rho}(u_1 - \hat{\theta}_1)(l_2 - \hat{\theta}_2)]^2 - l_2 u_1 (2\hat{\theta}_1 - u_1)(2\hat{\theta}_2 - l_2)}}{l_2 (2\hat{\theta}_2 - l_2)}, \quad (10)$$

The smaller root is chosen from R_l'' and the larger root is chosen from R_u'' to be the lower bound and upper bound for the CI of effect size measure, respectively. Similarly, two roots can be derived assuming that $R < 0$. Note that when θ_1 and θ_2 are independent, the above equations can be reduced to equation (7) in Li et al. (2010, page 2526). Let \hat{a} , \hat{b} , \hat{c} and \hat{c}' be the estimates of the regression parameters a , b , c and c' , respectively. For the ratio measures of effect size in our study, the CIs by the MOVER can be obtained as follows:

Case 1: for $ab/(ab+c')$,

Step (1): construct confidence limits (l_1, u_1) for $\theta_1 = ab$ and (l_2, u_2) for $\theta_2 = c'$ using data from the main study;

Step (2): apply the equations in (7)-(8) to obtain confidence limits (l_3, u_3) for $ab+c'$;

Step (3): apply the equations in (9)-(10) to obtain confidence limits (l^*, u^*) for $ab/(ab+c')$.

Case 2: for c/a ,

Step (1): construct confidence limits (l_1, u_1) for $\theta_1 = c$ and (l_2, u_2) for $\theta_2 = a$ using data from the main study;

Step (2) apply the equations in (9)-(10) to obtain confidence limits (l^*, u^*) for c/a .

2.2. The GPQ Approach for Ratio Measures of Effect Size

Yu and Tsai (2012) applied a GPQ-based algorithm to estimate CIs for mediated effects. In the present study, we further extend this GPQ-based approach to the construction of CIs for the ratio measures of effect size. The derivation is presented below.

Let S represent a random variable whose distribution depends on ϑ and a nuisance parameter ϕ . Based on Weerahandi (1993), a GPQ must satisfy the following two conditions:

(i) The distribution of T does not depend on the unknown parameters, where T is a function of the observed value of S (denoted by s), ϑ and ϕ ;

(ii) The observed pivotal quantity T_{obs} does not depend on the nuisance parameters.

In this study, since $\vartheta = (a, b, c, c')$ in Equations (1) to (3) are unknown parameters, pivotal quantities U_a, U_b, U_c , and $U_{c'}$ may be considered with the following known distributions:

$$U_a = \frac{\hat{a} - a}{\sqrt{V(\hat{a})}} \sim t_{n-2}, \quad U_b = \frac{\hat{b} - b}{\sqrt{V(\hat{b})}} \sim t_{n-3}, \quad U_c = \frac{\hat{c} - c}{\sqrt{V(\hat{c})}} \sim t_{n-2}, \quad U_{c'} = \frac{\hat{c}' - c'}{\sqrt{V(\hat{c}')}} \sim t_{n-3},$$

where $V(\hat{a})$, $V(\hat{b})$, $V(\hat{c})$, and $V(\hat{c}')$ are sample variance of \hat{a} , \hat{b} , \hat{c} and \hat{c}' , respectively. Based on the distributions of U_a, U_b, U_c and $U_{c'}$, the forms of $ab/(ab+c')$ and c/a can be rewritten respectively.

$$\text{Let } \bar{X} = \sum_{i=1}^n X_i / n, \quad \bar{Y} = \sum_{i=1}^n Y_i / n, \quad \bar{M} = \sum_{i=1}^n M_i / n, \quad S_{XX} = \sum_{i=1}^n (X_i - \bar{X})^2 / n, \quad S_{XM} = \sum_{i=1}^n (X_i - \bar{X})(M_i - \bar{M}) / n, \\ S_{YY} = \sum_{i=1}^n (Y_i - \bar{Y})^2 / n, \quad S_{XY} = \sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y}) / n, \quad S_{MY} = \sum_{i=1}^n (M_i - \bar{M})(Y_i - \bar{Y}) / n,$$

$MSE_1 = \sum_{i=1}^n (Y_i - \hat{a}X_i)^2 / (n-2)$, $MSE_2 = \sum_{i=1}^n (Y_i - \hat{c}X_i - \hat{b}M_i)^2 / (n-3)$, and $MSE_3 = \sum_{i=1}^n (Y_i - \hat{b}M_i)^2 / (n-2)$. The CIs of $ab/(ab+c')$, and c/a may be found by applying the GPQ-based approach in the following manner.

Case 1: for $ab/(ab+c')$, let $s_1 = (s_{xm}, s_{xx}, s_{my}, s_{xy}, mse_1, mse_2, mse_3)$ denote the observed quantities of $S_1 = (S_{XM}, S_{XX}, S_{MY}, S_{XY}, MSE_1, MSE_2, MSE_3)$, the parameter $\theta_1 = \frac{ab}{ab+c'}$, and nuisance parameter $\varnothing = (\beta_{01}, \beta_{02}, \beta_{03}, c)$. Moreover, let

$$\Delta_{\frac{ab}{ab+c'}} = \frac{\left\{ \frac{s_{xm}}{s_{xx}} - U_a \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - U_b \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}}{\left\{ \frac{s_{xm}}{s_{xx}} - U_a \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - U_b \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\} + \left\{ \frac{s_{mm}s_{xy} - s_{xm}s_{my}}{s_{mm}s_{xx} - s_{xm}^2} - U_{c'} \sqrt{\frac{s_{mm}mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}} \quad (11)$$

$$= \frac{\left\{ \frac{s_{xm}}{s_{xx}} - \left(\frac{MSE_3}{S_{XX}} \right) \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - \left(\frac{S_{MY} - S_{XM}S_{XY}}{S_{MM}S_{XX} - S_{XM}^2} \right) \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}}{\left\{ \frac{s_{xm}}{s_{xx}} - \left(\frac{MSE_3}{S_{XX}} \right) \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - \left(\frac{S_{MY} - S_{XM}S_{XY}}{S_{MM}S_{XX} - S_{XM}^2} \right) \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\} + \left\{ \frac{s_{mm}s_{xy} - s_{xm}s_{my}}{s_{mm}s_{xx} - s_{xm}^2} - U_{c'} \sqrt{\frac{s_{mm}mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}}$$

$$\Delta_{\frac{ab}{ab+c'}} = \frac{\left\{ \frac{s_{xm}}{s_{xx}} - U_a \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - U_b \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}}{\left\{ \frac{s_{xm}}{s_{xx}} - U_a \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - U_b \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\} + \left\{ \frac{s_{mm}s_{xy} - s_{xm}s_{my}}{s_{mm}s_{xx} - s_{xm}^2} - U_{c'} \sqrt{\frac{s_{mm}mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}} =$$

$$\frac{\left\{ \frac{s_{xm}}{s_{xx}} - \left(\frac{MSE_3}{S_{XX}} \right) \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - \left(\frac{S_{MY} - S_{XM}S_{XY}}{S_{MM}S_{XX} - S_{XM}^2} \right) \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}}{\text{denominator}}, \quad (12)$$

where

$$D = \left\{ \frac{s_{xm}}{s_{xx}} - \left(\frac{MSE_3}{S_{XX}} \right) \sqrt{\frac{mse_3}{s_{xx}}} \right\} \left\{ \frac{s_{my} - s_{xm}s_{xy}}{s_{mm}s_{xx} - s_{xm}^2} - \left(\frac{S_{MY} - S_{XM}S_{XY}}{S_{MM}S_{XX} - S_{XM}^2} \right) \sqrt{\frac{mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\} + \left\{ \frac{s_{mm}s_{xy} - s_{xm}s_{my}}{s_{mm}s_{xx} - s_{xm}^2} - \left(\frac{S_{MM}MSE_2}{S_{MM}S_{XX} - S_{XM}^2} \right) \sqrt{\frac{s_{mm}mse_2}{s_{mm}s_{xx} - s_{xm}^2}} \right\}$$

Case 2: for c/a , let $s_5 = (s_{xm}, s_{xx}, s_{my}, s_{xy}, mse_1, mse_2, mse_3)$ denote the observed quantities of $S_5 = (S_{XM}, S_{XX}, S_{MY}, S_{XY}, MSE_1, MSE_2, MSE_3)$, the parameter $\theta_5 = \frac{c}{a}$, and nuisance parameter $\varnothing = (\beta_{01}, \beta_{02}, \beta_{03}, b, c')$. Moreover, let

$$\Delta_{\frac{c}{a}} = \frac{\left\{ \frac{s_{xy}}{s_{xx}} - U_c \sqrt{\frac{mse_1}{s_{xx}}} \right\}}{\left\{ \frac{s_{xm}}{s_{xx}} - U_a \sqrt{\frac{mse_3}{s_{xx}}} \right\}} \quad (13)$$

$$= \frac{\left\{ \frac{s_{xy}}{s_{xx}} - \left(\frac{MSE_1}{S_{XX}} \right) \sqrt{\frac{mse_1}{s_{xx}}} \right\}}{\left\{ \frac{s_{xm}}{s_{xx}} - \left(\frac{MSE_3}{S_{XX}} \right) \sqrt{\frac{mse_3}{s_{xx}}} \right\}}. \quad (14)$$

It can be verified that Δ_{θ_j} where $j=1,2$ in (11) and (13) satisfies conditions (i). Further, replacing $S_{XX}, S_{XY}, S_{XM}, S_{MY}, MSE_1$ and MSE_2 by $s_{XX}, s_{XY}, s_{XM}, s_{MY}, mse_1$ and mse_2 in (12) and (14), Δ_{θ_j} turns to be θ_j and satisfies conditions (ii). Thus, Δ_{θ_j} is a GPQ for θ_j . Furthermore, the distribution of the required GPQ may be obtained from the following Monte Carlo algorithm.

Step 1: Choose a large number, say $K = 10,000$. For $k = 1, 2, \dots, K$, and carry out the following two steps.

Step 2: Generate mutually independent t random variates $U_{a,k}$ and $U_{c,k}$ with $n-2$ degrees of freedom, respectively. On the other hand, generate mutually independent t random variates $U_{b,k}$ and $U_{c',k}$ with $n-3$ degrees of freedom, respectively.

Step 3: Calculate $\Delta_{\theta_j,k}$, $j = 1, 2$ and $k = 1, 2, \dots, K$.

Step 4: Conduct permutation of $\Delta_{\theta_j,k}$ and take values of the $\alpha/2$ th and $1-\alpha/2$ th percentiles of $\Delta_{\theta_j,k}$, $k = 1, 2, \dots, K$.

Consequently, a $100(1-\alpha)\%$ generalized confidence interval for ratio effect size (i.e. θ_j , $j = 1, 2$) is the set $\{\theta_j | \Delta_{\theta_j} \in C_\alpha\}$, where C_α is a region satisfying $P(\Delta_{\theta_j} \in C_\alpha) = 1 - \alpha$. Moreover, the following equal-tailed generalized confidence interval for the ratio effect size measures is generated: $P_\gamma[\Delta_{\theta_j,\alpha/2} \leq \Delta_{\theta_j} \leq \Delta_{\theta_j,1-\alpha/2}] = 1 - \alpha$, where the quantities $\Delta_{\theta_j,\alpha/2}$ and $\Delta_{\theta_j,1-\alpha/2}$ are estimated by $\alpha/2$ th and $1 - \alpha/2$ th percentiles of $\Delta_{\theta_j,1}, \dots, \Delta_{\theta_j,K}$.

3. AN ILLUSTRATED EXAMPLE

In this section, we present an analysis of 95% CIs for the two ratio measures of effect size constructed by different estimation methods using one real example. These CIs were then compared in terms of expected lengths.

The dataset used in the present study was obtained from the Taiwan Education Panel Survey (TEPS) project, which was launched in 2001 with the aim of collecting data from a nationally representative sample of 7th graders in Taiwan (Chang, 2003). Three variables were selected from the first wave (year 2001) of TEPS data: parents' educational expectation, students' own educational expectation, and students' academic performance. Students' educational expectation was theorized to be a mediator to explain the effect of parents' expectation (X) on students' academic performance (Y). After omitting missing data, 10,139 samples were analyzed. The estimates of the parameters were $\hat{a} = 0.4744$, $\hat{b} = 0.1423$, and $\hat{c} = 0.2253$, $\hat{c}' = 0.1578$ and the mediated effect ($\hat{a}\hat{b}$) was approximately 0.0675. Table 1 displays the 95% CIs of the two effect size measures estimated by the MOVER, GPQ-based, delta and percentile methods. For $ab/(ab+c')$, the interval lengths of the MOVER and the percentile methods were relatively wider than those of the other two methods. The GPQ-based method had the smallest length. For c/a , the interval lengths obtained from the MOVER, GPQ-based and delta methods were almost the same, and the length of the percentile method was slightly narrower than those of the other three methods.

TABLE 1. ESTIMATED CONFIDENCE INTERVAL (CI) AND LENGTHS OF THE FOUR METHODS FOR TEPS DATA

Effect Size	Estimate		MOVER	GPQ	Delta	Percentile
$ab/(ab+c')$	0.2996	CI	(0.2735, 0.3276)	(0.2805, 0.3199)	(0.2757, 0.3235)	(0.2743, 0.3246)
		length	0.0541	0.0394	0.0478	0.0503
c/a	0.4749	CI	(0.4463, 0.5056)	(0.4470, 0.5062)	(0.4453, 0.5045)	(0.4495, 0.5052)
		length	0.0593	0.0592	0.0592	0.0557

TABLE 2. ESTIMATED CONFIDENCE INTERVAL (CI) AND LENGTHS OF THE FOUR METHODS FOR TEPS DATA (N=145)

Effect Size	Estimate		MOVER	GPQ	Delta	Percentile
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$ab/(ab+c')$	0.1183	CI	(0.0057, 0.2924)	(0.0220, 0.2427)	(-0.0044, 0.2410)	(0.0140, 0.2755)
		length	0.2867	0.2207	0.2454	0.2615
c/a	0.637	CI	(0.3576, 1.4681)	(0.3559, 1.4831)	(0.2346, 1.0393)	(0.3499, 01.8736)
		length	1.1105	1.1273	0.8047	1.5237

To understand the performance of these interval estimation methods under smaller sample sizes, we randomly selected 200 samples from the TEPS data, and 145 samples were analyzed after deleting missing data. The parameter estimates were $\hat{a} = 0.3212$, $\hat{b} = 0.0754$, and $\hat{c} = 0.2046$, $\hat{c}' = 0.1804$. The mediation effect was obtained as $\hat{a}\hat{b} = 0.0242$. The estimated CIs and interval lengths are presented in Table 2. For $ab/(ab+c')$, consistent with the previous results for large samples, the length for the GPQ-based method was the smallest; the length for the MOVER was the largest among the four methods. For c/a , the results were not consistent with those for large samples. The percentile method had the largest length, whereas the delta method generated the smallest length. There appear to be more differences among the CIs estimated by these methods with smaller samples, especially for the c/a measure.

4. SIMULATION STUDIES AND DISCUSSION

4.1. Simulation Design

To address accuracy-related concerns, a Monte Carlo simulation study was conducted to evaluate the 95% CIs of the effect size measures in terms of both coverage probability and expected length under various conditions. Commonly used sample sizes in social science were investigated $\{n=100, 200, 1000\}$. The parameters a and b were set to be equal, and the parameter values of a and b took on the values of 0.14, 0.39, and 0.59, while c' was 0.14, 0.39, and 0.59. The parameter values were chosen to represent zero, small ($a = b = 0.14$), medium ($a = b = 0.39$), and large ($a = b = 0.59$) mediated effects (Cohen, 1988; Tofighi, et al., 2009). Data were simulated using Equations (2) and (3). ε_2 and ε_3 were normally distributed with mean 0 and error variance of 1, and X was generated from normal distribution with mean zero and variance $\sigma_x^2 = 9$. We evaluated performance of these interval estimation methods for each parameter combination based on 2,000 independently generated replications. The nominal confidence level was kept constant at $1 - \alpha = 0.95$ in all simulation settings, and the random K -number of the GPQ-based procedure was set equal to 10,000. The simulation results for coverage probabilities and expected lengths of the four methods (The MOVER, GPQ-based, delta and percentile methods) are summarized in Tables 3 and 4.

TABLE 3. ESTIMATED COVERAGE PROBABILITIES (CP) AND EXPECTED LENGTHS (EL) OF 95% CI FOR $(ab)/(ab+c')$ UNDER VARIOUS PARAMETER COMBINATIONS.

n	c'	a	b	cp				el			
				MOVER	GPQ	Delta	Percentile	MOVER	GPQ	Delta	Percentile
100	0.14	0.14	0.14	0.9356	0.929	0.9475	0.9445	0.9745	0.5146	0.4165	0.5162
	0.14	0.39	0.39	0.9855	0.871	0.9475	0.94	1.4185	0.5718	0.6036	0.6218
	0.14	0.59	0.59	0.9975	0.886	0.941	0.934	1.0815	0.4882	0.5244	0.5264
	0.39	0.14	0.14	0.9485	0.942	0.947	0.948	0.1514	0.1494	0.147	0.152
	0.39	0.39	0.39	0.959	0.874	0.936	0.931	0.3549	0.2538	0.3023	0.3037
	0.39	0.59	0.59	0.9825	0.858	0.9435	0.9405	0.4611	0.2618	0.3341	0.3354
	0.59	0.14	0.14	0.948	0.947	0.946	0.942	0.1001	0.1007	0.0988	0.1016
	0.59	0.39	0.39	0.945	0.892	0.933	0.932	0.236	0.19	0.2191	0.2201
	0.59	0.59	0.59	0.9765	0.8675	0.953	0.946	0.3148	0.2044	0.2603	0.2601
200	0.14	0.14	0.14	0.955	0.9205	0.9505	0.945	2.226	0.2734	0.278	0.2959
	0.14	0.39	0.39	0.989	0.8745	0.9515	0.9495	0.6437	0.3474	0.4164	0.4201

	0.14	0.59	0.59	0.9995	0.882	0.949	0.944	0.6386	0.3134	0.3653	0.3666
	0.39	0.14	0.14	0.9405	0.927	0.938	0.933	0.1034	0.1002	0.1019	0.1033
	0.39	0.39	0.39	0.97	0.876	0.9565	0.954	0.2411	0.1737	0.2127	0.2133
	0.39	0.59	0.59	0.9935	0.869	0.958	0.9525	0.3076	0.1779	0.2342	0.2329
	0.59	0.14	0.14	0.943	0.9395	0.942	0.944	0.0689	0.0681	0.0685	0.0696
	0.59	0.39	0.39	0.959	0.906	0.952	0.949	0.1639	0.1314	0.1543	0.1539
	0.59	0.59	0.59	0.9795	0.8665	0.9485	0.9475	0.2165	0.141	0.1832	0.183
1000	0.14	0.14	0.14	0.9515	0.919	0.944	0.9475	0.1235	0.1085	0.1187	0.1196
	0.14	0.39	0.39	0.9895	0.8655	0.949	0.949	0.2501	0.1435	0.1838	0.1842
	0.14	0.59	0.59	0.9975	0.88	0.947	0.948	0.2593	0.1328	0.1626	0.1628
	0.39	0.14	0.14	0.9495	0.939	0.95	0.9475	0.0451	0.0433	0.0449	0.045
	0.39	0.39	0.39	0.9695	0.8735	0.95	0.949	0.1041	0.0757	0.0943	0.0941
	0.39	0.59	0.59	0.984	0.8475	0.945	0.945	0.1326	0.0775	0.1041	0.1039
	0.59	0.14	0.14	0.9565	0.951	0.9555	0.9595	0.0302	0.0294	0.0301	0.0302
	0.59	0.39	0.39	0.954	0.893	0.9425	0.942	0.0718	0.0576	0.0685	0.0685
	0.59	0.59	0.59	0.9805	0.86	0.95	0.949	0.0948	0.0619	0.0816	0.0814

TABLE 4. ESTIMATED COVERAGE PROBABILITIES (CP) AND EXPECTED LENGTHS (EL) OF 95% CI FOR c/a UNDER VARIOUS PARAMETER COMBINATIONS.

n	c'	a	b	cp				el			
				MOVER	GPQ	Delta	Percentile	MOVER	GPQ	Delta	Percentile
100	0.14	0.14	0.14	0.935	0.963	0.942	0.9565	3.8151	3.1279	1.6975	3.0758
	0.14	0.39	0.39	0.8775	0.9535	0.89	0.9445	0.3733	0.467	0.3665	0.4557
	0.14	0.59	0.59	0.8345	0.961	0.837	0.9515	0.2337	0.3282	0.232	0.3217
	0.39	0.14	0.14	0.947	0.974	0.927	0.967	7.6748	6.7911	3.4851	6.6869
	0.39	0.39	0.39	0.8715	0.9435	0.8885	0.9365	0.5004	0.6293	0.4885	0.6188
	0.39	0.59	0.59	0.808	0.9525	0.8175	0.9365	0.2738	0.3949	0.2714	0.3874
	0.59	0.14	0.14	0.947	0.9675	0.908	0.956	12.2816	10.6521	5.2708	10.5009
	0.59	0.39	0.39	0.8965	0.9455	0.895	0.9405	0.6467	0.7864	0.6293	0.7685
	0.59	0.59	0.59	0.8265	0.9455	0.8375	0.9355	0.3244	0.4548	0.3212	0.4469
200	0.14	0.14	0.14	0.9265	0.951	0.933	0.943	1.1408	1.2373	1.0059	1.2169
	0.14	0.39	0.39	0.893	0.9475	0.889	0.9455	0.2576	0.3188	0.2555	0.3159
	0.14	0.59	0.59	0.8485	0.9545	0.8505	0.943	0.1626	0.2272	0.162	0.2247
	0.39	0.14	0.14	0.9435	0.956	0.9315	0.947	2.5653	2.6056	2.1273	2.5832
	0.39	0.39	0.39	0.8855	0.953	0.8895	0.9515	0.3437	0.4295	0.3398	0.4262
	0.39	0.59	0.59	0.8255	0.9475	0.826	0.94	0.1906	0.2728	0.1898	0.2695
	0.59	0.14	0.14	0.945	0.954	0.938	0.947	3.7514	3.8782	3.1799	3.8176
	0.59	0.39	0.39	0.9005	0.9525	0.9005	0.9445	0.4417	0.5346	0.4361	0.5274
	0.59	0.59	0.59	0.8465	0.9525	0.848	0.9465	0.2247	0.3144	0.2236	0.3111
1000	0.14	0.14	0.14	0.932	0.954	0.941	0.953	0.4332	0.4671	0.4256	0.4655
	0.14	0.39	0.39	0.8885	0.957	0.892	0.9525	0.1131	0.1395	0.113	0.139
	0.14	0.59	0.59	0.836	0.953	0.835	0.953	0.0722	0.1003	0.0721	0.0999
	0.39	0.14	0.14	0.94	0.9515	0.94	0.9495	0.9111	0.9532	0.8914	0.951
	0.39	0.39	0.39	0.883	0.9505	0.8855	0.949	0.1507	0.1873	0.1504	0.1864
	0.39	0.59	0.59	0.8375	0.9455	0.837	0.942	0.0841	0.1199	0.084	0.1195

0.59	0.14	0.14	0.936	0.945	0.9425	0.9435	1.331	1.3746	1.3014	1.3674
0.59	0.39	0.39	0.8975	0.954	0.901	0.954	0.1929	0.2326	0.1925	0.2319
0.59	0.59	0.59	0.8425	0.955	0.8485	0.9535	0.0995	0.1385	0.0994	0.1384

4.2. Results

The simulation results of coverage probabilities and expected lengths under various sample sizes for the effect size measure $ab/(ab+c')$ are summarized in Tables 3. Except for the GPQ-based method, the other three methods have coverage probabilities close to or higher than the nominal level of .95. The MOVER has higher coverage probabilities than the other methods, especially when the values of both a and b are large ($a=b=0.59$). The GPQ-based method has the smallest expected lengths when the mediated effects are medium or large, particularly with larger samples. When the mediated effects are small for small samples ($n=100$), the delta method generates smaller expected lengths compared with the GPQ-based method. The performances of the delta and percentile methods are similar for both criteria of coverage probabilities and lengths. In a comparative sense, the coverage probabilities of the GPQ-based method do not attain the 0.95 nominal level in certain cases, and therefore, it is less applicable for estimating $ab/(ab+c')$. In most cases, the MOVER has higher coverage probabilities compared with the other three methods. Another method to consider is the delta method. The delta method has smaller lengths than the MOVER, and it also has acceptable coverage probabilities.

For the effect size measure c/a , the simulation results for coverage probabilities and expected lengths under various sample sizes are summarized in Tables 4. In terms of coverage probabilities, the performances of the MOVER and delta methods are similar. The coverage probabilities of these two methods are far below 0.95 with larger mediated effects, which is less than adequate. By contrast, the performances of the GPQ-based and percentile methods are similar. The GPQ-based method generates slightly better coverage probabilities than the percentile method; the coverage probabilities of the GPQ-based method are closer to the 0.95 nominal level. In terms of expected lengths, the delta and MOVER methods still show similar performances. These two methods have smaller expected lengths than the GPQ-based and percentile methods. For a small sample size, the delta method has considerably smaller lengths compared to the other three methods. However, as previously mentioned, the coverage probabilities of the delta method are far lower than 0.95 in many cases, and thus, we do not recommend its use for estimating c/a . The methods recommended are the GPQ-based and percentile methods. The GPQ-based method has slightly better coverage probabilities, but the percentile method has slightly smaller expected lengths.

5. CONCLUSIONS

In this paper, we present two relatively new procedures-the MOVER and the GPQ method-to construct CIs for ratio measures of effect size; we then present a comparison of their performances with the delta and percentile methods for a single mediator model. The two criteria we applied to evaluate performance of estimation methods were empirical coverage probability and interval length.

When sample sizes are sufficiently large with small mediated effects, all the estimation methods generate consistent and acceptable results. However, when large samples cannot be obtained and/or small mediated effects cannot be guaranteed, different estimation methods might need to be applied to obtain adequate and precise results. In addition, for different ratio measures of effect size, different methods might be suitable. For the effect size measure of $ab/(ab+c')$, if the estimation accuracy is of concern, the MOVER is a good choice because it has higher coverage probabilities. If the estimation precision is of concern, the delta method is recommended because it has smaller lengths than the MOVER with reasonable coverage probabilities.

As for the measure of c/a , the GPQ-based and percentile methods are more suitable. If the estimation accuracy is of concern, the GPQ-based method is a better choice because it has higher coverage probabilities. By contrast, the percentile method is a good choice for estimation precision because it has smaller lengths. The present study only investigated the cases for which a , b and c' were equal to 0.14,

0.39, and 0.59, respectively. When the values of a , b or c' are close to 0, the denominators for the ratio measures of effect size might approach 0, thus causing estimation problems. Further investigations are required to determine whether the conclusions drawn from this study can be extended to such situations. In addition, this study examined only normally distributed simulation data, and the performance of these interval estimation methods under non-normal data may be further investigated.

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THE EFFECT OF THE 2007 TO 2009 GLOBAL FINANCIAL CRISIS ON THE UNITED STATES FINANCIAL ACTIVITIES SECTOR

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ABSTRACT

The purpose of this research is to determine the effects of the 2007 to 2009 Global Financial Crisis on the demand for labor in the United States Financial Activities Sector. Analysis of secondary data from the United States Department of Labor, Bureau of Labor Statistics from 2004 to 2014, will provide evidence of significant statistical difference between the first five years which include the years previous to the 2007 to 2009 Global Financial Crisis, and the last five years of the data which include the years post the 2007 to 2009 Global Financial crisis. Preliminary analysis of data on employment hours and earnings, showed a significant different between the data. The research analyze data of changes in the employment hours and earnings, number of employees, average weekly hours, number of hires, number of separations, job openings, and unemployment rate in the sector. The research will provide insight into how the 2007 to 2009 Global Financial Crisis has changed the demand for labor in the U S Financial Activities Sector. By understanding these changes the research will aid organizations in determining the best use of assets, for acquiring the future labor resources needed, in the United States Financial Activities Sector.

Keywords: Global Financial Crisis; Financial Activities Sector; Employment Hours and Earnings; Number of Employees; Average Weekly Hours; Number of Hires; Number of Separations; Job Openings; Unemployment Rate.

1. INTRODUCTION

The 2007 through 2009 Global Financial Crisis was an economic event unlike any the world has seen since the Great Depression, which represents a paradigm shift in approach to the economy. Because of this paradigm shift, literature written prior to the recent crisis must be reconsidered to account for this change in the way we view the economy. This study will examine the unemployment levels in the United States financial activities sector for a 5 year period which includes years prior to the 2007 through 2009 Global Financial Crisis and a five year period which includes the years preceding 2007 through 2009 Global Financial Crisis. Comparing these different periods will allow the researcher to gain insight into the changes which has occurred in the demand for labor in the United States Financial Activities Sector. By understanding these changes researchers can gain a better understanding of the dynamics of the economy in the aftermath of the 2007 through 2009 Global Financial Crisis.

2. LITERATURE REVIEW

The threat of collapse of the world's economy resulting from the 2007 to 2009 Global Financial Crisis, was an economic event unlike any the world had ever seen (Crotty, 2009; Junankar, 2012; Prager, 2013). The scale of this financial crisis resulted in the most significant economic event since the Great Depression (Crotty, 2009; Jovovic & Jovovic, 2013). Loose monetary policy by the United States Federal Reserve, was the underlining factor which created the economic environment resulting in expansion of consumer debt, used to compensate for stagnant wages (Crotty, 2009; Prager, 2013; Raja-Junankar, 2012). There was appearance of economic growth resulting from excessive consumer debt by Americans for a number of years preceding the financial crisis (Prager, 2013; Raja-Junankar, 2012). The development of shadow the banking system, and an increase in global demand for collateralized debt, additionally contributed significantly to the financial crisis (Jovovic & Jovovic, 2013). The financial crisis originating in the United States subprime mortgage industry quickly spread around the globe (Crotty, 2009; Prager, 2013; Raja-Junankar, 2012).

JP Morgan Chase March 24, 2008 acquisition of Bear Stearns, followed by the Lehman Brothers, September 15, 2008 bankruptcy, signaled the height of the financial crisis, leading to a global economic downturn (Prager, 2013; Raja-Junankar, 2012). There were bank failures all around the globe resulting from this event (Jovovic & Jovovic, 2013). This included a significant number of bank failures in the United States economy. One result of the global financial crisis was high rate job losses in the financial sector of the United States economy (Jovovic & Jovovic, 2013). 3,125,000 jobs were lost in 2007 in the United States financial activities sector, and in 2008 2,712,000 jobs in the sector were lost (United States Department of Labor, Bureau of Labor Statistics, and n.d.).

Unemployment in the United States rose to 10%, in October, 2009, in the aftermath of the 2007 through 2009 Global Financial Crisis, the United States (United States Department of Labor, Bureau of Labor Statistics, n.d.), followed by an extensive period of high unemployment in the United States economy. Unemployment remain above 8% in United States for a period of 42 months following (Shipps & Howard, 2013); (United States Department of Labor, Bureau of Labor Statistics, n.d.). Unemployment rate in the United States was at 7.6% in April 2013 (Shipps & Howard, 2013); (United States Department of Labor, Bureau of Labor Statistics, n.d.), and fell to 6.6% by January 2014 (United States Department of Labor, Bureau of Labor Statistics, n.d.). Despite financial reports by many companies reporting significant profit levels, United States unemployment remained at levels which were higher than recent history (Shipps & Howard, 2013). The number of jobs being created in the economy was well below the number needed to significantly reduce the unemployment rate. There was a trend by many companies that opted to pay dividends instead of taking on additional employees. A jobless recovery due to structural unemployment resulting from technology advancement which was responsible for a reduction in the number of employees needed in the workforce was one possible explanation give (Shipps & Howard, 2013).

A trend of significant part time employment in the United State economy emerged as a result of the economic downturn in the aftermath of the global financial crisis (Hipple, 2010; Williamson, 2013).

The fourth quarter of 2009 saw the number of individuals in the United States labor market who were working part time due to the state of the economy increase to 9.2 million, which was up 1.8 million from 2009 (Hipple, 2010). 2012 saw the number of individuals in the United States labor market who were working part time due to the state of the economy fall to 8.1 million (Williamson, 2013). This figure is almost twice the number of workers employed part time previous to the economic down turn.

3. RESEARCH

This study was a very narrow study which focused on the labor market of the United States Financial Activities Sector, specifically examining the demand for labor in the 5 years which include the period preceding the 2007 through 2009 Global Financial Crisis and the 5 years which include the period post the 2007 through 2009 Global Financial Crisis, to determine how employment in the United States Financial Activities Sector have changed in the aftermath of the recent global financial crisis.

RESEARCH QUESTIONS

1. In the aftermath of the 2007 through 2009 Global Financial Crisis, is there evidence which suggest a statistically significant difference in the demand for labor in the United States Financial Activities Sector?
2. How has the demand for labor in the United States Financial Activities Sector changed relative to general employment in the Unites States, in the aftermath of the 2007 through 2009 Global Financial Crisis?

The significance of this study results from the magnitude of 2007 through 2009 Global Financial Crisis. This economic event was the greatest economic event since the Great Depression. Literature written prior to this recent financial crisis was written in the context which reflects economic theory framed in the context of the Great Depression. Because the literature prior to the 2007 through 2009 Global Financial Crisis does not reflect this new paradigm shift created by the recent financial crisis, there is a need to update the literature to reflect the new economic reality created by this economic event. There are broad based economic implications arising from this crisis. By understanding these changes, this research will

aid organizations in determining the best use of assets, for acquiring the future labor resources needed, in the United States Financial Activities Sector.

Quantitative analysis was conducted on secondary data, which was collected from the United States Department of Labor, Bureau of Labor Statistics, on the general unemployment levels in the United States and unemployment levels specifically in the United States Financial Activities Sector. This data was selected to avoid any questions regarding the validity and reliability of the data. SPSS was used to perform quantitative analysis of time plots on the data sets to compare data on the level of general unemployment in the United States economy, and unemployment in the United States Financial Activities Sector from the two different periods prior to and post the 2007 through 2009 Global Financial Crisis. The use of dot plots allowed single data points, at specific periods of time to be analyzed and displayed in a graphically. Bar charts were also used to compare value between the two different periods. By conducting analysis of data between the two different time periods, the researchers provided a better understanding of changes which has occurred in employment activities between the different time periods proceeding and post the recent global financial crisis.

FIGURE 1. U.S. FINANCIAL ACTIVITIES SECTOR NUMBER OF EMPLOYEE IN THOUSAND FROM 2004 TO 2008 VERSUS 2009 TO 2013

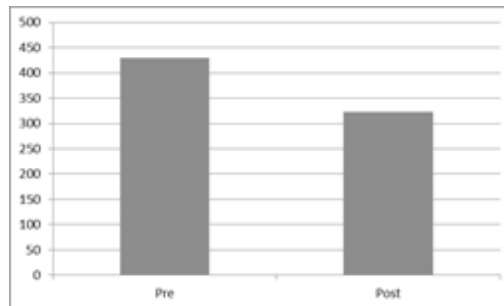


FIGURE 2. U.S. FINANCIAL ACTIVITIES SECTOR NUMBER OF HIRES IN THOUSANDS FROM 2004 TO 2008 VERSUS 2009 TO 2013

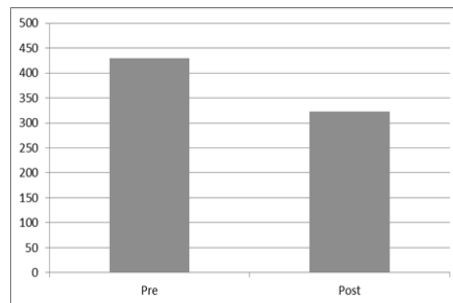


FIGURE 3. U.S. FINANCIAL ACTIVITIES SECTOR AVERAGE WEEKLY HOURS OF PRODUCTION AND NONSUPERVISORY EMPLOYEES FROM 2004 TO 2008 VERSUS 2009 TO 2013

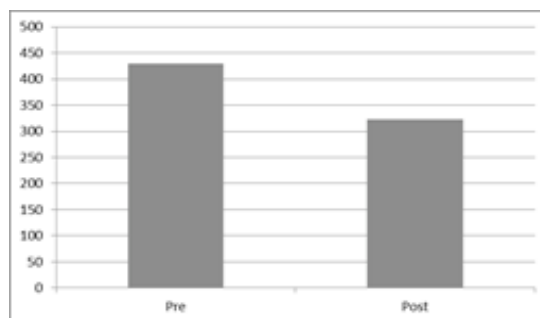
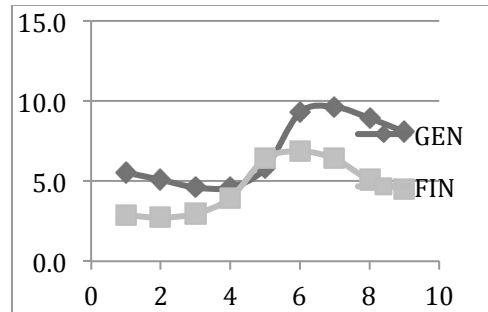


FIGURE 5. COMPARISON OF THE U.S. FINANCIAL ACTIVITIES SECTOR AND U.S. GENERAL UNEMPLOYMENT RATE FROM 2004 THROUGH 2013



Analysis of the data revealed significant differences between the two periods, which were examined prior to, and post the 2007 through 2009 Global Financial Crisis. A comparison of the number of employees in the United States Financial Activities Sector revealed a significant reduction in the number of employees and the number of new hires, post the recent global financial crisis. Additionally, comparison between the two periods also revealed an increase in the average weekly number of hours worked by employees in the sector, which was statistically significant.

A comparison of unemployment in the United States Financial Sector and the general economy from 2004 through 2013, revealed unemployment in the United States Financial Activities Sector climbed above unemployment in the general economy for a brief period from the middle of 2008 to early 2009, before quickly falling to levels significantly lower than the general economy unemployment numbers. Despite the fact, the recent global financial crisis originated in the United States Financial Activities Sector, and significant contraction of employment was seen in the sector, evidence suggest employment in the sector appeared to be significantly stronger than employment in the general United States economy. Relative to the United States general economy, employment in the United States Financial Sector would appear to have gotten stronger in the aftermath of the 2007 through 2009 Global Financial Crisis. These findings suggest the Troubled Asset Relief Program (TARP), had a significant effect on stabilizing employment in the financial sector, but the program was less effective in stabilizing employment in the general economy.

The results of this research raised some very interesting questions. With unemployment in the United States Financial Activities Sector remaining at such low levels, what happened to the over 4 million workers who lost jobs in the sector, as a result of the 2007 through 2009 Global Financial Crisis?

Why are these workers not reflected in the unemployment rate in the United States Financial Sector? One explanation may be, many of these workers were simply attracted to the financial sector because of the real estate bubble, and returned to their original careers once the real estate market crashed. Another explanation may be, many of the skills developed in the financial activities sector may more easily be transferable to other none financial sector employment. Additional research is needed to gain a better understanding why unemployment numbers do not seem to account for a significant portion of the over 4 million workers displaced in the United States Financial Activities Sector, and exactly what happened to these workers that left the sector.

4. CONCLUSION

The 2007 through 2009 Global Financial Crisis, which threatened to collapse the world's economy, was the greatest economic event the world has seen. Economic literature written prior to this global financial crisis was framed in the context of the Great Depression. Because of the magnitude of this economic crisis, much of the literature written prior to this crisis must be reconsidered to take into consideration to account for the new economic reality today. By studying the demand for labor in the United States financial activities sector per and post this financial crisis, this research provided some insight into the changes which has occurred in the United States Financial Activities Sector employment. By understanding these changes in the demand for labor in the sector, insight into the new reality of today's

global economy may allow better allocation of labor resources by organizations to attract the necessary talent needed in the United States Financial Activities Sector in the future.

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LINKEDIN PROJECTS IN MANAGEMENT EDUCATION

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Research Note

ABSTRACT

On the basis of open-ended assessment data from about one thousand students, implications for teaching LinkedIn to management students are provided. These findings include the validation by students of the value of learning through experiential projects how to construct a LinkedIn profile, use locational search limiters in finding apt connections, joining LinkedIn groups and leveraging the membership for connections and information, using educational affiliations as premises for networking, using LinkedIn job histories as blueprints of plausible career paths for student career strategizing, using industry and specific firm LinkedIn search limiters to focus searches, and how to best move online relationships in LinkedIn to real world face-to-face networking venues. Downsides of using LinkedIn reported by students are also discussed.

Keywords: Social networking, management education, social media

1. INTRODUCTION

LinkedIn in has become an essential tool in the careers of people in this business epoch. It is a social medium that provides participants with a profile page on the Web. This can include résumé type items, such as employment history, educational degrees and attendance, certifications, and know-how and endorsement of know-how by others. In 2014 LinkedIn had 313 million users in nearly every which place; thirty-nine million of which are students (LinkedIn, 2014). For example, it has a number of people who are in Antarctica. It enables extensive descriptions of job responsibilities and activities and enables people to be found by headhunters, employers, and potential collaborators. Moreover, LinkedIn is believed to contribute to productivity at work (Meredith and Grudin, 2009). A nifty feature of LinkedIn is that you can receive reports on who has viewed your profile. Finding people to connect with on LinkedIn can be done through membership in alumni associations, professional societies, and special interest groups. You can be informed which of your email connections are LinkedIn members to make it easy to locate and invite them to be connected with you on LinkedIn. You can search for people to connect with on the basis of their location, current or past companies they have worked for, their industry, their profile language, the schools they have attended, non-profit interests, groups they belong to, what their function is at work, and the size of their company, for example. Increasingly, many users are mobile users, accounting for 38% of site visitors in 2014 (Tillman, 2014).

2. TEACHING LINKEDIN

The instructor required students to join LinkedIn for many years. This was accomplished through projects through which they must develop an impressive profile, connect with the professor, connect with the other learners in the course, connect with alumni of the university in areas that they are interested in to join groups related to their interest, and to evaluate the course's LinkedIn projects they are involved in. This latter assignment over five years provided the data for this report. Nine hundred and seventy-three students completed the required assessment of their course's LinkedIn projects. This assessment was open-ended with students permitted answer it as they pleased. The advantage of this was that it mitigated researcher bias from framing and or constraining responses. The downside was the data required coding. Students should garner skill and expertise endorsements for their profile. Additionally, professors can provide students with a meaningful recommendation.

3. LINKEDIN PROJECT ELEMENTS WITH POSITIVE ASSESSMENTS

The preponderance of respondents found the projects beneficial. Many expressed the notion that they had heard of LinkedIn but had not gotten around to developing a profile and appreciated the impetus of it

being a course requirement. A significant number had previously initiated a LinkedIn profile but had not meaningfully used it. The assessment instrument questions did not request respondents to specify whether their previous experience with LinkedIn was initiated by receiving an invitation from someone else or from their own initiative after hearing of the site. In any case, a negligible number of respondents reported joining after receiving a connection request from someone else. One benefit of LinkedIn that students reported was being able to reconnect with former friends from their secondary school and even earlier. Others found it very useful to be connected with many of their peers in their university, partially with the notion of not losing touch as they proceed through their career into influential positions in the future.

4. LEVERAGING ALUMNI

One of the most valued benefits was connecting with alumni. Students were required to join the main university alumni group. For some reason, there were several alumni groups for the university, which given the situation that LinkedIn members can join a limited number of groups, was more of a problem than an opportunity. The college of business and other schools of the university had their own alumni groups too which seemed less troublesome but perhaps unnecessary. To join a group one must proactively send a request to the group's moderator and have it accepted. For some kinds of groups, some evidence of appropriate membership is required, whereas other groups are relatively open to everyone. In the case of the St. John's University alumni LinkedIn group, it required approval of applicants for membership approval. However, approval requests were often not handled in a timely fashion leading to the consternation of students who wanted to keep on schedule with the projects. The instructor contacted the moderator of the group who was Scott Van Deusen, the Executive Director of Advancement Programs at St. John's University. He suggested amplifying the directions of the associated LinkedIn project in the instructor's course outlines to have students contact him directly with the url of their profiles and he would immediately add them to the alumni group. It was clear to the instructor that the administration of the university was thrilled to have future alumni piling in to the alumni group in LinkedIn. Students were encouraged to contact alumni who were in positions that they aspire to reach over the long-term in their careers and connect with them in LinkedIn. They were told to explain to potential alumni contacts that they were encouraged by a professor at the university to make connections with people like them and that the students would appreciate any advice and other help that might be provided to them. Many of the university's alumni did not join a LinkedIn St. John's alumni group. However, students were directed to contact such alumni directly if there was a particular interest perhaps through the facilitation of membership in a common LinkedIn interest group. Alumni who were not in the alumni group had previously been less frequently contacted by St. John's students and were reportedly more receptive to inquiries from the students than ones who had received a number of such inquiries. Some alumni were strikingly helpful. For instance, in most semesters students received offers of internships or even jobs through alumni LinkedIn connections developed through the course LinkedIn assignments. This was very exciting for other students to learn of during courses.

5. LINKEDIN GROUPS AS PORTALS TO OCCUPATIONAL SPECIALTIES

Students were encouraged to join groups related to their career and other interests. So, for example, someone with an interest in management information systems might find LinkedIn groups with thousands of people specialized in that, including: "Information Management, for the information professional," "Management Information System - An Insight," "HIMSS," "Chief Information Officer (CIO) Network - The Group for CIOs," "Management Information Systems Student Association," "Computer Science, Computer & Management Information Systems Students," "MS in Management Information Systems (MSMIS)," and "A.M.I.S. | Accounting & Management Information Systems". When you go to add someone as a connection, sometimes LinkedIn forwards the connection request without asking for the premise of the connection, perhaps based on the connections settings of the target person. For example, they might list themselves as open networkers ready to accept all offers. However, the more general situation is that some premise for the connection must be offered or at least knowledge of the person's email address must be shown. One basis is having worked or studied at the same organization. Another is being a member of the same LinkedIn group. So, if you are interested in connecting with sustainability executives, being a member of many sustainability groups will most likely provide you with a common group for most of your target connections. If there is a particular individual that you are interested in connecting with but do not have any concrete premise to connect with them, it is possible to view what

groups they are members in and to join one of those groups and thus establish a premise to connect with them. Furthermore, the instructor encouraged students to selectively choose which groups' badges they are members of to have displayed in their "Groups" section of their LinkedIn profile to foster the kind of image they wish to project (Wolff, 2014).

6. CONNECTING WITH EXPERTS IN FAR-FLUNG PLACES THROUGH LINKEDIN

One of the limiters of LinkedIn searches is geographic. So, if a student is interested in meeting with people in a particular city or region they will be visiting, it is possible to search for people in the industry or job function that they are interested in and connect with them with the notion of setting up coffee get-togethers or other meetings with them. Many students tend to focus their LinkedIn searches in the areas in the vicinity of their university of study (Deng, 2014). The instructor provided them with examples of meet-ups that he created for himself with groups of social media experts in cities such as Vienna where not only did he meet all-at-once a goodly number of people of interest but the invitees were surprised to become aware of many social media experts they did not know of with common interests through his meet-up. Establishing meet-ups were not a course requirement though and the instructor did not receive reports of students following through with large-scale meet-ups.

7. PARSING INFORMATION FROM LINKEDIN GROUPS

Many LinkedIn groups have message boards, blogs, or email-distributed messages. These are opt-in/opt-out features of groups. Some students did not realize this and felt overwhelmed with messages from groups they joined. Many valued highly seeing dialogue in industries and functional areas they had interest in though. A few students joined the fray of these discussions though most seemed content to remain as passive recipients of this discourse.

8. NEGATIVE VIEWS OF LINKEDIN PROJECTS

Some students were critical of aspects of the LinkedIn projects. Sometimes, they found it difficult to get connected. On occasion, the instructor would notice they did not even reach out to other students in the course and suspect that the lack of success was associated with a lack of effort. On occasion, their profiles were unengaging with no picture, no information on their jobs or education, and pretty much unlikely to lure people to connect with them (Tillman, 2014). The instructor found it hard to determine if indeed they had no job history or if they were just not recording it. However, he would exhort them to include internships and volunteer jobs rather than to provide nothing related to experience. Some students felt that LinkedIn was only a venue for job-finding and were uninterested since they already had a job. Others were suspicious of social media generally and felt that they would be "creeped" by people who misrepresented who they were for possibly nefarious purposes.

9. A SORCERER'S APPRENTICE PERSPECTIVE ON LINKEDIN PROJECT PARTICIPANTS OVER TIME

Ultimately, the LinkedIn set of projects in my courses has proven to be positively valued by learners and it has enabled the instructor to stay in touch with students after they leave the university and no longer use the university email address. Since people who are connected to people you know are the people who come up on top in LinkedIn searches, many students are now finding that they are coming up through their connection with the instructor with former students in his courses who are now more advanced in their career paths. These alumni are very aware of my projects and are sympathetic with them and provide especially strong support for his students.

10. CONCLUSION

On the basis of open-ended assessment data collected over several years from about one thousand students, implications for teaching LinkedIn to management students were derived. These findings include the reporting by students of the value of learning through experiential projects how to construct a meaningful LinkedIn profile, use geographic search limiters to find apt connections, joining LinkedIn groups and leveraging the membership for connections and information, using university affiliations as premises for networking, using LinkedIn employment histories as blueprints of plausible career paths for student strategizing, using industry and specific firm LinkedIn search limiters to narrow searches, and

how to best move online relationships in LinkedIn to face-to-face venues. Negative aspects of using LinkedIn reported by students were also discussed.

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