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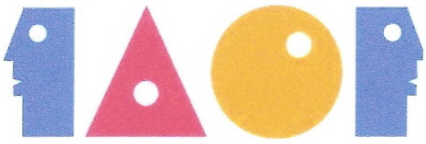

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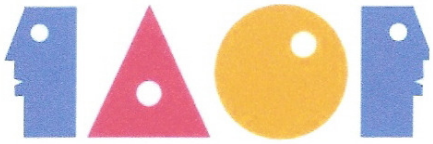

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THE ROLE OF ENTREPRENEURSHIP EDUCATION PROGRAMS IN NATIONAL SYSTEMS OF ENTREPRENEURSHIP AND ENTREPRENEURSHIP ECOSYSTEMS

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Abstract

We explore the integration and outcomes of entrepreneurship education programs within national systems of entrepreneurship and entrepreneurship ecosystems to provide new insights for policy directions. We further explore the entrepreneurial university and enhancement of an entrepreneurial culture in higher education institutions. This is accomplished by using a validated framework of entrepreneurship education programs, consisting of context, outcomes, objectives, assessment, content, audience and pedagogy. We provide a philosophical standpoint with an inductive research approach using a case study to demonstrate the dynamic interface between an entrepreneurship education program at the Kontaktstelle für Wissens- und Technologietransfer (KWT), within the German national system of entrepreneurship referred to as Existenzgründungen aus der Wissenschaft (EXIST) and greater entrepreneurship ecosystem surrounding the program. We conclude by providing a conceptual framework of the dynamic components and relationships of these programs and systems, followed by limitations and recommendations to further validate the framework.

Keywords: Entrepreneurship Education Programs, National Systems of Entrepreneurship, Entrepreneurship Ecosystems, KWT, EXIST.

Introduction

Not only have governments around the world accepted the functional economic theory of entrepreneurship as a pathway to economic development, but embraced entrepreneurship education programs (EEPs) as an integral and dynamic component of entrepreneurship ecosystems (EECs) and national systems of entrepreneurship (NSE) (Audretsch, 2015; Acs *et al.,* 2014; Thomas and Autio, 2014; O'Connor, 2013; Kenny, 2015). Furthermore, The World Economic Forum (2012) identified six domains that comprise an entrepreneurship ecosystem, later adding a seventh and far reaching domain; that of the university as catalyst. This domain provided emphasis on the role of the *entrepreneurial university* to provide significant value to ecosystems.

Acs *et al.* (2014, p. 476) introduced the novel concept of NSE, which are fundamentally resource allocation systems that are driven by individual-level opportunity pursuit, through the creation of new ventures, with this activity and its outcomes regulated by country-specific institutional characteristics. The German Existenzgründungen aus der Wissenschaft (EXIST) program is one such National System of Entrepreneurship, providing significant integration into EECs. EXIST was originally launched to enhance the entrepreneurship profile and activity in Germany; by increasing early-stage entrepreneurial activity (TEA) and developing the *entrepreneurial university*. Despite ranking high on the World Innovation Index, Germany identified its weakness in commercializing innovation through entrepreneurship (in line with significantly low TEA rates relative to other innovation-driven economies: GEM, 2014).

NSE is a relatively new concept, having its roots from longstanding developments in National Systems of Innovation (Acs *et al.,* 2014). Autio *et al.* (2014) went on to delineate National Systems of Innovation and Entrepreneurship, improving our understanding of the theoretical, managerial, and policy implications of entrepreneurial innovation. Their context was the role in stimulating entrepreneurship activity, as well as its impact on the outcomes of entrepreneurial innovation. Instrumental in such impact included EEC activities, such as, co-creation and evolution with ecosystems, entrepreneurial firms embedded in networks, interaction between entrepreneurs and ecosystems, and overall, to foster development of EECs. The European Union (EU) and USA are leaders in the development of NSE, primarily due to national funding projects and initiatives, with support institutions like the National Council for Enterprise Education (NCEE), Kauffman Foundation (USA), the German EXIST program and the Danish "Fonden for Entreprenorskab". Other developed nations, such as Australia for example, promote significant National Innovation Systems, but lack on the appropriate application of NSE (Maritz *et al.,* 2015). NSE and their effect on economic and social development in nations have recently received much attention in the literature (Audretsch, 2015; Autio and Thomas, 2014; Nambisan and Baron, 2013; Mason & Brown, 2014).

The purpose of this paper is to explore the dynamic integration and outcomes within NSE on EEPs and EECs and the *entrepreneurial university* in contextual environments to provide insights for new policy directions. The case in point is the Kontaktstelle für Wissens- und Technologietransfer (KWT) and EXIST program at the Starterzentrum (Start-up Centre) at Campus Saarbrücken, Germany. The proposed outcome is a conceptual framework incorporating dimensions of the integration of EEPs, NES and EECs. We adopt an interpretivist philosophical standpoint with an inductive research approach to explore various components and elements of the KWT and EXIST integration from NSE, EEP and EECs perspectives. We commence with an overview of EEPs and EECs and *the entrepreneurial university*.

Entrepreneurship Education Programs

Entrepreneurship education (EE) has received a depth of literature surrounding the economic and social benefits associated with it; with outcomes such as economic growth, innovation commercialisation and job creation (Lackeus, 2015). O'Connor (2013) further explored EE from a government and policy perspective, linking the importance of policy, entrepreneurship, education and EECs. EE has been touted as one of the most important components of EECs to enhance intentionality and business creation stability (Van Gelderen *et al.,* 2015; Lackeus, 2015).

EEPs are any pedagogical program or process of education for entrepreneurial attitudes and skills, which involve developing personal qualities (Maritz *et al.,* 2015). To provide inference to NSE and EECs, we adopt the EEP framework originally conceptualized by Maritz and Brown (2013), further validated by Kenny (2015). The framework provides contextualization for this research, and represents EEPs across all dimensions, with the exception of ecosystem integration. Such ecosystem integration was conceptualized by Maritz *et al.* (2015), but yet to be validated. This framework identified components of context, outcomes, objectives, assessment, content, audience and pedagogy. To guide this study, we provide brief discussion on each of these components.

The context of EEPs provides the set of circumstances or facts that surround the program, usually within the parameters of higher education. Such context provides the contextual boundaries of this study. Context may also be associated to academic disciplines, such as science, technology, engineering and mathematics (STEM: Maritz *et al.,* 2015); international contexts (Fayolle, 2010), diversity, such as gender (Pedridou *et al.*, 2009); competitive offerings (Morris *et al.,* 2013), educator diversity (Jones, 2010); skills, knowledge and attitudes (Matlay, 2008); type of entrepreneur (Nekka & Fayolle, 2010); teaching methods and pedagogy (Fayolle, 2010); content and research (Maritz & Donovan, 2015); evaluation (Harte & Stewart, 2012); outcomes (Matlay, 2008) and enterprise culture (Rae, 2010).

EEP outcomes refer to activities and actions of participants after being exposed to entrepreneurship education (EE), most often referred to as entrepre-

neurial self-efficacy and/or entrepreneurial intentionality (Moberg *et al.,* 2014). Despite outcomes driven by participants, such outcomes may well be influenced by stakeholders associated to programs. EEP objectives are more externally focused, and not participant centric as outcomes. Interchangeably identified as goals, objectives are usually described as pedagogical, social and/or economic outcomes (Fayolle, 2010).

Assessment of EEPs is a two-dimensional component, consisting of EEP assessment and assessment of participant knowledge, skills and behaviors. Assessment is driven by program objectives, content and pedagogy. Content of EEPs has recently received much deliberation, identifying a possible lack of appropriate practical application in EE (Maritz *et al.*, 2015). Such examples include substituting traditional business plan content with more recent developments, such as lean-startup, business model canvas and design thinking. Ideally, content should be centered on a theory for practice perspective (Rae, 2010), although this has raised many contentious issues between entrepreneurship educators (Maritz *et al.,* 2015). Content also directly influences the way in which EE may be delivered, most often referred to as pedagogy.

Pedagogy refers to the way in which EEPs are delivered, with terms such as experiential, student-centered, practice-based and team-based approaches often being highlighted in EE (Jones, 2010). The introduction of online platforms, blended learning, flipped classrooms and massive open online courses, for example, provide a paradigm shift on traditional face-to-face pedagogical initiatives in EEPs. Program participants, usually referred to as audience, provide significant heterogeneity to EEPs. Students are only one pillar of audience, and only represent one of many domains of stakeholder involvement in EEPs (Maritz & Brown, 2013). Stakeholder involvement in EEPs has received prominent attention in recent times (Blenker *et al,* 2014), identifying stakeholder expectations as complex and varied, reflecting a heterogeneous range of individual, group and community needs. Associated to audience, yet distinctly apart, is the interaction of EEPs with EECs. Interaction with EECs is associated with network theory, whereby independent systems collaborate for common cause. As such, EEP integration with EECs may be viewed as far reaching, strategic, dynamic and more complex than the components of the EEP framework originally developed by Maritz and Brown (2013). This study further explores such EEC integration.

Entrepreneurship Ecosystems And The Entrepreneurial University

An EEC is a system, network or group of interconnected elements, formed by the interaction of an entrepreneurial community of stakeholders or organisms with their environment (Maritz *et al.,* 2015). An *entrepreneurial university* is a higher education institution (HEI) that acts in an entrepreneurial manner, based upon entrepreneurship research, the system of innovation and entrepreneurship, productivity of technology transfer offices and university spin-offs (Walshok and Shapiro, 2014).

While the components of an entrepreneurial university are diverse, all successful entrepreneurial universities have an entrepreneurship education curriculum, (Frederick, 2011). Fetters *et al.* (2010) identified elements of university-based entrepreneurship ecosystems consisting of senior leadership sponsorship, entrepreneurship education courses, entrepreneurship practicum, ongoing curriculum innovation, entrepreneurship research program or Centre, networking events, entrepreneurship students club(s), student venture investment fund, links to angel and venture funds, incubator(s), entrepreneurship endowed chair(s) and Centre or program endowment.

For an entrepreneurial university to thrive, it is necessary that it interacts within the larger economic community EEC. Such EECs either replace, or complement, or even pre-condition to, cluster strategies, innovation systems, knowledge based economies, and national competitiveness policies (Thomas and Autio, 2014, Isenberg, 2011). Domains of EECs include policy, finance, culture, supports, human capital and markets. HEIs may fall under the human capital domain, consisting of their own entrepreneurial ecosystems. It is thus vital that entrepreneurial universities integrate within their greater regional and national EECs (Maritz *et al.,* 2015). Entrepreneurship education is one of the most prominent methods to successfully integrate, despite recognition that other elements of the entrepreneurial university are required to enhance innovative and entrepreneurial activity (Frederick, 2011).

After Isenberg's (2011) development of EEC domains, the World Economic Forum (2012) developed an framework consisting of six pillars, subsequently adding a seventh pillar a year later (support mechanism, funding and finance, human capital, education and training, regulatory framework, infrastructure, culture and markets, and universities as catalysts). The addition of universities as catalysts provides evidence of the importance of HEIs to not only offer EEPs, but also provide further integration into dynamic EECs and NSE. Such activities include promoting a culture of respect for entrepreneurship, playing a key role in idea-formation for new companies and playing a key role in providing graduates for new companies (Drexler & Eltogby, 2014).

In a study of Dutch Entrepreneurial Ecosystems, Stam (2014) extended the literature with a model that includes framework conditions (formal institutions, culture, physical infrastructure, and demand) and systematic conditions (networks, leadership, finance, talent, new knowledge, and support services) that affect entrepreneurial outputs (entrepreneurial activity) and outcomes indicating value creation (productivity, income, employment and well-being). Stam (2014) further defines an entrepreneurial ecosystem as an independent set of actors that is governed in such a way that it enables entrepreneurial action, placing emphasis on context and the entrepreneur. We apply this holistic framework in this study.

Method and Approach

We adopted an interpretivist philosophical standpoint with and inductive research approach (Saunders, 2011) to explore various components and relationships of the EEP within the context of the KWV and the EXIST program. We implemented a case-study approach to pursue the principles of data collection established by Yin (1994) using multiple sources of evidence. Semi-structures interviews were conducted with KWV and EXIST stakeholders, participants, program designers, facilitators, consultants and start-up companies (n = 16). We were provided access to all program documentation, and complimented the primary data sources with secondary sources of information (such as leaflets, brochures, promotional material and social media content). Data were edited and categories prepared, with transcription for categorization and relationships between components. Drawing on this rich data, we present the findings around the Maritz and Brown (2013) and Kenny (2015) EEP frameworks under the components of context, objectives, outcomes, audience, content, pedagogy, assessment and evaluation. We propose an additional component, that of integration with EECs, to be explored in this research.

Similar to a recent study on EEPs (Kenny, 2015), we replicated multiple data sources, including observation, program feedback commentary, program documentation and module content, assessment material, proposal documentation, regulatory documents, participant interviews, program designers, lecturers, scientists, archival, promotional, websites, newsletters, email correspondence and other course related material.

The KWT and EXIST Case

KWT is the business and technology-transfer Centre of Saarland University, and EXIST is a German Federal Government initiative to foster entrepreneurship in national higher education institutions. Saarland University is one of only three universities in Germany to be awarded the prestigious title *Entrepreneurial University* in 2013 within the framework of *EXIST – Culture of Entrepreneurship – The Entrepreneurial University* awarded by the former Federal Ministry of Economics and Technology.

Saarland University (UdS) has a campus in Saarbrücken and Homburg, Saarland, Germany. Founded in 1948, the university has eight faculties: Law and Economics, Medicine, Humanities 1-3, and Natural Sciences and Technology 1-3. There are five collaborative research centres (SFBs) surrounding the faculties, represented by research institutes surrounding Saarland University. These include The Max Plank Institute for Computer Science (MPI), International Conference and Research Centre for Computer Science, Leibniz Institute for New Materials (INM), Steinbeis Forschungszentrum Material Engineering Center (MECS), Korean Institute of Science and Technology Europe (KIST), Fraunhofer Institute for Nondestructive Testing, Fraunhofer Institute for Biomedical Engineering, Center for Bioinformatics, Automative Quality Saar, Helmholz-Institute for Pharmaceutical Research Saarbrücken (HIPS), Center for Integrative Physiologie and Molecu-

lar Medicine (CIPMM), Human and Molecular Biology Center, Institute for Preventive Medicine Homburg, Competence Center Molecular Medicine, German Research Center for Artificial Intelligence, Max Plank Institute for Software Systems, and Zentrum für Mechatronik and Automatisierungstechnik (ZEMA). The research institutes provide vital research and development resources to entrepreneurship initiatives within KWT. Although research is not a prominent outcome of KWT, the university is none-the-less in the top 400 ARWA rankings. In particular, the university is acclaimed for its top 100 ARWA ranking in the computer sciences, affiliated with the Max Plank IT Inkubator.

Technology transfer at Saarland University is represented by KWT and WuT GmbH, together with 35 effective full-time employees. KWT is the umbrella structure for Wissens-und Technologietransfer GmbH (WuT), responsible for the Start-up-Centre, Congress and Event Agency, Patent Marketing Agency and Uni-Shop. A strategic objective of KWT is the development of a sustainable entrepreneurial culture in teaching, research and administration of the Saarland University and non-university research institutions.

Although operationally independent, WuT GmbH is a full subsidiary of KWT. KWT is directly responsible for all entrepreneurship (including entrepreneurship education) initiatives, industry cooperation and public relations and UdS Events. KWT has been operational since 1995, and WuT since 2002. The three Start-up Centres, resembling traditional incubators or accelerators, consist of multi-story buildings, with no less than 24 start-ups residing in each. Start-up Centre 1 opened its doors in 1995, complimented by a second building in 2001. Start-up Centre 2 opened in 1998; offsite from the main campus, in closer proximity to Saarbrücken City. Start-up Centre 3, predominantly representing the Faculty of Medicine, was opened in 1999, with an additional new building in 2002 on the Homburg campus.

KWT is accountable for university-wide technology transfer duties and initiatives. In addition, KWT is responsible for all entrepreneurship and development support for technology transfer start-ups within the university; also linking start-up activity and support to the Saarland provincial communities. Support initiatives include entrepreneurship coaching programs, business development initiatives, business simulations and games, conceptual and creative workshops, business networking events, entrepreneurship lectures (cross-faculty and multi-disciplinary such as STEM), crash courses in entrepreneurship, the launch of a new scientific research department (FTE junior professors and visiting professors), integration of entrepreneurs in residence and within lectures, e-learning initiatives (such as integration of Stanford Technology ventures e-platform), active scouting for innovative ideas (opportunity identification), managing a Start-Up fund, overseeing the IT Inkubator GmbH supporting the internationalization of start-ups and facilitating regular start-up weekends. Outcomes since the launch of the EXIST program two years ago include 81 consultation cases, with 12 start-ups in 2013. Consultation cases include initial discussions and fur-

ther dialogue and developments towards launching a new venture. Start-ups represent registered new business start-ups. This increased to 171 consultation cases and 36 start-ups in 2014. This growth has maintained in 2015, with 140 consultation cases and 25 start-ups to date (effective September 2015), with year-end expectations showing double digit growth in registered start-ups.

Coaching and consulting activities are actively pursued by six full-time equivalent KWT employees, offering free consultation on different key aspects of the entrepreneurship process (opportunity evaluation, managing the growing business to exit strategies). Further support is afforded in areas of start-up fundamentals, business ideas, business plans, lean-startup and business model plans, start-up dynamics, financial support, professional advisory, business simulations, entrepreneurship tools, design thinking and professional development initiatives. Unique to KWT, is that they have access and integration to the Science Parks, Saar GmbH (Science Park 1 and 2), located on the same premises. The Science Parks play an integral role in the commercialisation of innovation, providing co-working facilities and direct links between business and the university. The science parks also provide laboratories and expertise across discipline ranges in the university and research centres. Start-up entrepreneurs often progress from the start-up centre to co-working and office facilities in the science parks. In addition, there is the on-premises "Scheer-Tower", a community of private investment for start-ups. This community provides private funding for start-ups (after entrepreneurs exhaust funding from EXIST).

KWT has a direct link to the internationally renowned Max Plank Institute for Computer Science (MPI) through the IT Inkubator GmbH. This incubator is a Max Plank innovation and Saarland University Technology Transfer joint venture, transforming world-class science into global high-tech business. The IT Inkubator GmbH was founded in 2013, providing significant resource to potential start-up activity, such as basic research, early product development, market interface development and commercialistion of products and services. As a discipline, research in computer science at Saarland University is rated in the top 100 universities globally (ARWU), and the objective of the IT Incubator is to provide similar impact from a commercialisation perspective.

The second pillar of responsibility of KWT is industry cooperation. Such cooperation includes the contact point for knowledge and technology transfer, including ways of successful interface between science and business. This includes active dialogue with industry and community in order to initiate joint projects and initiatives of value, support and fostering project cooperation and education and training based upon research led entrepreneurship initiatives. Strategic objectives of industry cooperation include development of regional cooperation between public research and industry in order to build strategic partnerships, promotion of open innovation by connecting companies across sectoral, organizational, technological and geographic boundaries. Forms of coopera-

tion include pure and applied research, contract research, higher degrees by research initiatives, access to equipment and laboratories, access to research institutes, proof of concept and reproduction models, consulting, faculty visits and recruitment (internships). Research, development and industry cooperation examples include change management in the product development process, increased efficiency of wind turbines, enhanced hydraulic systems, precision microfinancing, and use of metallic solid tubes in movement building. Recent industry cooperation events include business day at Saarland, lab conversations and dialogue, economy meets science, IT theme evening and industry day for aspiring engineers.

The final pillar of responsibility of KWT is that of intellectual property exploitation (predominantly patents) through WuT GmbH. Prior to 2002, most German universities failed to file patent applications and transferred inventions from industry cooperation to the partner/s for free. This was referred to as the so called 'professors privilege', since abolished by incorporation of the German Employee Invention Act of 2002. This opened up the establishment of regional Patent Marketing Agencies (PVA), subsidised by the federal and regional government. WuT is such an agency. WuT was founded in 2002, currently with five full time equivalent employees, responsible exclusively for the evaluation and commercialisation of all inventions created at Saarland Universities and University of Applied Sciences (HTW). Patent applications are made through external patent attorneys, with over 550 invention disclosures, 220 patent filings and in excess of 125 license or sales agreements to date. Since incorporation of the EXIST program, patent technology transfer aligned specifically to the program include 56 invention disclosures, 17 patent application and 13 licence or sales agreements in 2013; and 62 invention disclosures, 37 patent applications and 15 licence or sales agreements in 2014. Examples of commercialization exploitation activities include life sciences (drug development, whole cell bioreactors, pharmaceutical biotechnology), computer sciences (computer graphics, security, audiovisual networking, database systems) and materials sciences and technology. Strategies to enhance exploitation include the transfer of IP rights ton the start-up, relatively low down payment based on patent costs, no minimum licence fee but obligation to exercise the licence, compulsory royalty payments, and should one of the inventors be involved in the spin-off, he/she has to waive the inventors' bonus.

Other than institutional and university resources, KWT is externally funded by the Federal Government (Bundesmimisterium für Wirtschaft und Energie und Verkelir, funder of EXIST), Europäischer Fonds für Regionale Entwicklung (EFRE), the European Union (EU) and Local Saarland Government. These funding institutions represent significant components of the National System of Entrepreneurship (NSE) and Entrepreneurship Ecosystem (EEC). Prior to the application of funding from EXIST, KWT identified their current portfolio of competitive advantage to leverage their proposal for funding of the *entrepreneurial university*. Strengths included an international reputation of research

excellence in informatics and nano-biomedical technology, national reputation in technology transfer, successful application and infrastructure of three start-up centres and two science parks, strong international collaborations and links, and a strong entrepreneurship alumni association. Weaknesses identified included a weak entrepreneurship culture prevailing throughout Germany, coupled with a relatively weak entrepreneurial orientation of German scientists and inventors. Threats included limited resources (Saarland a relatively small university in German standards), small business operators in the Saarland districts (not much opportunity for significant industry sponsorship), limited engagement with alumni and limited quality management on existing programs (this has since been rectified). Opportunities included engaging with more hi-technology start-ups, proactive engagement of university research institutions and centres, and aligning with best practice entrepreneurship institutions in the EU and beyond.

Impact assessment for the next few years sees KWT with a successfully operating and accredited Certificate in Entrepreneurship, international incubator cooperation and collaboration, start-up activity in significant EECs (such as Silicon Valley), significant alumni collaborations, integration of significant entrepreneurs in residence, thirty new start-up per annum, developed e-books and e-learning online platform, a sponsored Chair in Entrepreneurship (Professor), development of a Master program in Entrepreneurship, and finally, a developed culture of entrepreneurship: the *entrepreneurial university*. A business development advisor (scout) is resourced, his/her responsibilities to include the promotion and advancement of technology transfer and commercialization by KWT throughout the university.

Since inception of the EXIST program in 1998, the EXIST initiative went through various iterations. EXIST is a NSE, providing federal resources to develop entrepreneurship in the greater Germany region. In 1998 EXIST 1 co-operated with partners from science, economy and politics in the promotion of five EXIST model regions. In 2000 the program motivated students in the EXIST SEED initiative, providing funding for individual founders. In 2002, EXIST 3 promoted EXIST transfer, the promotion of 10 formation networks. In 2006 EXIST 3 enhanced the promotion of intensive entrepreneurship research, with the initiation of 47 founding networks at universities and non-university research institutions. In 2007 EXIST provided founder Scholarships to individual founders, complimented by the EXIST research transfer to individual founders. In 2010 EXIST 4 funded 22 universities to develop and implement a University-wide strategy for founding profiling. In 2013 EXIST 5 awarded the term "*Entrepreneurial University*" to three prominent universities: The University of Kassel, the University of Lübeck and Saarland University. This resulted in the commitment of the universities to develop an entrepreneurial culture of excellence (EXIST-founding culture university), hence the term *entrepreneurial university*. Significant funding to these three universities is for a period of five years (2013-2018),

subject to assessment and performance criteria and benchmarks.

Findings and discussion

Context

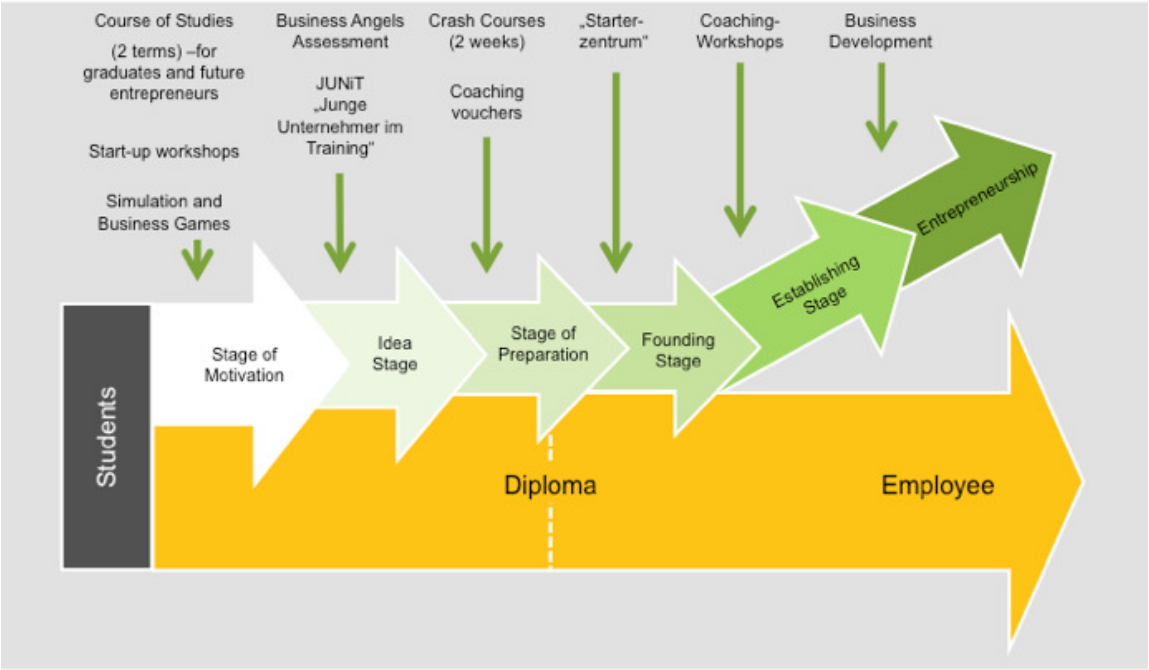
Our data gathering provided a significant contextual challenge in that it was difficult to separate the entrepreneurship education and training components and the other activities associated with KWT and EXIST. All respondents were of the opinion that the process of developing the *entrepreneurial university,* coupled with methods and processes to achieve an entrepreneurship culture are components of combined initiatives, and not just that of an education and training perspective. Nonetheless, our findings and discussion section concentrates on the education and training components, and the conclusion and applications section concentrates on the overall integration of other aspects of KWT and EXIST.

Figure 1 provides a schematic of the education and training components at KWT, identifying a continuum stage-gate approach. This provides context within KWT, KuT and Saarland University (higher education institution specific). The framework identifies various activities related to entrepreneurship education and training at different stages of the entrepreneurship process. For example, entrepreneurship lectures are provided to enhance entrepreneurial intentionality of students in the motivation stages, and coaching programs are administer at stages of start-up establishment and launch. In many programs, context identifies disciplines, but in this instance, we contextualize within the parameters of university wide entrepreneurship.

Entrepreneurship lectures resemble traditional EE at leading international institutions, based upon accredited academic standards/threshold learning outcomes. These courses all provide credit points towards undergraduate and graduate courses, consist of full semester (12 weeks by 2 hour classes on entrepreneurship content), offered by existing faculty and sessional/part time entrepreneurs in residence, and assessed by formal university methods (projects, peer review, self-reflection, exams, assignments and participation). A unique differentiator is that each of these courses is offered as a cross-faculty/cross-disciplinary and university wide initiative towards enhancing the *entrepreneurial university*. Courses are offered in degree programs in disciplines of the natural sciences, language and cultural studies, informatics, pharmacy, medicine, psychology, sport, business, science, technology, engineering and mathematics (STEM) and IT. The cross-disciplinary EE initiative is a direct result/outcome of the funding from EXIST, and interface with the EEC.

Other KWT EE initiatives include business simulations/business games, creativity (concept) workshops, coaching (by the six resident consultants and entrepreneurs in residence), the business idea challenge (competition for the best idea), jUNIt (a work placement type initiative to foster enterprising skills in undergraduates), Start-up workshops (replicating a crash course in

Figure 1. Entrepreneurship Education and Training at KWT



Source: Adapted from promotional material of the EEP offering at KWT

entrepreneurship) and access to professional and outsourced experts such as lawyers, mentors, tax experts (coaching cheques).

A significant initiative is the Start-up Centres, consisting of three incubator type facilities, exposing over 60 start-ups to the world of entrepreneurship. Incubatees (or start-up companies) usually tenant space and resources for a period of three years; where after many of them transfer to one of the two Science Parks on the Saarland University campus. The local Saarland Government and Saarland University primarily fund the Start-up Centre resources, with integration from other participants of the EEC.

Ongoing EE is afforded to the start-ups via regular workshops on special and topical issues in entrepreneurship, such as social media for entrepreneurs, the business model canvas, crowdfunding, design thinking for entrepreneurs and gender entrepreneurship. Business development and managing the growing workshops are also offered to the Saarland entrepreneurship community via workshops, symposia, events and activities, significantly subsidized by KWT, the local Saarland Government, EXIST and other EEC participants. Such entrepreneurship workshops usually take the form of full day "entrepreneurship day" workshops, presented by professors, resident consultants and industry experts.

During the entrepreneurship process, Saarland University students, Start-up Centre incubates, and related EEC Saarland participants may apply to EXIST for Start-up Grants. This is to fund business ideas to fund early-stage start-ups from universities and other research institutes, available to academics, graduates or former research assistants and students. In addition, EXIST funds high-technology start-up projects with intensive development periods which have already been demonstrated to be feasible from a technical point of view. These two funding opportunities are supplementary to the KWT funding from EXIST. KWT provides these potential grant recipients with the opportunity to participate in the EE initiatives as depicted in Figure 1. This is yet again a good example of the integration of EEPs and EECs and NSE.

To further enhance EEPs and cross-disciplinary EE through KWT, a Certificate in Entrepreneurship is currently being developed. This resembles a graduate certificate, consisting of 24 credits, and available to all students at Saarland University. The certificate resembles international best practice EE, moderated, assessed and developed by leading practitioners in the discipline. In addition, and as a direct result of EXIST funding, KWT is developing e-books on contemporary topics in entrepreneurship (further discussed under *pedagogy*). KWT also hosts the start-up weekend biannually. This event allows Saarland University students access to significant international know-how and resources, and opportunity to launch a new start-up in 54 hours. The event is powered by Google for Entrepreneurs, and all participants have access to the EE resources offered by KWT (refer to Figure 1). The start-up weekend adds significant value to nascent entrepreneurs, and allows them access to EECs.

Enhancing the *entrepreneurial culture* across campus, KWT also facilitates complimentary self-assessment of budding entrepreneurs, incentives for new inventions, integration with research centres and research institutions of the university, and a scheme whereby students are able to take leave of absence from regular studies to participate in start-up activities. Other initiatives by KWT include targeting scientists and professors from research centres and research institutions. This involves technology transfer, commercialization of scientific inventions, patent exploitation, and a revolving start-up fund to incentivise such scientific participants. HWT also interact with the community (which includes private incubators in the greater Saarland province), The European and German Research Institute of Artificial Intelligence, PricewaterhouseCoopers-accelerator, Scheer Group (outsource partners), and last but not least, engagement of international Guest/vVsiting Professors. These collaborations lso allow access to KWT facilities. Overall, all KWT activities undergo rigorous governance and assessment procedures, which include external moderation and evaluation. Not only providing a platform of sustainability after funding from EXIST (2018), such governance provides legitimacy when dealing with external stakeholders, the community and EECs.

Objectives and outcomes

The primary objective of EE at Saarland University is to integrate the vision and mission of KWT to develop the *entrepreneurial university.* Goals of EE include outcomes related to enhancing economic benefits of employment and regional development for Saarland, plus social benefits of regional improvement of quality of life and inclusion. These goals include *creating* employment by enhancing start-up activity, rather than providing traditional business education to enhance *employability* of students. EE outcomes are two-fold. In the first instance, and in the early stages of the entrepreneurship process (see Figure 1), the outcome is to enhance entrepreneurial intentionality amongst students. This may be referred to as increasing motivation, and changing attitudes towards entrepreneurial behaviour. In the second instance, outcomes associated with further stages of the entrepreneurship process revolve around enhancing the entrepreneurial self-efficacy of students. This relates to the confidence students have in being involved in start-up activity. Respondents identified that objectives and funders and stakeholders, discussed in the next section, significantly influence outcomes.

Audience

Understandably, the audience associated to EE at Saarland University is somewhat heterogeneous, despite targeting university students. One pillar of audience is students. EE in this case targets students across campus, very much in line with recent developments in STEM and cross-disciplinary EE (Maritz *et al*., 2015). The other pillar is internal stakeholders, consisting of KWT staff and university staff more broadly. Respondents articulated the many challenges associated with infusing an entrepreneurial culture across faculty, particularly with regard to the influencing the motivations of scientists in research laboratories and centres. Funders and external stakeholders were also reported as important, due to the nature of such relationships (such as heterogeneous demands and expectations).

Content

The content across the heterogeneity of courses was predominantly an appropriate integration of theory and practice, in-line with benchmarked EEPs (Maritz *et al.,* 2015; Kenny, 2015). Since the courses had differing audiences and outcomes, content varied, in-line with such dynamics. Respondents, overall, had a good grasp of required content, offering much of the latest entrepreneurship and innovation content, benchmarked against leading providers of EE. Two skilled Assistant Professors of entrepreneurship, engaged in the process as a result of EXIST funding, provide expertise on the latest content of EE. Traditional EE content is existent across courses, including marketing, opportunity evaluation, start-up fundamentals, social media, finance for entrepreneurs, business planning, innovation management and creativity to name but a few. More recent content was also evidenced, such as the business model canvas, lean-startup, design thinking, crowd-funding and entrepreneurial marketing.

Pedagogy

More recent content necessitates a more dynamic pedagogy, or rather heutagogy, whereby students become problem-solvers in their own right (Jones, 2010). Methods of traditional delivery (such as face-to-face) have been substituted in many courses by blended, online and flipped approaches. A current development of KWT is the publishing of e-books in entrepreneurship. These are authored by a combination of the two resident Assistant Professors, cross-faculty Professors and industry experts. These interactive, theory for practice-based perspective e-books incorporate the latest scientific and practice initiatives, including start-up financing, business model innovation, corporate entrepreneurship, innovation management, learning from failure, social entrepreneurship and software for startups, to name but a few.

Assessment and evaluation

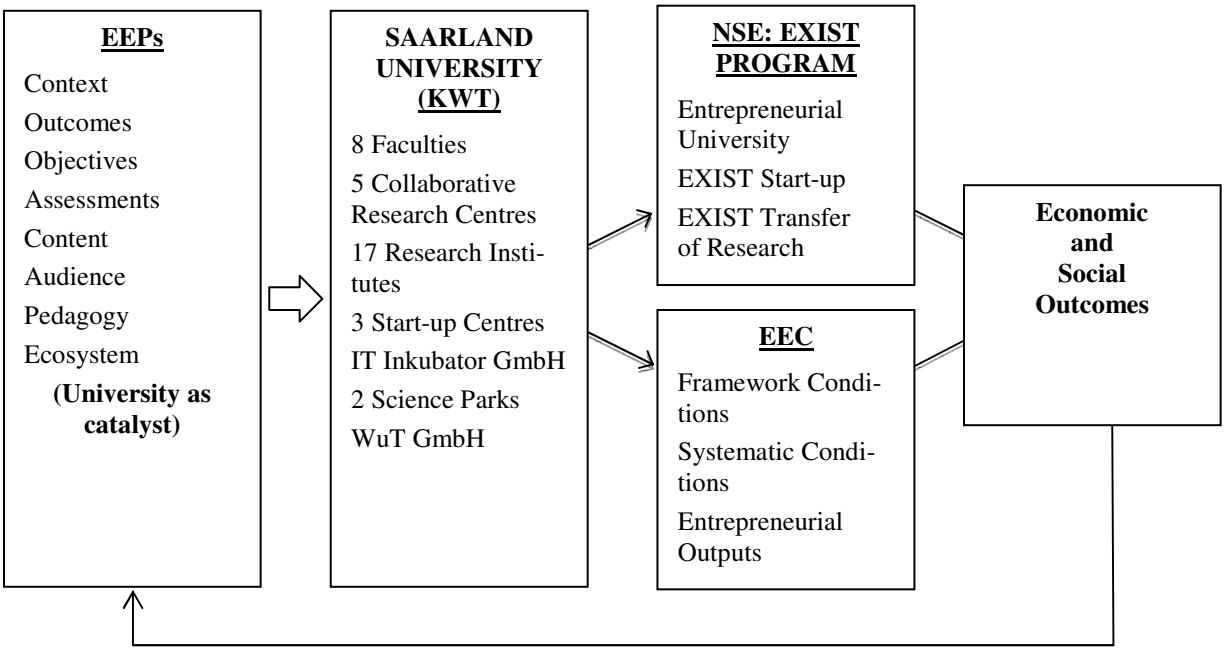
Respondents reported on the interface between student assessment, program objectives, content and pedagogy. Traditional assessment mechanisms are in place, such as exams, projects, participation, reports and assignments. Non-rational assessment, such as self-reflection, per evaluation and outcomes based assessment are also integrated into the courses. Program evaluation is a more complex issue, identified as an integration of internal evaluation (KWT and Saarland University) and external evaluation (EXIST and external funders).

Ecosystem integration

This component was first identified as an EEP component by Maritz et al. (2015), but yet to be validated. The data collected in this study, inclusive of interviews, highlighted the importance of integrating EEPs with entrepreneurial ecosystems. Respondents provided examples of such importance, ranging from the impact from external funders, governing bodies and service providers, to international collaborations, EE best practice, venture funders (such as business angels), community engagers and regional start-up community engagement. Although identified as a NSE, the EXIST program dominated the external engagement platform of this research, providing evidence of the importance of the greater entrepreneurial ecosystem on EEPs. A recent initiative, that of *start-up weekend*, personified the importance of integrating ecosystems, in this case, external and international start-up service providers, funding mechanisms (such as crowd and virtual funding), MOOCS, regional government cooperation, federal government initiatives, expert panels and international entrepreneurship founders and communities. This particular initiative resulted in content pedagogical changes in EE at KWT.

We introduce a conceptual framework identifying the integration of EEPs, NSE and EECs in Figure 2. This is based on the integration of previous EEP framework validation in Kenny (2015), based on the conceptual framework of Maritz and Brown (2013); the scholarly work on NSE of Acs *et al*. (2014) and EEC research of Stam (2014). Emphasis is on the foundation, core and instrumental role of EEPS in NSE and EECs, providing mutual interdependence

Figure 2. A Conceptual Framework of the Integration of EEPs, NSE and EECs



Source: adapted from Maritz and Brown (2013), Kenny (2015) and Stam (2014)
Abbreviations: Entrepreneurship Education Programs (EEP)
National Systems of Entrepreneurship (NSE)
Entrepreneurship Ecosystems (EEC)

between these facets. The university as a catalyst in enhancing entrepreneurial ecosystems is at the centre of this framework.

Conclusion, Applications and Limitations

This paper set out to explore the importance and role that EEPs have on EECs and NSE. Despite EEPs identified as separate components of EECs and NSE (Acs *et al.,* 2014; Stam 2014; Isenberg, 2011), this research places emphasis on a more tangible and integrative approach. We propose a holistic approach of mutual interdependence of EEPs, EECs and NSI, whereby each is influenced by initiatives and activities in the other. Our research indicated that it was challenging, if at all impossible, to provide particular inference on any of these facets without taking the other into account. Our study found that context, outcomes, objectives, content, evaluation, audience and pedagogy of EEPs are directly influenced by parameters of EECs and NSE. This is illustrated using an example from our case in point, providing an application approach to our findings.

One of the EE initiatives proposed by KWT is the development of *E-Books*. These books are identified as supple-

ments to traditional EE courses (such as face-to-face), complimenting alternative and innovative delivery modes (such as online, blended and flipped). The context is within higher education and participants of the EE initiatives offered by KWT (see Figure 1), and outcomes include the enhancement of entrepreneurial skills, knowledge, attitudes, behaviour and self-efficacy of students. Content includes e-books on topical entrepreneurship, including start-up financing, business model innovation, corporate entrepreneurship, social entrepreneurship, gender entrepreneurship, entrepreneurial marketing and innovation management to name but a few. The e-books contain interactive content, whereby readers may link directly to theoretical underpinnings and practice-based initiative. For example, readers may link to cloud funding sources in the start-up financing e-book, and simultaneously apply for funding online. This has direct underpinnings to the EECs, whereby entrepreneurship students may be linked directly to business angels and venture financing mechanisms. Similarly, direct links exist to policy and taxation policies and regulations as promulgated by governments. Such interface correlates with the EEC components that include framework conditions, systematic conditions and outcomes indicating value creation (see, for example, Stam, 2014). And finally, the e-book interface with NSE involves the EXIST initiative. The development of e-books is a contractual obligation of KWT in their strategy concept; in the original application proposal to EXIST in 2012, further elaborated upon in their phase B proposal in 2015. This deliverable, overall, enhances the intent and strategy of Saarland University (through KWT) to become the *entrepreneurial university*, through federal funding via the EXIST program. In this example, the delivery of the e-books would not have been possible without the funding and involvement of EXIST, and the interface with the wider EEC.

Our study also found that interdependence between EEPs, EECs and NSE is not static, in that changes or initiatives in one area may have a direct causal impact on another. An example would be the emergence of alternative sources of funding. Start-ups are depending more and more on innovative and non-traditional forms of funding, such as crowd-sourcing and online crowd-funding. This in turn necessitates changes in content and design of EEPs, together with changes in regulatory systems and taxation laws at an EEC level, affecting dynamics of funding from national bodies at the NSE level (EXIST in this case).

These findings provide a deeper understanding of the role of EEPs in EECs and NSE, specifically in the context of Federal and nationally funded and supported entrepreneurship initiatives. There are multiple implications from this study. For entrepreneurship educators, the various components of designing EEPs require a systems approach, taking cognisance of wider audiences and stakeholders. For institutional leaders, initiatives to enhance the *entrepreneurial university* have been provided. For greater EEC participants, we have provided evidence of the importance, and place of, EE within such ecosystems. And, for NSE, we have provided a re-aligned perspective regarding the mutual

interdependence between EEPs and regulatory frameworks and external funding.

Finally, this research is not without its limitations due to being confined to the case in point at KWT at Saarland University, the EXIST program and the EEC attributable to this case. Replication to other EEPs, EECs and NSE are recommended to validate findings in this study. Further research into other cultures and scenarios is encouraged.

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STUDENT ENTREPRENEURSHIP: A RESEARCH AGENDA

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Abstract

The purpose of this paper is to define the term "Studentpreneur" and stimulate research in the field of Student Entrepreneurship. A research agenda is proposed to further the knowledge of Student Entrepreneurship. The paper identifies Student Entrepreneurship as an emerging phenomenon that provides a dual opportunity. The first is the opportunity to zoom in on one category of entrepreneurs and observe if the traditional theories developed in the "meta category" of entrepreneurs apply to this subcategory; for example, Traits, Psychological tests and Dynamic Capabilities, in a goal to legitimate them further. The second opportunity is to study Studentpreneurs as an exemplary case. Two themes are suggested for the research agenda linked to the latter opportunity: Identity Construction and management of Multiple Identity.

Key words: entrepreneurship research, entrepreneurship, student entrepreneur, studentpreneur, dynamic capabilities, traits, multiple identity, identity formation, psychological testing.

Introduction

The task of the research program "Global Entrepreneurship Monitor" (GEM) is to evaluate each year the level of entrepreneurial activity for each country. The Global Entrepreneurship Monitor (2013), which includes data of sixty-nine countries, posits that "one-third of the differences in economic growth among nations may be due to differences in entrepreneurial activity**".** For this reason educational entities, the community, and government have identified entrepreneurs as fundamental in the development of new ventures (Hisrich, Langan-Fox, & Grant, 2007). Universities are now are tasked with promoting regional

development and economic growth (Rothaermel, Agung, & Jiang, 2007). They are now providing entrepreneurship education and offering incubator facilities, becoming more and more "entrepreneurial universities" (Politis, Winborg, & Dahlstrand, 2011; Rasmussen & Sørheim, 2006).

In contemporary times, uncertainty about economic stability has been rising. As a result, students are "now faced with a wider variety of employment options, the probability of ending up with a diversity of jobs, more responsibility at work and more stress" (Henry, Hill, & Leitch, 2005), which makes entrepreneurship a more appealing option for future graduates. Entrepreneurship skills provide students with more flexibility in choosing their career. They know that starting their own business at any point in their life is still an option due to economic crisis, downsizing or other events.

This is also confirmed by the literature on Youth Entrepreneurship, of which Student Entrepreneurship is a part. As Henderson and Robertson put it, "young people are likely to experience a portfolio career consisting of periods of paid employment, non-work, and self-employment" (2000). Additionally, according to the latest report from the Kauffman Foundation (2013), it is a global phenomenon: "Among young people, the word has gone out that those without self-starting skills may be at a permanent disadvantage."

The impact on the global economy of previous successful students who started their business while at university, or shortly after, is well known. Larry Page and Sergey Brin met at Stanford and started Google as a research project for their graduate studies (Vise, 2008) and now have over 53,000 employees (Google Inc., 2014). Bill Gates (Wallace & Erickson, 1993), Steve Jobs (Isaacson, 2011), Michael Dell (Dell & Fredman, 1999), and Mark Zuckerberg (Yadav, 2006) all started their businesses in their dorms before dropping out. The companies they created now employ almost 350,000 people and reach many more, with over 1.3 billion active users for Facebook alone (Statistica, 2014). More recent student entrepreneurs who dropped out include Matt Mullenweg who created Wordpress while at the University of Houston (Welch, 2014) and Shawn Fanning with Napster (Tart, 2011). Exceptions do exist including Reditt founders; Steve Huffman and Alexis Ohanian (Tart, 2011) but rarity it seems. However, this suggests more research is needed on student entrepreneurs (Politis et al., 2011).

The authors of this study lead the development of a research agenda on Student Entrepreneurship with the main question: Who are those students who decide to go down the path of entrepreneurship? This question then leads to: How can we further the understanding of Student Entrepreneurship? To reach this goal, the methodology undertaken uses a two-step approach. The first step involves a systematic search of the key words "student entrepreneur" and "student entrepreneurship" in the large volume of management literature and also in the literature on entrepreneurship. Then the articles are filtered to keep only the ones where the definition of student entrepreneur and student entrepreneur-

ship are aligned with this research. Due to a paucity of results, the second step consists of a research of student entrepreneurship on much wider range of journals and following the snowballing technique (following citations and authors in relevant articles).

We define "Studentpreneurs" and identify Student Entrepreneurship as an emerging phenomenon and then show that while the intentions of students to become Entrepreneurs have been studied, how they practice Entrepreneurship has not. It is then postulated that the study of the phenomenon of Student Entrepreneurship is a dual opportunity. The first is the opportunity to zoom in on one category of entrepreneurs and examine if the traditional theories developed on the "meta category" of entrepreneurs apply to this subcategory, namely Traits, Psychological tests and Dynamic Capabilities. The second opportunity is to study Studentpreneurs as an exemplary case, with incredible examples (Michael Dell, Bill Gate or Mark Zuckerberg) and extraordinary conditions (educational environment and the low cost of starting a business, for instance). Two themes are suggested for the research agenda that are linked to the latter opportunity: Identity Construction and management of Multiple Identity.

Definition of Entrepreneur and Entrepreneurship

The first definition of the term Entrepreneur was provided by Cantillon in 1755. Entrepreneurs, or "undertakers" in a literal translation, are "gens a gages incertains" (Cantillon), which in modern English translates to: "someone who assumes the risk and may legitimately appropriate any profits" (Bruyat & Julien, 2001). For Schumpeter (1951), an entrepreneur is an innovator who introduces new services, products or technology. These very wide definitions are constantly being updated.

The definition of Entrepreneurship for this study is formulated from the practitioner view of Tjan, Harrington and Hsieh (2012) and the academic view of Bruyat and Julien (2001). For the former, Entrepreneurship refers to the first-stage of the founding of a business and connotes the classic Silicon Valley notion of a start-up and the innovative spirit required to launch one (Tjan et al., 2012). For the latter, Entrepreneurship is seen as a process of change for the venture and the entrepreneur: "while Entrepreneurship is to do with a process of change, emergence and the creation of new value, it is also a process of change and creation for the entrepreneur" (2001).

From Student Entrepreneur to Studentpreneur

Entrepreneurs are defined in a multitude of ways in the literature. The same is true for Student Entrepreneurs but the definitions are significantly less specific. They see themselves as "dream merchants" Purewal (2001) or they "build emerging businesses rather than extending and defending existing businesses" (Baghai, Coley, & White, 2000). A broader definition contends: "He isn't only interested in building businesses. He's also the political science major who starts a political organization, using it as a platform to connect thinkers from other disciplines" (Torenberg, 2012). They can

also be the students using “classrooms and labs as platforms, resources, and subsidies to construct marketable products, processes, or services” (Mars, Slaughter, & Rhoades, 2008). They are sometimes defined as “academic entrepreneurs” however most of the research on academic entrepreneurship focus on faculty members having entrepreneurial activities, not on the students (Bercovitz & Feldman, 2008). Even though there has been significant research on academic entrepreneurship, academics being entrepreneurs is a moderately marginal phenomenon when compared to “the large number of student entrepreneurs who are educated and fostered in the university context, and who often continue to develop their new firm in interaction with the university after graduation” (Politis et al., 2011).

This study departs from much of the previous work by exploring the Student Entrepreneur, not just as a student attending entrepreneurial classes, but as conducting a business on/near campus while simultaneously attending formal university award courses. To refine further the definition of the phenomenon of Student Entrepreneurs, the business has to be innovative (not a reproduction of a traditional business) and at least at the incubator/start-up stage (generating revenue). As a consequence, the definition of Student Entrepreneur for this research agenda is as follow: The Student Entrepreneur is an individual attending award classes at university and conducting innovative and revenue generating entrepreneurial activities.

After further exposure to conferences on Entrepreneurship, the authors have come to the conclusion that even if the definition is altered and shared, the general understanding of a “Student Entrepreneur” remains as a student enrolled in an Entrepreneurship course. For this reason, the new term “Studentpreneur” is used to clearly depart from that general understanding. Definition of Studentpreneur for this research agenda: the Studentpreneur is an individual attending award classes at university and conducting innovative revenue generating entrepreneurial activities.

Student Entrepreneurship is an Emerging Phenomenon

The paucity of results of the systematic search of terms relevant to student entrepreneurship demonstrates that it is not an established and well research phenomenon at the top level of the management literature. The key words used for the systematic search are: "student entrepreneur*", "college age entrepreneur*”, "undergraduate entrepreneur*", "student start-up*" and "student startup*". This systematic search was performed using the database SCOPUS. Forty-two of the top academic journals in Entrepreneurship, Management, and Organisation Studies were selected for the scope with no limit regarding the year of publication. These journals are ranked either A* or A in the 2013 Australian Business Deans Council (ABDC) journal quality list. Only 14 journal articles meet the research criteria. Eleven focus on the intentions of students to become entrepreneurs. Another one treats of the role of entrepreneurship clubs and societies in entrepreneurial learning but does not mention students running a business (Pittaway, Rodri-

guez-Falcon, Aiyegbayo, & King, 2011). Finally, only two focus on Studentpreneurs as we define it in this research agenda. The first one is a narrative of a team of academics and students in setting up a business, "Envirofit International", published in Entrepreneurship Theory & Practice (Hudnut & De-Tienne, 2010). The second one, "Student Entrepreneur: Resource Logic & Effectual Reasoning" (Politis et al., 2011) is a response to the call for research for comparative studies studying if student entrepreneurs are different to other kinds of entrepreneurs. One of its main finding (see quote below) is that student entrepreneurs are a different group of entrepreneurs, at least in the use of resources. It is a significant starting point for this research agenda.

"Relatively little is known about young adult views on Entrepreneurship. The work that has been undertaken tends to focus on the specific factors which influence someone to start a business rather than Entrepreneurship as a career choice." These words from 2000 by Henderson and Robertson show that the research has not been focusing on youth embracing entrepreneurship. However, a set of new studies demonstrates that it is a growing area, even an "emerging phenomenon" (Mars et al., 2008). The latter authors even define a category of Student Entrepreneurs very closely to Studentpreneurs: the State Sponsored Student Entrepreneurs. Their reasoning is that entrepreneurial students take more and more advantage of university resources such as specialised professors, spaces such as incubators, patent and copyright protections provided by the university and sometimes their classroom learning. They are also "utilising the entrepreneurial environments of their universities to access markets with the products, processes, and services they have created" (Mars, 2006).

Another reason for the emergence of Student Entrepreneurship can be seen in the fact that Entrepreneurship education is now mainstream (Politis et al., 2011). The Kauffman Foundation in 2008 reported that it was "one of the fastest growing subjects in today's undergraduate curricula". According to the same report, the number of Entrepreneurship courses in the U.S. rose from 250 in 1985 to 5,000 in 2008 with over 9,000 faculty members teaching it. This is the result of high-level investment in Entrepreneurship education. For instance, in 2006 the Kauffman Institute selected nine U.S. universities to receive $25.5 million to assimilate entrepreneurship into all areas of research and study. The result of such a boost in Entrepreneurship education explains partially the surge in Student Entrepreneurship, making this phenomenon an important area for further study.

How Have Studentpreneurs Been Studied? Intentions vs. Practice

In the entrepreneurship literature, the closest area to studies on Studentpreneurs are studies on self-employment and/or entrepreneurial intentions of students after they graduate. The reasoning for this is psychologists see the appraisal of intentions as the closest way to predict behaviour (Ajzen, 1991). A significant amount of the studies on behavioural intentions (McStay, 2008) have been conducted by psychologists, and more

specifically cognitive psychologists (Ajzen, 1991; Fishbein & Ajzen, 1975; Searle, 1983), which demonstrates the need for a cross-disciplinary literature review. For some researchers self-employment intentions and entrepreneurial intentions are synonyms (Souitaris, Zerbinati, & Al-Laham, 2007; Walter, Parboteeah, & Walter, 2011). For others, entrepreneurial intentions relate specifically to high growth start-ups (Krueger 1993 in Walter 2011) whereas self-employment includes all types of entrepreneurship (Walter et al., 2011). In any case, both types of studies focus on the prediction of student behaviour. The classical theory of planned behaviour has largely been used in entrepreneurship research (D. A. Shepherd & DeTienne, 2005; Souitaris et al., 2007). Being identified as the fundamental element for understating the process of setting up a startup is the reason for such a focus on entrepreneurial intentions. In such research two streams of study have been privileged "personal characteristics" or "traits", and how contextual factors affect the intentions to become an entrepreneurs (Lüthje & Franke, 2003). Important findings come from such research. Walter et al. (2011) demonstrate that "the university setting can directly affect the likelihood that students identify and exploit opportunities, and thus their self-employment intentions". This leads Walter et al. (2011) to the conclusion that the more the university exhibits "characteristics conductive to entrepreneurship", the more it will influence their students toward intentions of becoming an entrepreneur.

However, typically, studies on intentions do not focus on students who already run a business but on larger samples of students attending (or not in some cases) entrepreneurship classes. As a result, the findings of such studies may or may not apply to Studentpreneurs; further research is required to validate this hypothesis or otherwise. The most common limitation of behavioural intention studies applied to entrepreneurship, as noted by Walter et al. (2011), is that the "predictive validity of intention" has been demonstrated in a general context only (Armitage & Conner 2001 in Walter 2011). The logical conclusion is that even if the students have the intentions of self-employment or starting a high growth business, they may or may not act on their intentions (Bhave 1994 in Walter 2011). Indeed, what happens to the students with such intentions when the reality of living expenses, lifestyle and work-life balance settles in after graduation? How many graduates who said they wanted to become an entrepreneur realise they are not made for the frugal life of an entrepreneur? Typical first time entrepreneurs cut all their spending to invest everything in their venture. There are countless stories of young entrepreneurs sleeping on their friends' couch and using multiple credit cards while building a business (Stanford University's Entrepreneurship Corner Podcast (2015).

Self-employment and entrepreneurial intentions studies have important findings. However, the literature on students practising entrepreneurship is limited and further research is required to investigate if such findings can be applied to Studentpreneurs.

Zooming in on Studentpreneurs: Can Classical Theories be Applied to this Sub Category of Entrepreneurship?

Can Psychological Approach of Traits and Attributes theories be applied to Studentpreneurs?

Thirty years of academic research has been conducted on the psychological traits of becoming an entrepreneur. The locus of control and high Need for Achievement, or NAch, (Begley & Boyd, 1988; Essers & Benschop, 2007; Hornaday & Aboud, 1971; McClelland, 1965; Schmitt-Rodermund, 2004) are now widely recognised as traits of entrepreneurs and are commonly used in Entrepreneurship studies as noted by Davidsson in the latest ACE research vignette (2013). Caveats need to be taken into account as other researchers have demonstrated no significant results for the Need for Achievement (Hansemark, 2003).

Risk taking propensity is one of the main recognised traits of an entrepreneur (Kets de Vries, 1985; Nicolaou, Shane, Cherkas, & Spector, 2008; Schmitt-Rodermund, 2004; Stewart Jr, Watson, Carland, & Carland, 1999; Stewart Jr & Roth, 2001), but there is no agreement on the level of risk: moderate, calculated or simply a gut feeling. In addition to the uncertainty of the level of risk, Tjan, Harrington and Hsieh (2012) note that the line between risk takers and risks tolerators is blurry. It is one of the seven most researched psychological traits in entrepreneurship among need for achievement, need for power, need for affiliation, internal locus of control, desire for autonomy, and tolerance of uncertainty.

Less studied is the fact that a significant numbers of entrepreneurs go through ups and downs (Kets de Vries, 1985). Common as well in the practitioner literature, but rarer in the academic, is the notion of following a dream for which some archetypical entrepreneurs such as Bill Gates and Mark Zuckerberg are ready to sacrifice their Harvard degree (Tjan et al., 2012). Other traits are less studied: creative entrepreneurs demonstrate great degrees of energy (Kets de Vries, 1985; Schmitt-Rodermund, 2004), a high level of perseverance (Brockhaus & Horwitz, 1986) and imagination (Essers & Benschop, 2007), coupled with an aversion for "repetitive, routine" activities. Also, luck or serendipity is studied only by a few academics. However, in more common terms, it is about "making your own luck happen" (Tjan et al., 2012 p. 251). Entrepreneurs build themselves a network of people and opportunities and they are ready to leverage them when an opportunity arise.

The least researched traits, according to Kets de Vries (1985), is that "entrepreneurs somehow know how to lead an organisation and give it momentum." They infuse a great enthusiasm in start-up organisations. Their leadership capability derives from their "seductiveness, gamesmanship, or charisma" (Kets de Vries, 1985; Pink, 2009). They use their passion to transform their purpose into reality that others follow (Stewart, 1996; Tjan et al., 2012). Schmitt-Rodermund emphasises autonomy (2004) while Kets de Vries adds that entrepreneurs have a difficult time in working for someone else (1985), which a later psychological

approach by Stuart seems to corroborate (Stewart, 1996).

It is to be noted that several researchers are trying to discourage research in the area of traits of Entrepreneurship (Gatewood, Shaver, & Gartner, 1995), since no study proves at the 100% level the link between these traits and becoming an Entrepreneur. However, this review of the traditional area of traits and attributes of entrepreneurs shows that there has been a variety of research undertaken. Further research is required to study if the psychological approach of traits applies to the category of Studentpreneurs.

Can Psychological Testing Approach be Applied to Studentpreneurs?

Even though the traits mentioned previously are contested, they constitute a starting point in the identification of entrepreneurs. The next logical step to predict Entrepreneurship is the use of psychological tests. Attempts at testing for Entrepreneurship go back as far as 1965 (McClelland), leveraging the previous traits and characteristics identified. There are several issues that arise in applying psychological tests to entrepreneurs as Caird (1993) encapsulates. The first issue is that the population of entrepreneurs is heterogeneous. They differ widely by the type of business they are running, their motivation, their use of technology, and the list goes on. It naturally links to the second issue that there are a multitude of definitions of entrepreneurs along with the various characteristics with which they are labelled. The latter, according to Caird, justifies why some tests look at the traits and characteristics while others focus on "the nature of the entrepreneurs".

Throughout the existing Entrepreneurship literature is the knowledge of different types of people (Jung 1965; Meyer & Meyer 1980; Keirsey 1998) (Jung & Jaffe, 1963; Keirsey, 1998; Myers & Myers, 1980). A series of tests and instruments exist to test for personality traits (Myers-Briggs Type Indicator, DISC, Ennegram, and StrengthFinders). If existing tests relate to generic types of people, only a paucity of tests (Abraham, 2011) for types of entrepreneurs appear to exist in spite of "the fact that Entrepreneurship is affected by numerous factors" (Kalkan & Kaygusuz, 2012).

One of the earliest tests on the nature of the entrepreneur is Edwards' Personal Preference Schedule (Edwards, 1954). This personality test requires the respondent to rank needs. Edwards demonstrates that entrepreneurs have a "high Need for Achievement, autonomy, change and a low need for affiliation". However, as demonstrated by Watkins, results can be manipulated by changing the content and the range of the needs (1976).

Another personality test is McClelland's use of the Thematic Apperception Test (TAT) for measuring NAch, power and affiliation. He designed a specific setting (or set of pictures) of the TAT to assess these traits (1965). He found that entrepreneurs have "high NAch, high needs for power and low affiliation needs". However further studies, such as Roberts (1989), showed that the results varied according to the type of entrepreneur.

Comparative studies have demonstrated different results with different types of entrepreneurs, but there seems to be a commonality on thinking and intuition (Roberts, 1989). If existing tests relate to generic types of people, only a paucity of tests (Abraham, 2011) for types of entrepreneurs appear to exist in spite of "the fact that Entrepreneurship is affected by numerous factors" (Kalkan & Kaygusuz, 2012).

In any of the tests mentioned, young entrepreneurs or student entrepreneurs have never been mentioned. There is an opportunity to study if these tests, standalone or in any configuration, could be used to test for student entrepreneurship. If so, student entrepreneurs could be identified not only at university but also potentially prior to choosing a university; that is, while in high school.

Can Dynamic Capability Theories be Applied to Studentpreneurs?

Dynamic capabilities are typically labelled as an elusive concept or an abstract "black box" (Pavlou & EI Sawy 2011, p. 239). Dynamic capabilities are a basis for competitive advantage (Lawton & Rajwani 2011; Sirmon et al. 2010) and are at the heart of an organisation's competences (Zahra et al. 2006). Dynamic capabilities include making key decisions to help the growth of the startup. Entrepreneurs evolve in an inconstant and unstable environment and they need to be able to adapt to changes very quickly. The literature shows that when executives perform dynamic capability they are able to efficiently improve resource productivity and competitivity (Chiou 2011; Adeniran & Johnston 2012) and create market differentiation (Fang et al. 2010; Lee 2008; Lee et al. 2011; Helfat & Peteraf 2003). In his seminal article on dynamic capability, Teece (1997) focuses the research at a firm level by defining dynamic capability as "the firm's ability to integrate, build, and reconfigure internal and external competences to address a rapidly changing environment". Other literature now focuses on dynamic capabilities at the individual level, such as the identification of personality traits of entrepreneurs (Dollingers 2003) or the interpretation of the influence of social backgrounds on business decisions (Ucbasaran et al., 2001; Chang, 2012). The personality traits are defined as "the ability to renew, augment, and adapt competencies over time" (Marcus & Anderson 2006, p. 19).We believe that students are conscious that they do not have to master all the skills to build and run a business. As a consequence, they are more flexible and they are not as emotionally attached to their venture as are seasoned entrepreneurs. They can change their business model quickly. Moreover, dynamic capability can be acquired (Mulders et al. 2010). Studentpreneurs, who know their business knowledge is limited, know where to find help. They ask their professors, they attend presentations from professionals from the industry and meet up with them at the end. Finally, they talk to their peers. They are skilled at maximising serendipity. They have mastered the art of networking. However, there is no study that shows that Studentpreneurs already demonstrate dynamic capabilities.

From the literature, three sets of capabilities (at the individual level) that

make up the components of dynamic capability have the potential to be applied to Studentpreneurs. The first model, from Kindstrom (2012) comprises Sensing Capabilities, Learning Capability, Integrating Capability, and Coordinating Capability. Agarwal and Selen (2009) combine five capabilities: Entrepreneurial Alertness, Customer Engagement, Collaborative Agility, Collaborative Innovative Agility, and Collaborative Organisational Learning. Finally, Chang (2012) identifies four capabilities specifically applicable to IT entrepreneurs: "Market-oriented Sensitivity, Ability to Absorb Knowledge, Social-networking capability and the integrative ability to communicate and negotiate". There is an opportunity to see if Dynamic Capabilities can be identified on the category of Studentpreneur and by doing so further the understanding of the phenomenon of Student Entrepreneurship. The second opportunity is to study Studentpreneurs as an exemplary case, with incredible examples and extraordinary conditions. Two themes are suggested for the research agenda: Identity Construction and management of Multiple Identity.

Studentpreneurs to be Studied as an Exemplary Case

Identity Construction in Student Entrepreneurship Requires Further Research

Research in identity construction is a highly debated topic, but academics agree on one thing: identity is not simply the personality of the individual but is constructed via interactions between "the individual, society, and culture" (Down & Warren, 2008). The mainstream literature on Entrepreneurship rarely mentions identity (Essers & Benschop, 2007). However, in the area of identity construction in Entrepreneurship there is a growing interest in treating it as part of the entrepreneurial process (Nielsen & Lassen, 2012). Downing's work on the social construction of Entrepreneurship (2005) describes "how notions of individuals and collective identity and organisation are co-produced over time". He highlights that further knowledge on interactions between entrepreneurs and stakeholders focusing on how they co-produce their identities is needed as this is currently "unclear".

Shepherd and Haynie (2009) add that such social construction has a cost for entrepreneurs. In the pursuit of satisfying the need to be different and unique, which is present in all individuals (Brewer, 1991), entrepreneurs incur the risk of not belonging anymore and, as a result, experiencing the "dark-side" of mental health. The authors call for a model to manage multiple identities, to balance both needs. Shepherd and Haynie offer their own model that requires entrepreneurs to separate themselves from their venture, but it is only one attempt at identity management.

Nielsen and Lassen (2012) claim that Studentpreneurs are the perfect group to investigate identity construction in the entrepreneurial process. One of the reasons is that while young people are getting ready to join adulthood, there is a high level of identity reflection (Erikson, 1968). This is a complex time for young people as there are no clear answers to "who am I" and "who am I going to be-

come" (Moshman, 2005). Another reason, according to Nielsen and Lassen (2012), is that Studentpreneurs do not have a stable sense of identity. The reasoning is that they do not have the business knowledge, networking skills, and experience to understand the entrepreneurial process.

Multiple Identity in Student Entrepreneurship Requires Further Research

"Identity is fluid, depends on the environment, and is in constant change" (Harraway, 1991). From a constructionist perspective, identity can also be seen as a "discourse, socially constructed through language and embedded in power relations" (Essers & Benschop, 2007). It is on this theoretical ground that Essers and Benchops (2007) studied the "multiple identity construction" of Female Entrepreneurs of Moroccan or Turkish Origin in the Netherlands. They demonstrate the existence of complex processes of identity construction in female ethnic minority entrepreneurs. A key finding is that these identities are produced through communication /discussion with stakeholders, so the identit ies "become" instead of "are" (Essers & Benschop 2007). (2005) Downing (2005) comes to the same conclusion: "the becoming [of their identities] is negotiated with various constituencies". This study from Essers and Benschop calls for "attention to entrepreneurial identities" (Steyaert & Hjorth, 2003). A justification for this study is given by Essers and Benschop (2007): "There is a lack of research on identities of entrepreneurs whereas organisational identity is a mature topic".

After studying the narrative of 10 Studentpreneurs, Nielsen and Lassen (2012) find that "identity is multiple and not coherent and that this influences the entrepreneurial process". Entrepreneurship challenges the cognitive process of young people to create multiple identities: "when old meets new, multiple and hybrid identities may be created" (Nielsen & Lassen, 2012). At this stage of the research it seems that Nielsen and Lassen's article on "Identity in Entrepreneurship effectuation theory" is the only one mentioning the multiple identities in Studentpreneurs in the entrepreneurial process. This is as an opportunity to further the knowledge on Student Entrepreneurship in the areas of management of Multiple Identity.

Conclusion

The area of Student Entrepreneurship is an emerging phenomenon. Two opportunities have been described: using the category of Studentpreneurs to identify theories that have been developed at the Entrepreneur meta category level and studying Studentpreneurs as an exemplary case. Five research avenues have been highlighted that range from testing the dynamic capabilities on Studentpreneurs to studying how they manage their multiple identity.

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THE STUDY OF TOTAL QUALITY MANAGEMENT AND JOB SATISFACTION IN LAND AUTHORITY FROM NORTH TAIWAN

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Abstract

It is observed from previous study that although there is exploration on Total Quality Management ("TQM") and job satisfaction from some researches in Taiwan, there is not a single research involving employee job satisfaction in land authority, or which TQM perspectives affect job satisfaction. As such, this research utilizes TQM and job satisfaction as the theory basis and develops questionnaires accordingly for survey over land authority employees. There are a total of 210 respondents in this survey which explores which TQM perspectives affect employee job satisfaction in land authority as well as how to enhance employee's job satisfaction. Research result indicates that Total Quality Management does affect employee's job satisfaction. It is also observed that organization leaders do have critical influences over the success or failure in TQM implementation. Furthermore, organizations with holistic TQM implementation can effectively enhance their performance on education and training. Accordingly, this research presents relevant recommendations based on research results herein.

Key words: Total Quality Management, Job Satisfaction, Land Authority

Introduction

In recent years, Taiwan public servants have experienced increased job pressure under requirements from county and city's promotion to municipalities, government organization recreation and emphasis on public sector service quality. Their job satisfaction is also become lower and lower. This involves service quality and administration efficiency provided to the public by 346,000 public servants across the country. Therefore, it has become an urgent issue in finding measures to improve public servant's management method, work environment, on-job training and even job satisfaction.

With respect to related researches, a research by Schneider and Bowen (1985) on employee's perception over bank services indicates that employees are willing to offer better services to customers if an organization has a more comprehensive management system and provides good opportunities for promotion and development. Another research conducted by Bettencourt and Brown (1997) over employee's perception of job satisfaction and job equality indicates that employees tend to offer better service behavior to customers if they have a higher degree of job satisfaction. In a research related to human resource practices and degree of job satisfaction, Morrison (1996) considers that, in order to enhance service quality, enterprise human resource management policy should be dedicated to creating an environment which ensures employee's job satisfaction. During a survey conducted by Hallowell, Schlesinger and Zornitsky (1996) over insurance company managers, front line employees and customers, it is observed that employee's job satisfaction is related to customer's degree of satisfaction. Employees are more than happy to offer good services to customers if enterprises and organizations are able to enhance employee's job satisfaction. Zerbe, Dobni and Harel (1998) used North American airline industry employees as their survey objects. Their research indicates that the more popular management is, the higher employee's job satisfaction. And better service behavior will be generated accordingly. Testa, Skraruppa and Pietrzak (1998) used employees having contact with customers as well as travelers onboard 9 cruise liners to explore relationship between employee's job satisfaction and customer satisfaction. Their finding indicates that there is a positive correlation between employee's perception of job satisfaction and customer satisfaction. That is, customer's degree of satisfaction will be higher if employee's degree of job satisfaction is higher. This also spells out direct link between em-

ployee's job satisfaction and customer's satisfaction.

From the findings of aforementioned researches, it is observed that employee's job satisfaction not only relates to a company's management system, human resource and management's leadership, it is also directly linked with customer's satisfaction. Public sector organizations will be able to effectively enhance public servant's work morale and satisfaction if they can build up a work environment and systems preferred by employees. Public servants will be more willing to provide good services to the public if they possess higher work morale. Therefore, employee job satisfaction is indeed a critical indicator in measuring management method and system of enterprises and organizations. It is also an important factor affecting customer's satisfaction. Specifically, human is the most critical resource for respective industries and organizations. With this, it is necessary to explore how to improve organization management methods in order to enhance public servant's job satisfaction.

In his research over leadership and policy implementation, Oakland (2011) mentioned that total quality management (TQM) can enhance any organization's competitiveness, efficiency and flexibility through planning, organizing and understanding of all activities within an organization, and integrates all organization members into management circle. One thing worth mentioning is that Oakland considers that effective TQM can ensure management's emphasis on quality and prevention, and it will relieve management of the task of trouble shooting. In the meantime, Oakland also advocates in his research that top management should develop the following effective leadership measures which include: clear description of belief and plan in vision, specific and effective strategy and support plan, critical success factor and core process, appropriate management structure and authorized employee participation.

In a research focused on TQM influence on public servant's employee satisfaction and loyalty, Chang, Chiu and Chen (2010) observe that if total quality management practice is integrated into employee education and training, employee authorization, teamwork, employee remuneration and leadership, the end result will indicate that these variables all have a positive influence on employee's loyalty and employee satisfaction can be influenced through loyalty. In a research exploring if e-service quality (integrated with TQM spirit and concepts) affects customer satisfaction and analyz-

ing if customer's perceived value plays as an intermediary variable in customer satisfaction's influence over customer loyalty, Chang, Wang and Yang (2009) observed that e-service quality indeed has a positive influence over customer satisfaction and loyalty. Specifically, customer's perceived value also plays an important role in customer satisfaction's influence over customer loyalty. Nwabueze (2011) surveyed 50 CEOs of health care system institutes in United Kingdom to explore TQM implementation's influence in those institutes. The result indicates that organization leaders possess critical influence over the success or failure for TQM implementation. In addition, this research also defines leadership methods which leaders of health care institutes with TQM implementation should have. These methods include being a good communicator, a good planner, a leader of action, a good commander, a leader of firm mind-set, a good listener, a passionate/committed leader and a good organizer. All these traits assist in an organization's promotion of TQM. Lam, Lee, Ooi and Lin (2011) assumed that TQM enhances 146 Malaysia service institutes' learning orientation and market performance, and analyzed if learning orientation also affects these service institutes' market performance. This research observes, through questionnaire, that companies implementing TQM indeed are capable of dramatically improving their leaning orientation and market performance.

From these it is observed that TQM is capable of integrating concepts of quality emphasis and all employees into work environment improvement, employee education and training, employee authorization, teamwork, employee remuneration and organization management. Meanwhile, according to findings from previous researches, TQM indeed is capable of dramatically enhancing employee's perception on work environment and satisfaction and further enhancing organization performance and output. As such, this research intends to utilize TQM to explore how to enhance employee satisfaction among employees of public sector organizations.

Materials and Methods

Total Quality Management

Oakland (1989) considered that TQM model in organizations should include two perspectives of "soft management" and "hard management."

The main purpose for TQM "soft management" lies in the management of "customer-supplier relationship" which emphasizes in communication of organization culture, communication with cus-

tomer, communication within organization as well as organization's goal and commitment. To achieve this goal, soft management should be enhanced on the three fields as follows:

(A) Culture: Oakland considered that organizations should emphasize organization members' self- management and achieve organization's optimized performance through good self-management.

(B) Communication: Oakland asserted that communication can be categorized into internal and external organization communication. For internal communication, overall organization performance cannot be enhanced and TQM goal is certainly not achievable if there are communication problems among different members. As for external communication, Oakland asserted that numerous cases have demonstrated that the perception of poor quality on numerous good products and services may result from bad communication with customers. From this we learn the importance of communication on quality enhancement.

(C) Commitment: For the purpose of continuous system improvement, all members of TQM organizations, from supervisors to employees, shall be committed to long term quality enhancement.

As for "hard management", enhancements should be exerted on three fields:

(D) Systems: Oakland asserted that establishing organization performance standards and improving systems (management or production system) are management's responsibilities. From time to time, management should improve systems, satisfy organization's needs and expectation, and continue to fine-tune process.

(E) Teams: From time to time, respective departments of an organization work independently without collaborating with one another because of their different duties. To achieve TQM goal, management should be good at forming an organization in order to explore overall performance.

(F) Tools: TQM organizations should utilize various tools to assess, inspect and implement quality improvement process. As such, organizations should develop quality tools and train their employees to familiarize and utilize them.

Job Satisfaction

Job satisfaction is a worker's response to scenarios related to work in an organization. Therefore, job satisfaction is

a critical indicator to an organization as well as the worker himself/herself. Through related scholar documents, this research pinpoints factors affecting employee's job satisfaction and their influence on workers. These factors are divided into the following three categories in accordance with theories developed after 1940:

(A) Measurement Based on Needs Satisfaction – Content Theory Meeting Individual's Needs on Money, Position and Achievement: such as Need Hierarchy (Maslow, 1943), ERG Theory (Alderfer, 1969) and Needs Satisfaction Theory (Porter & Lawler, 1968).

(B) Measurements Based on Expected Actual Values: Expectancy Theory of Motivation, Gap Theory, Equity Theory, and so on.

(C) Others: Two-Factor Theory, Three-Factor Theory, System Theory, and so on.

Introduction of Relatively Representative Theories of Content Theory and Process Theory: Need Hierarchy Theory, ERG Theory, Two-Factor Theory

(A) Need Hierarchy Theory:

U.S. humanistic psychologist Maslow (1943) presented Needs Hierarchy Theory based on motive research which considers that all human behaviors are generated from needs. He divided human needs into 5 levels of – from low end to high end – physiological needs, safety needs, social needs, needs for respect and needs for self-fulfillment. These needs are in a hierarchy structure and they come with a sequence. Higher level needs will only be pursued after lower level needs are met.

(B) ERG Theory (Existence, Relatedness and Growth Theory):

ERG Theory is advocated by Alderfer (1969). This is because there are limits on Maslow's Needs Hierarchy Theory which does not have specific divisions over parameters of needs in respective levels. Furthermore, assumption of specific sequence does not apply to everyone. With this, Alderfer utilized Maslow's Needs Hierarchy Theory as a blueprint, simplified it and divided it into three types of existence needs, relationship needs and growth needs.

(C) Two-Factor Theory:

Herzberg presented Two-Factor Theory in 1966. This theory is also called the "Motivation - Hygiene Theory". Herzberg asserted that traditional percep-

tion over job satisfaction in the early days is not enough. Previously, traditional theory considers that a person's job satisfaction is only categorized into satisfaction and dissatisfaction. Employees will feel satisfied as long as their job dissatisfactions are removed. With respect to such views, Herzberg directly pointes out insufficiency of this theory and presented the theory of two factors of motivation and hygiene.

From job satisfaction related theories mentioned above, researcher of this study applied System Theory in this research the descriptions as follows: Wemimont presented System Theory which suggests that people's job satisfaction is mainly affected by external environment and internal factors. External environment includes various items of company policy, work environment, remuneration, interpersonal relationship, management leadership, management methods, welfare system, promotion system and work atmosphere. All these environmental factors have direct influence over worker's internal perception. As for internal factors, they mainly include personal perception of value, personal experience, level of education and age. System Theory suggests that external environment will first affect a person's internal mind-set. For instance, a company's promotion system will first affect employees' inner perception. Employees will then express their feelings and, as a result, this will affect external environment. Accordingly, views of System Theory are ways of explanations which inter-connect with each other. Through the views of System Theory, factors affecting job satisfaction can generally be categorized into external environment and inner factors.

R*esearch Design*

1. Research Variables

With respect to design of research, this research takes references from research structures presented by Chang, Chiu and Chen (2010) and Chang, Wang and Yang (2009) and presents its own hypothesis that TQM does affect land authority employee's job satisfaction.

On the measurement of TQM, this research takes reference from TQM variables and scale questionnaire of "2003 Critical Factor Analysis Plan for Service Industry's TQM Implementation Effectiveness in Our Country." There are eight TQM perspectives in this questionnaire including "senior management's participation in quality event", "management of service quality strategy", "management of service design", "management of service

process", "supplier management", "customer relationship management", "computerization level of quality information" and "promotion of service quality education and training." However, after this research's assessment of the questionnaire's perspectives and questions, it is considered that land authority does not the perspective and related questions on supplier management. As such, TQM perspectives have been modified to seven of them and wording in questionnaire have also been modified accordingly based on targets interviewed in this research.

On the measurement of job satisfaction, this research takes reference from the research of "Re-Establishment of Public and Private Organization Employee Job Satisfaction Scales" conducted by Tsai, Min-Hong (2006). Through statistics methodologies of item analysis and factor analysis, Tsai, Min-Hong re-established a job satisfaction scale suitable for domestic work environment here in Taiwan. The result indicates that job satisfaction should include six perspectives of "sense of work achievement", "remuneration and satisfaction", "superior's satisfaction", "work support", "colleague relationship" and "promotion opportunity." This research utilizes such questionnaire's perspectives and questions for testing. As such, this research presents the following research structure. (See Figure 1.

2. Introduction of Questionnaire Contents

According to research structure mentioned above, TQM perspectives include seven perspectives of senior management participation, service quality management, service design management, service process management, customer relationship management, information computerization and education and training. Job satisfaction includes six perspectives of sense of work achievement, remuneration and satisfaction, superior's satisfaction, work support, colleague relationship and promotion opportunities. As for measurement methodology, this research utilizes Likert Scale to measure TQM and job satisfaction. Measurement is conducted using items of very agree (5 points), agree (4 points), average (3 points), disagree (2 points) and very disagree (1 point) on the scale.

3. People Interviewed

People interviewed in this research are public servants working in Taipei City land authorities. Researcher worked together with questionnaire interviewers in conducting interviews in land authorities. Interviews were conducted from November 1st to November 20th of 2014. It took people interviewed roughly ten minutes to fill in each questionnaire. Researcher and

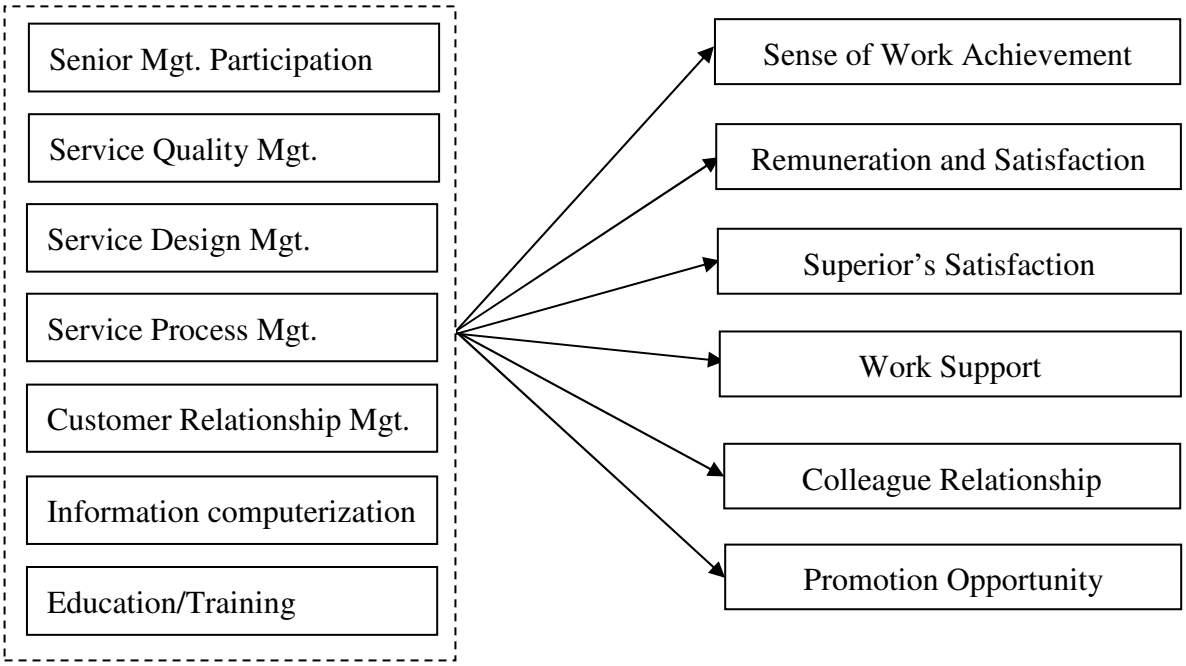

Figure 1. Structure for This Research

Table 1. TQM Perspectives & Items

Perspective	Definition	Items
Service Quality Education & Training Level of Promotion	Level of Education& Training Provided & Supported by Organization	1. Your organization will fully support employee education and training.
		2. Your organization provides management personnel and supervisors of respective units with quality related training courses.
		3. Your organization provides personnel of respective units with TQM concept education and training.
		4. Your organization provides employees with training on quality control circle engagement.
		5. Your organization provides all employees with basic statistics skill education and training.
		6. Your organization provides all employees with advance statistics skill education and training.
		7. Senior management in your organization is willing to support employee education and training.
Service	Level of Service	1. Your organization has established specific short

Perspective	Definition	Items
Quality Strategy Mgt.	Quality Promoted & Drafted by Organization	term service quality goal.
		2. Your organization has established specific long term service quality goal.
		3. Your organization has established specific service quality strategy planning level.
		4. Your organization has established specific service quality performance control system.
		5. All respective units in your organization will treat continuous service quality activity as one of their important duties.
		6. Your organization enjoys a high level of implementation on quality control circle activities.
Customer Relationship Mgt.	Mgt. of Relationship Between Organization & The Public	1. Your organization aggressively collects the public's response and comments on service quality information system.
		2. Your organization aggressively looks for ways to meet with people's current and future needs.
		3. The public has a high degree of participation during your organization's designing and developing process of new services.
		4. Each year, your organization randomly holds meetings to exchange views with the public.
		5. Each year, your organization holds regular meetings to exchange views with the public.
Service Process Mgt.	Organization Personnel's Monitoring Over Equipment & Service	1. Your organization is capable of conducting thorough assessment over various service quality levels.
		2. Your organization is capable of utilizing statistics control chart to conduct service process quality control.
		3. Personnel of your organization will fully fulfill their duty of self-inspection.
		4. Personnel of your organization are capable of fulfilling their duty in service equipment maintenance operation.
		5. Management personnel of your organization are capable of fulfilling their duty of service operation inspection and checking.
Service Design Mgt.	Level of Organization's Drafting & Mgt. of Service Process	1. Your organization emphasizes a lot on new service design quality.
		2. Your organization emphasizes a lot on service feasibility.
		3. Your organization establishes specific service speci-

Perspective	Definition	Items
		fications and design process.
		4. There is a good interaction between your organization and other related departments.
		5. During the process of designing new services, your organization will conduct analysis on customer's needs.
Senior Management Participation in Quality Control Activity	Level of Senior Management's Emphasis & Participation on Quality Control Activity	1. Senior management of your organization has a high level of participation in quality management activities.
		2. Senior management in your organization has a high level of participation in quality enhancement activity meetings.
		3. Senior management in your organization emphasizes a lot on quality performance result.
		4. Senior management in your organization emphasizes a lot on employee work quality.
Level of Computerization on Quality Information	Level of Quality Information Computerization Promoted by Organization	1. Your organization aggressively promotes statistics analysis on various service quality.
		2. It is easy for the public to have access to information on the internet published by your organization.
		3. It is easy for personnel of respective departments to have access to quality information on intranet.

Table 2. Job Satisfaction Measurement Scale

Perspectives	Definition	Items
Sense of Work Achievement	Contents of Work and Level of Sense of Achievement from Work	1. I feel that contents of my work are very interesting.
		2. I like the contents of my current work.
		3. I am proud of the work in which I am engaged.
		4. Sense of achievement from work makes me feel satisfied.
		5. I feel my work is meaningful.
		6. I feel satisfied that my work offers the opportunity for me to perform independently.
		7. I feel satisfied that, from time to time, I have opportunity to utilize my ability to do something when working.
Remuneration Satisfaction	Level of Satisfaction on	1. I feel satisfied with the benefits provided by my organization.

Perspectives	Definition	Items
	Salary & Welfare Obtained from Work	2. Benefits provided by my organization are as good as the ones provided by other companies.
		3. I have received benefits which I deserve to have.
		4. I am satisfied with the pace of salary increase.
		5. I feel that my salary is able to reflect my devotion to work.
		6. As far as salary is concerned, I feel that I am valued by my organization.
		7. Benefits provided by my organization are fair.
		8. I feel that my effort has been rewarded appropriately.
Superior Satisfaction	Level of Satisfaction on Direct Supervisor	1. My supervisor is a capable worker.
		2. I like my supervisor.
		3. My supervisor cares about subordinate's feelings.
		4. My supervisor treats me fairly.
		5. I feel satisfied with supervisor's ability to make decision.
Work Support	Level of Satisfaction on Various Resources Needed During Work Process and Support Needed to Complete Work	1. My organization will provide me with information needed to complete task.
		2. I am able to obtain resources needed to complete work.
		3. My organization has very specific contents on internal job assignment.
		4. I am able to learn result of my work in time.
		5. My organization provides me with a safe and comfortable work environment.
Colleague Support	Level of Satisfaction on getting along and communication with colleagues working together	1. I like the colleagues that I work with.
		2. I have a good time with my colleagues.
		3. Members of my work team enjoy good communication with one another.
		4. Members of my work team collaborate with one another.
Promotion Opportunity	Level of Satisfaction on Job Promotion Channel and Opportunity	1. My current work has numerous promotion opportunities.
		2. Promotion opportunity in this organization is same as the one in other organizations.
		3. I am satisfied with promotion opportunity.
		4. People with good performance in my organization enjoy opportunities of fair promotion.

interviewers would personally answer questions if there was any problem raised when questionnaires were filled-in. Consequently, a total of 210 questionnaires had been retrieved for this research.with 138 males and 72 females. 42 of them are under the age of 30. 91 of them are aged between 31 to 40, and 40 of them aged between 41 to 50, and 37 of them aged over 51. A total of 188 people came with education background of university (including college), while 22 people came with master degree education background. There were 133 people with service years of less than 10 years, while service years for the remaining people were above 11 years. 46 of people interviewed assumed management positions.

4. Statistics Analysis Methodology

The main purpose of this research is to understand if TQM affects land authority employee's job satisfaction. Therefore, multiple regression analysis is utilized to explore causation relationship and influences amount variables.

Research Result

Multiple Regression Analysis

1. Sense of Work Achievement

According to sense of work achievement regression analysis result, service quality management (β=.403), education and training (β=.398), senior management participation (β=.299) and customer relationship management (β=.182) affect land authority public servant's sense of work achievement. This indicates that the higher level an organization's promotion and establishment of service quality is, and the higher level an organization's providing and support of education and training is, and the higher level senior management's participation in TQM is, and the better relationship between an organization and the public is, public servant's sense of work achievement from work will therefore be higher.

2. Sense of Remuneration Satisfaction

According to sense of remuneration satisfaction regression analysis result, customer relationship management (β=.291), senior management participation (β=.289), education and training (β=.213) and information computerization (β=.133) affect land authority public servant's sense of remuneration satisfaction. This indicates that the better relationship between an organization and the public is, and the higher level senior management's

Table 3. Summary of Sense of Work Achievement Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.395	.156		.000
Senior Mgt. Participation	.302	.187	.299	.000***
Service Quality Mgt.	.421	.198	.403	.000***
Service Design Mgt.	.129	.114	.118	.112
Service Process Mgt.	.111	.097	.100	.100
Customer Relationship Mgt.	.201	.197	.182	.003**
Information Computerization	.192	.178	.166	.102
Education & Training	.401	.155	.398	.000**
R Square		.398		
Adjusted R Square		.362		
F(p)		21.312 (.000***)		

**$p < .01$, ***$p < .001$

participation in TQM is, and the higher level an organization's providing and support of education and training is, and the higher level an organization's promotion of quality information computerization is, public servant's level of salary and benefit satisfaction from work will therefore be higher.

3. Sense of Superior Satisfaction

According to superior satisfaction regression analysis result, education and training (β=.422), senior management participation (β=.399), service quality management (β=.121) affect land authority public servant's sense of superior satisfaction. This indicates that the higher level an organization's providing and support of education and training is, and the higher level senior management's participation in TQM is, and the higher level an organization's promotion and establishment of service quality is, the level of public servant's sense of direct superior satisfaction will therefore be higher.

4. Sense of Work Support

According to work support regression analysis result, education and training (β=.242), senior management participation (β=.221), customer relationship management (β=.198) and service quality management (β=.103) affect land authority public servant's sense of work support.

Table 4. Summary of Remuneration Satisfaction Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.382	.211		.000
Senior Mgt. Participation	.299	.272	.289	.000***
Service Quality Mgt.	.198	.121	.102	.328
Service Design Mgt.	.145	.123	.109	.121
Service Process Mgt.	.092	.082	.083	.192
Customer Relationship Mgt.	.309	.322	.291	.020*
Information Computerization	.192	.112	.133	.005**
Education & Training	.212	.192	.213	.000***
R Square		.398		
Adjusted R Square		.352		
F(p)		19.210 (.000***)		

* p <.05, **p < .01, ***p < .001

Table 5. Summary of Superior Satisfaction Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.422	.411		.000
Senior Mgt. Participation	.401	.083	.399	.000***
Service Quality Mgt.	.156	.110	.121	.020**
Service Design Mgt.	.131	.129	.122	.111
Service Process Mgt.	.142	.128	.118	.126
Customer Relationship Mgt.	.124	.139	.126	.062
Information Computerization	.111	.127	.109	.101
Education & Training	.432	.191	.422	.000***
R Square		.310		
Adjusted R Square		.335		
F(p)		19.727 (.000***)		

**p < .01, ***p < .001

Table 6. Summary of Work Support Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.295	.273		.000
Senior Mgt. Participation	.242	.237	.221	.000***
Service Quality Mgt.	.121	.118	.103	.010**
Service Design Mgt.	.109	.104	.108	.121
Service Process Mgt.	.127	.137	.122	.120
Customer Relationship Mgt.	.201	.207	.198	.013*
Information Computerization	.112	.108	.105	.122
Education & Training	.288	.255	.242	.001**
R Square		.398		
Adjusted R Square		.362		
F(p)		21.312 (.000***)		

* p <.05, **p < .01, ***p < .001

This indicates that the higher level an organization's providing and support of education and training is, and the higher level senior management's participation in TQM is, and the better relationship between an organization and the public is, and the higher level an organization's promotion and establishment of service quality is, public servant's level of satisfaction over various resources needed during the process of work completion and support needed for work completion will therefore be higher.

5. Sense of Colleague Relationship

According to colleague relationship regression analysis result, senior management participation (β=.232), service quality management (β=.229), education and training (β=.242) affect land authority public servant's sense of colleague relationship. This indicates that the higher level senior management's participation in TQM is, and the higher level an organization's promotion and establishment of service quality is, and the higher level an organization's providing and supporting education and training is, public servant's level of satisfaction over getting along with and communication with colleagues working together will therefore be higher.

8. Sense of Promotion Opportunity

According to promotion opportunity regression analysis result, senior management participation (β=.477), education and training (β=.325), service

Table 7. Summary of Colleague Relationship Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.332	.318		.000
Senior Mgt. Participation	.292	.288	.232	.020*
Service Quality Mgt.	.228	.232	.229	.003**
Service Design Mgt.	.092	.113	.098	.128
Service Process Mgt.	.129	.131	.122	.059
Customer Relationship Mgt.	.172	.156	.162	.092
Information Computerization	.142	.162	.158	.102
Education & Training	.288	.247	.225	.000***
R Square		.332		
Adjusted R Square		.303		
F(p)		18.232 (.000***)		

* p <.05, **p < .01, ***p < .001

Table 8. Summary of Promotion Opportunity Regression Analysis

	B	Standard Deviation	β	Significance
Constants	.552	.478		.000
Senior Mgt. Participation	.492	.458	.477	.009**
Service Quality Mgt.	.278	.281	.288	.000***
Service Design Mgt.	.142	.153	.158	.221
Service Process Mgt.	.103	.124	.102	.102
Customer Relationship Mgt.	.199	.204	.188	.042*
Information Computerization	.112	.122	.107	.112
Education & Training	.310	.338	.325	.000***
R Square		.376		
Adjusted R Square		.335		
F(p)		21.107 (.000***)		

* p <.05, **p < .01, ***p < .001

quality management (β=.288) and customer relationship management (β=.188) affect land authority public servant's sense of promotion opportunity. This indicates that t the higher level senior management's participation in TQM is, and

the higher level an organization's providing and supporting education and training is, and the higher level an organization's promotion and establishment of service quality is, and the better relationship between an organization and the public is, the level of public servant's satisfaction over job promotion channel and opportunity will therefore be higher.

Conclusion

Oakland (2011) once mentioned in his research that total quality management is capable of enhancing any organization's competitiveness, efficiency and flexibility through planning, organizing and understanding all activities within an organization, and integrating all members of the organization into management circle. Therefore, total quality management can be a kind of management thinking and practice which comprehensively takes quality control and all members into consideration. In this research, it is observed, through comments from 210 land authority public servants, that total quality management indeed affects employee's job satisfaction. Finding from this research is consistent with the ones in researches conducted by Chang, Chiub and Chen (2010) and Chang, Wang and Yang (2009).

Further exploration of variables with significant influence over job satisfaction indicates that: sense of work achievement is affected by variables of service quality management, education and training, senior management participation and customer relationship management; sense of remuneration satisfaction is affected by variables of customer relationship management, senior management participation, education and training and information computerization; sense of superior satisfaction is affected by variables of education and training, senior management participation and service quality management; sense of work support is affected by variables of education and training, senior management participation, customer relationship management and service quality management; sense of colleague relationship is affected by variables of senior management participation, service quality management and education and training; and promotion opportunity is affected by variables of senior management participation, education and training, service quality management and customer relationship management.

Specifically, one thing worth mentioning is that both senior management participation and education and training are capable of affecting six perspectives

of job satisfaction. This is a vindication of Nwabueze's finding in his research: an organization leader has significant influence over the success or failure of TQM implementation. This is also a vindication of the finding by Lam, Lee, Ooi and Lin (2011): for organizations implementing TQM, education and training can effectively enhance their performances. As for the remaining variables, both service quality management and customer relationship management play a critical role in affecting job satisfaction. This also means that land authority public servants consider that hardware improvement along is slightly insufficient in enhancing employee job satisfaction. To effectively enhance sense of job satisfaction, improvement must be made on fundamental fields of service quality and customer relationship.

Table 9. Summary of TQM and Job Satisfaction Regression Analysis Result

Satisfaction / TQM	Work Achievement	Remuneration Satisfaction	Superior Satisfaction	Work Support	Colleague Relationship	Promotion Opportunity
Senior Mgt. Participation	(β=.299)	(β=.289)	(β=.399)	(β=.221)	(β=.232)	(β=.477)
Service Quality Mgt.	(β=.403)	---	(β=.121)	(β=.103)	(β=.229)	(β=.288)
Service Design Mgt.	---	---	---	---	---	---
Service Process Mgt.	---	---	---	---	---	---
Customer Relationship Mgt.	(β=.182)	(β=.291)	---	(β=.198)	---	(β=.188)
Information Computerization	---	(β=.133)	---	---	---	---
Education & Training	(β=.398)	(β=.213)	(β=.422)	(β=.242)	(β=.242)	(β=.325)

Note: Fields with Beta values are variables with significant influence in this research.

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FORMING VALUES OF PRODUCTIVE BEHAVIORS

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ABSTRACT

Work behaviors which are aimed to the vision and the mission of the company are called productive behaviors (Suhariadi, 2001). There are two types of productive behaviors: efficient behaviors and effective behaviors. Effective-productive behaviors are workers' behaviors toward the attainment of the organization's (company) targets (job effectiveness). Efficient behaviors are workers' behaviors which are oriented to the attempts of maximally using and economizing the resources, infrastructures, media, and company funds in its effort for reaching the targets (Suhariadi, 2002).

This research tried to look for the various types of peoples' work values as the forming bases of the productive behaviors (effective or efficient). Theoretical bases of the work values and also the assessment of the values used Schwartz's theory (2001). There were ten work values as the bases for people to behave and work for yielding the productive behaviors. Suhariadi's Productive Behavioral Measuring Instrument (2002) and Schwartz's Portrait Value Questionnaires (2001) were used to measure and test some basic values which were influencing the productive behaviors. Research samples were purposively chosen, in which 129 employees of The Java-Bali Power Generating Company (PT. PJB), who were following the basic management training in 2004, participated. Multiple regression analysis with the backward method was used to test the influence of the ten values to the efficient and effective productive behaviors.

The analysis results showed that the effective behaviors were formed by benevolent values (β = - .129; p = .083), power values (β = .097; p = .052), and conformity values (β = .175; p = .014), with R^2 = .272 and the stastistic significant score was .022. It means that forming and improving the effective behaviors requires people who have less attempts to make-up prosperity just for their colleagues, highly attempts to reach for the social status, prestige and power of others, and high self-control to prevent from hurting others and also breaking the social norms. Meanwhile forming the efficient behaviors was influenced by universalism values (β = .144; p = .016), achievement values (β = -.092; p = .027), power values (β = .105; p = .014), conformity values (β = .146; p

= .009). These indicate that forming and improving the efficient behaviors requires people who have the power of appreciation, tolerance, and protection for prosperity of the mankind and the universe; less self-centered; the highly attempts for reaching social status, prestige, and power of others; and high self-control to prevent from hurting others and also breaking the social norms.

Introduction

In the middle of long economy crisis, any corporate is demanded to increase its productivity, so right now productivity increasing becomes central issue in any corporate. Corporate could survive when all product and service produced could compete in the market. Productivity is really important for the corporate, so the corporate must decrease all production cost (fix cost and variable cost), such as cost economizing, human resources decreasing, substitution searching, etc. Any production cost decreasing and revenue increasing will be back again to all people in the corporate. Although production cost has been decreased and revenue increasing has been grown up, productivity still could not reach a good result whenever people's behavior in corporate are still unproductive.

Description of the productivity behavior significance has been explained by Suhariadi (2001, 2002). Suhariadi (2004) stated that the most demanding thing in productivity increasing effort is the appearance of productive behavior from the employee. Any manipulation without any productive behavior, absolutely could not give any contribution to the corporate and the employee. Litwin and Stringer in Gibson and friends (1987) declared that the appearance of behavior (productive behavior) influenced by 2 reasons, individu and environment. In other words, behavior is a function of people (P) and situation (S), mathematically $\beta = f(P,S)$. According to Suhariadi (2005), there are 2 productive behavior, effective behavior and efficient behavior. Effective behavior is behavior directing to goal achievement, coordination meeting to achieve the goal, and accuracy problem solving, meanwhile efficient behavior is behavior using minimal cost for the work process, using time accurately, and high inabsence in corporate.

The productive behavior is really important for the corporate, so any influencing factor to it should be fought. Accordance with Litwin and Stringer in Gibson and friends (1987), that behavior is formed by the people and the environment. In people aspect, according to Fishbein, M., and Ajzen, T (2004) consisted of any aspects, those are individual, social, and information factor. Individual factor explained in detail consisted of personality, emotion, intellegency, value, attitude, and experience. Meanwhile social factor consisted of education, age, sex, religion, race, and culture. And information factor consisted of knowledge, media, and intervention.

Accordance with definition above, Fontaine (2004) stated that value is central aspect from self concept that

could become someone behavior determining. Added by Roceach (1969) in Fontaine (2004), values organized in someone's value system functions as standard determining someone's attitude and behavior. Until this definition, could be seen that one of the most important basis determination in someone's behavior (productive behavior in this context) is value. Productive behavior in efficient and effective form will not appear if the value support productive behavior in someone self does not appear. People will not think what the siginificance of corporation's goal is when his mind and thought do not have any organization goal achievement values. People will not think what the significance of energy economizing standard when those people do not have any standard in energy economizing for their own needs and their corporate.

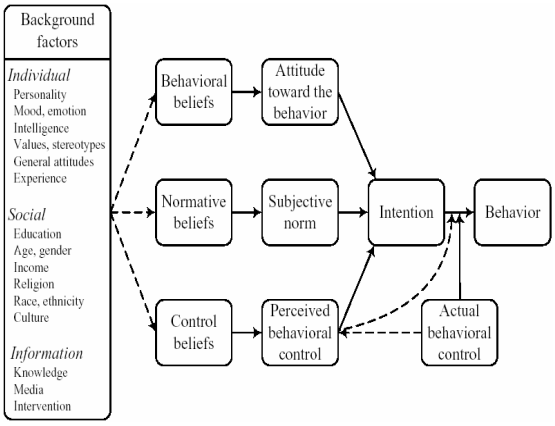
Problem

Based on description above, this research want to answer basic problem about what values are the basis of productive behaviors forming?

Conceptual Framework

Productive Behavior

Repeating Suhariadi research result (2001,2002,2004), this is reexplaination of productive behavior definition. Creating productive behavior for the employee is not an easy job. There are several things should be paid attention. Behavior theory figure, Skinner, declared that individual behavior is shaped through external media, that is reinforcement. Meanwhile necessities figure, A. Maslow declared that someone's behavior forming need an understanding of his individual necessities. An interactive theory describing behavior is Fishbein and Ajzen model. The model is:



Picture 1. Factors influencing behavior
Source: Fishbein, M., and Ajzen, T (2004)

Based on picture above, to form and change someone's behavior, firstly individual believing about productivity significance to himself and his corporation should be plant. If believing of productivity significance has been shaped, any positive attitude to productivity will appear directly. This positive attitude will motivate willingness to behave productively. This intention will cause productive behavior in the self of the employee.

Can be concluded that organization productivity increasing has to be done through all member in organization, cause they are the generator of organization wheel. The focus is how can increase and appear productive behavior in each person's self. The assumption is they themselves determine the motivation and productive behavior.

Drucker (1991) declared that individual productivity increasing stated in management commitment. While Coates (1988) identified that some productive behavior dimensions in someone's self, those are (a) doing control proportionally, (b) working based on time without pressed by deadline, (c) not dictating any problem to the job process, (d) maintain quality, but not the excellent thing, (e) doing quality rotation, (f) informing management and member development, (g) preparing access to get data and information, (h) perceiving suggestion and recommendation fast.

Westbrook (1993) still considered that someone's productive behavior should base on to "Shewhart's wheel" (Deming Wheel) which behavior continuously are perfected to produce higher productivity by following PDCA *(plan, do, check, and action)* cycle. In other side, there is McNeese-Smith's point of view (1996) declared that employee's productive behavior (sample of the research is hospital's employee) could be measured through productive behavior dimension, behavior reflecting efficient and effective behavior. The characteristic of productive behavior measurement is only self-measurement investigating employee's behavior in achieving organization's goal, behavior in seeing the cost using, taking action from a good meeting, finishing the job on time, accurate, low absence, and not having preference of high employee changing.

Based on all models above, productive behavior measurement in this research refer 2 behavior models, effective behavior that focuses on organization goal achievement and efficient behavior that focuses on efficiency in achieving the goal. Based on those 2 factors and with observing productive behavior in the work field through any appear dimension in daily work, measurement instrument for productive behavior variable will be made. Dimension seen reflect that effective productive behavior is behavior directing to goal achievement, doing coordination meeting to achieve the goal, and problem solving accuracy. And dimension to see efficient productive behavior is behavior using minimal cost in work process, using working hour efficiently, low absence in corporate.

Values

Schwartz defined value as someone's basic conception in choosing behavior, appraising other and facing the fact, explaining, then justifying and evaluating behavior. Value as the goal or criteria for any situation, is based on the significance of those values as life principle. Value also represents how an abstract idea in a society used together, implicitly or explicitly, about what good and right thing would be reached (Schwartz et al, 2001).

From this characteristic, value could be defined as someone's cognitive-emotion representation about three basic type of human life universally and biologically. Those three types include (a) human necessities as organism, (b) social interaction demand for people coordination, (c) social institution demand for togetherness wealth. So, value could overlap individual and collective interest (Schwartz: 2001). Value could be meant as someone's standard in

choosing and evaluating behavior, event, and people. Value is offered as an important thing in interpersonal relations. Values group shapes value priority system. Culture and individu could characterized by this value priority system, so the definition of value could be differed in 2 analysis unit levels, individual and cultural (Smith and Schwartz, 1997). Analysis unit differences of value demands any differences in instrument forming used in value measurement.

First is value in culture analysis unit. In this context, culture represents how an abstract idea in a society used together, implicitly or explicitly, about what good and right thing would be reached. This culture value is basic for specific norm informing to individu about appropriate behavior in any situation (Schwartz et.all, 2001). Value in analysis level culturally used to characterize certain culture, something seen is abstract idea about something good, right, and acceptable in certain society (William, 1968 in Smith and Schwartz, 1997). Hofstede, 1980 (in Danadjaya, 1986) stated that human has relative stable mental program. These mental programs influence the thinking way and other's behavior. This program is shaped since the human born, came from physics characteristic and also the environment. Collectively, mental program of a people group in an area will become their culture, where in nation level will become "national culture." This mental program is not a thing could be observed directly by human, cause of his abstract characteristic. But inferentially could be concluded its existence used definition or certain meaning.

Second is value in individu analysis unit. In individual analysis level, value represent motivational goal directing to life principle (Rokeach, 1973; Schwartz & Bilsky,1987,1990 in Smith and Schwartz, 1997). Relations between value differences reflect conflict psychodynamic and individual experience appropriation when use value in his life. Even Rokeach divided value in 2 terms, personal and social value. Personal value centralizes to individu and focuses on intrapersonal relations, while social value centralizes to community and focuses on interpersonal relations. In personal level, George England defined value and value system as someone's perception framework. In his explaination, value is more likely to an ideology or life philosophy. That approach is not really different with Rokeach, the difference is only on the value instrument arranging. England has assumption that value is really related with someone's behavior. This is just like what Mintzberg said, values, personality, and someone's style together decide his job (Danadjaya, 1986). Just like England, Schwartz arranged a value typology, in detail consisted of 4 value dimensions with 10 value domains contents some motivations. Value domain drawn in a continue line relates intermotivation. This continue line shapes a circle structure locates opposite or compatible differences value types, depended on the nearness between those values (Schwartz, 2001).

Those 4 value dimensions with 10 value domains are:

a. Openness to Change Dimension*:*
    i. Self Direction domain: freedom in thinking and behaving espe-

cially in choosing, creating, and investigating (creativity, independent, freedom, curious, choosing own goals)

ii. Stimulation domain: spirit, new happiness, and life challenge (exciting, life, daring, a varied life)

iii. Hedonism domain: happiness and hedonism in someone's life (pleasure, enjoying life)

b. Conservation Dimension:

i. Security domain: safety, harmony, and social stability in social and individual relations (family security, social order, healthy, national security, clean, reciprocation of favors)

ii. Conformity domain: self controlling to the willingness and motivation to hurt others and break the social norms (obedient, politeness, self-dicipline, honoring parents and elders)

iii. Tradition domain: respectfull, commitment, and someone's acceptance to cultural and religious values (respect for tradition, humble, moderate, devout, accepting my portion in life)

c. Self Enhancement Dimension:

i. Achievement domain: personal successful got through his competence based on social standard (successful, social recognition, capable, ambitious, influential)

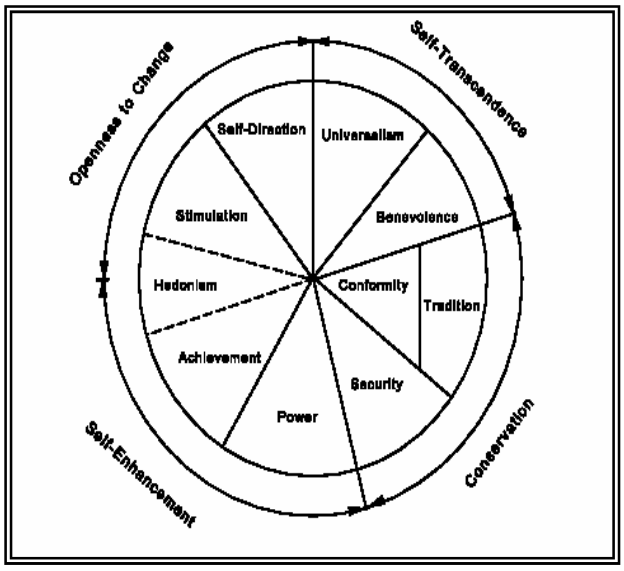
ii. Power domain: someone's efforts to achieve social status, grade, and authority to others (social power, authority, wealth, preserving my public image)

d. Self Transcendent Dimension*:*

i. Benevolence domain: maintenance and increasing the prosperity of the society, one of it through social contact (helpful, loyal, responsible, honest, forgiving)

ii. Universalism domain: meaning, understanding, awarding, tolerance, and protecting for human and nature wealth (equality, a world at peace, social justice, wisdom, protecting the environment, unity with nature, broadminded) (Schwartz & Bardi, 2001:270).

To be more clear, this is the picture of the 4 dimensions and 10 domains of Schwartz :



Picture 2. Schwartz Value Dimension Structure

Picture above draws a structure in circle shape consisted of 4 main dimensions. Those 4 main dimensions shape 2 bipolar poles, where each two dimensions located opposite pole, but com-

patible with different dimension from another pole. *Openness to change* dimension is opposite with concervation dimension, but compatible with the dimension surrounding it. And the other dimension, self-enhancement dimension is opposite with self-transcendence dimension, but compatible with dimensions surrounding it.

Openness to change value emphasizes on the freedom of thinking and behaving, and also new happiness in facing challenge. Individu orients to this value prefer liking creative and innovative attitude in creating or investigating something (have a high spirit). Otherwise, individu orients to concervation value emphasizes on stable relations (status quo), in interpersonal relations or with the corporate he work. That individu also like social order, and has a high commitment in his cultural and religious values (http://enlinea.itam.mx/WPZ/inclusion /upload1/download.asp).

Self-enhancement value emphasize on ambition to get the private happiness, although have to sacrifice other's interest. Individu orients to this value, craves a successful and wonderful life. That individu wants to control and dominate others ot things surrounding him, he is ambitious and wants to get confession of his successful. In other side, individu orients to self-transcendence value emphasizes on the increasing of together wealth, helpful and care to others. Individu orients to this value have high value in social justice, equality, responsibility, and loyality.

The differences in this value analysis levels, concluded by Schwartz and Smith (1997) that there are 2 differences should be noted. First, dimension forming the background of the value priority on those 2 levels are not the same. Second, choices to use one of the analysis level have to use this question: if want to know the relations of individu differences in making value priority to look for variance atribut on other individu, individual level dimension is used, although that study involve people from difference culture. Then, if want to see the relations between difference culture in applying value to look for variance in different culture in different variable, cultural value level is used, although individual behavior is usually used.

Research Method

This research tries to look for any work values as behavior forming basis (effective or efficient), through value influence examination to productive behavior. Values measurement uses theoretical basis from Schwartz's thought (2004) about 10 work values, Self Direction, Stimulation, Hedonism, Security, Conformity, Tradition, Achievement, Power, Benevolence, Universalism. Those 10 work values as stand on basis for anyone to behave included to work until produce productive behavior. This instrument usually called Portrait Values Questionnaire (PVQ) from Schwartz (2001). While productive behavior measurement use Fendy's thought (2002) stated that there are 2 productive behavior forms, effective behavior and efficient behavior. So, there are 2 dependent variable in this research, effective behavior and efficient behavior.

The sample is decided purposively, that is 129 employees of PT Pembangkit Jawa Bali who were following basic management training in the year of 2014. Double regression analysis with backward method is used to examine the impact of 10 values to effective and efficient productive behavior. Backward method is used to get a match model to the independent variables, those are the impact of 10 values to productive behavior. All measurement use software SPSS version 11.

Research Result

Based on statistical measurement could be explained something below:

1. Quantitative Description

Statistical calculation is started with quantitative explaination about variables measured with mean and standard deviation. Generally, the result is drawn on the table below:

Table 1. Mean and Deviation Standard (DS) from 12 Variables

No	Variable	Mean	DS	No	Variable	Mean	DS
1	Effective Behavior	30.1	4.89	7	Conformity	2.194	0.699
2	Efficient Behavior	22.6	3.95	8	Tradition	2.783	0.648
3	Self Direction	2.875	0.800	9	Achievement	3.174	0.923
4	Stimulation	2.959	0.907	10	Power	3.860	0.872
5	Hedonism	2.959	0.907	11	Benevolence	2.341	0.673
6	Security	2.228	0.683	12	Universalism	2.400	0.661

Notes:
1. Productive behavior scale 5 with 11 effective behavior items and 7 efficient behavior items.
2. PVQ uses scale 6 with 40 item version.

To describe the meaning of those productive behavior value above, value standard from Fendy (2005) will be used:

Table 2. Scores and Values

Category	Effective Behavior Score	Efficient Behavior Score	Work Values
Very High	25,31 – 29,00	33,01 – 38,00	5,1 – 6,0
High	21,41 – 25,30	28,01 – 33,00	4,1 – 5,0
Enough	17,61 – 21,40	23,01 – 28,00	3,1 – 4,0
Low	13,81 – 17,60	18,01 – 23,00	2,1 – 3,0
Very Low	10,00 – 13,80	13,00 – 18,00	1,0 – 2,0

Based on the table above, could be concluded that the average respondent have effective behavior, but do not have efficient behavior. Seeing respondence's background that is The Java-Bali Power Generating Company (PT. PJB) employee with position as supervisor below could be stated:

a. Those employees have already comfort to work in stable condition and target achieving. From the beginning work, they have been given corporate load target and they are pressed by the management to work hard in achieving goal decided.
b. Those employees in achieving target much more orients to the target that should be reached with any way, so usually must ignore certain rules directing to the work efficiency.

It is also happened with work values. Could be seen that only achievement and power values state in enough categories, while other values state in low categories. This indicates that The Java-Bali Power Generating Company (PT. PJB) employees only have enough value about personal successful achieved through their competence based on social standard (successful, social recognition, capable, ambitious, influential) and also the values about the significance of someone's effort to achieve social status, grade, and authority to others (social power, authority, wealth, preserving my public image). Those 2 values classify into Self Enhancement dimension.

2. Inferential

After getting an explanation about productive behavior and work value condition, then productive behavior shaping significantly sheped by certain work values is examined. Based on statistical calculation with double regression analysis with backward method could be seen that significantly productive behaviors (effective and efficient) are influenced by some work values.

Table 3. Double Regression Examination

No	Dependent Variable	R	R^2	F	Significance
1	Effective Behavior	0,351	0,123	3,335	0,022
2	Efficient Behavior	0,483	0,233	8,467	0,000

Table above indicates that productive behaviors are based on someone's work value, because at the end those values become their behavior standard. Effective productive behavior and efficient productive behavior are based on certain work values. Toward each productive behavior, any work value becomes behavior based on basis could be seen in table 4 and 5 below:

Table 4. Effective Behavior Double Regression Examination

No	Dependent Variable	Beta Un-standard	Significance
1	Constanta	24,717	0,000
2	Benevolent	-1,29	0,083
3	Power	0,097	0,052
4	Conformity	0,175	0,014

Table 5. Efficient Behavior Double Regression Examination

No	Dependent Variable	Beta Un-standard	Significance
1	Constanta	9,138	0,000
2	Universalism	0,144	0,016
3	Achievement	-0,92	0,027
4	Power	0,105	0,014
5	Conformity	0,146	0,009

First, about effective behavior, in fact employee's behavior directing to organization (corporate) goal achievement (work affectivity) significantly based on benevolence (negative), power, and conformity values. In general, that result could be stated that effective behavior could be reached when people pay less attention to individual prosperity to some people known, causes this thing could direct to less objectivity in organization goal achievement. It is also with effective behavior increasing needs the strength of work value directing to someone's high efforts in achieving social status, grade, and authority to others, cause with this way there will be no individual determination anymore. The most important thing is organization goal achievement and not individual or group goal achievement. Beside, that productive behavior could be increased when the people have high work value in self control to the willingness and motivation to hurt others and break the social norms. The organization goal should be the main, but all of these should be reached through corporation's rules without ignoring individual ang group interests.

Second, about efficient behavior, work behavior orients to the effort to exploit resources, structure, infrastructure, and corporate monetary maximally and economizely in goal achieving needs strong work value principle in Universalism, Power, Conformity, and the less strength of Achievement aspects. It indicates that shaping and increasing efficient behavior needed people with a strenghness to the award, tolerance, and

protecting the human and the nature, using corporate resources maximumly and not destroying the nature, so would not disturb human wealth in a long term. All idea about corporate resources exploitation could be happened when people doing it have strong control not to destroy the nature and hurt others. That could be done if social norms and values in society are high respected. Efficient behavior achieving and increasing need people having strong value in the efforts of achieving social status, grade, and authority to others, cause employees assume that efficiency could be done then they stay in social position with grade. Finally, efficiency is happened when people doing it do not give priority to personal successful, so demanded to give priority to group successful than individual successful.

Conclusion and Suggestions

Based on the discovery above, could be concluded that:

1. Employee's behavior increasing directing to organization goal achievement (work affectivity) significantly is based on benevolent (negative), power, and conformity work values.
2. Employee's behavior increasing orienting to the effort of resources, structure, infrastructure, and corporate monetary exploitation maximumly and economizely in achieving goal needs strong work value principle in Universalism, Power, Conformity, and less strong Achievement aspect.

This research is limited in population and sample decided. In the future it might be better to add and wide the sample variance to any private corporate from any various field.

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ORGANIZATIONAL STUDY OF A MAJOR UNIVERSITY: RECOMMENDATIONS FOR CHANGE IN HIGHER EDUCATION

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Abstract

This organizational study evaluates effectiveness and current operations of a major institution of higher education, a large metropolitan university in the United States. We conducted the study applying methods developed by organizational theorists, Drs. Elliott Jaques and W. Edwards Deming. Following the analyses, we developed several system-wide recommendations for organizational change to improve the institution.

Key Words: Organizational Study, Elliott Jaques, W. Edwards Deming, University, Organizational Change, Organizational Theory, Organizational Improvement

Introduction

To determine organizational effectiveness and evaluate current operations within a higher education environment, we performed an analysis using the methods prescribed by Elliott Jaques and W. Edwards Deming, respectively time-spanning and identifying the presence of deadly diseases within two sub-systems (divisions) of the organization (university). These analyses were done independently in one sub-system dedicated to philanthropic revenue generation and alumni relations and the other dedicated to student service.

Both divisions play a key role in the long-term success of the institution. While there are individual differences between the sub-systems in their operations, the Jaques and Deming methodologies revealed critical similarities between them that are indicative of greater challenges for the organization that should be addressed in order to move forward.

Following a discussion of these analyses and their findings, we will include a series of recommendations that the organization could use in order to right itself and move toward a successful future.

Foundational Theories for Analysis

To avoid disturbing the natural state of each sub-system, we did not conduct a formal survey of employees. Instead, we asked questions about project time spans and strategic processes to identify patterns and pitfalls within the current environment.

Elliott Jaques noted that problems within an organization are most commonly the result of the managerial system, rather than personal or group issues (1996, 2002).

He posited that objective measuring instruments and a sound theory of managerial hierarchy are requisite tools to analyze an organization; we have used both of his measures (the size of the role and the measure of the size of the person) in this analysis. By reviewing each individual's assignments with the longest targeted completion times, we are able to assess role complexity. Through observation we are also able to identify an individual's capacity for processing information and solving problems, which projects his or her maximum working capability.

W. Edwards Deming advocated that management transformation is the key to organizational success, having identified seven deadly diseases that stand in the way of this transformation (1992, p. 97). He noted that the systematic and system-wide removal of these diseases would allow space for his principles of management to be put into action.

Ivanov (2011, 2012, 2013, 2014, 2015), Jaques (1996, 2002), Deming (1992, 1992), as well as other scholars describe and depict these organizational paradigms further.

Diagnosis and Findings

In assessing the sub-systems, several key issues emerged. Using the Jaques methodology, the time span analysis was performed. The individual time spans of the two distinct sub-

systems can be seen in Appendix 1 and 2, respectively. We observe mismatches between capabilities and role levels, meaning that some individuals are overwhelmed with work while others could handle significantly more than their current responsibilities.

Likewise, there are several managers and employees who operate at the same level, and this overlap suggests that micromanagement is rampant. The compressed organizational structure is disconcerting and suggests that the organization is limited in its capacity to be successful.

We also diagnosed the organization's challenges through the lens of Deming's deadly diseases. First and foremost, there is no constancy of purpose. The sub-systems do not actively seek out new and innovative approaches that would create jobs for the future, instead of repurposing existing activities. There is an emphasis on short-term planning and profits; the university as a whole is in the midst of a budget crisis, and each division has been told to cut 5% of the total budget for the current fiscal year and for the next five fiscal years.

In the current climate, the subsystems frequently do not plan more than one year out, making it impossible to drive the organization to a higher level. Leadership constantly shifts the strategic priorities rather than honing in on a singular direction and putting tactics in motion to support that.

The sub-systems currently allocate no identifiable resources for long-term planning or innovation. These issues also contribute to management by metrics, as the sub-systems are constantly scrutinized at the bottom line where the only important outcome is the immediate budgetary impact.

Finally, there is a presence of an annual performance management process that is based on ratings, enabling managers to avoid professional development conversations throughout the year and instilling fear in employees around the institution.

Recommendations

As a result of our analysis and diagnosis, we are prepared to offer recommendations for organizational adjustments that would improve the university's systems and in turn their outputs. The majority of our recommendations are applicable university-wide while our analysis has specifically targeted the individual divisions studied. These recommendations are based on the successful implementation of Jaques' and Deming's principles in large, complex organizations.

Units within all divisions of the university should begin projecting goals in longer time spans. As the units strive to identify and accomplish tasks with longer time spans, the opportunity arises for the work in those units to be elevated. With work currently measured in periods of one year or less, the potential for all work is compressed to a low level (one or two). Extension of the goals would at least provide the opportunity for that level to rise.

In situations where the work potential is above the appropriate stratum, goals for individual positions should also be extended beyond one year, which is the time period in which performance is currently measured and

reviewed. In order for the organization's loftier goals to be met, individual work must also be raised to a higher level.

While matters of individual talent and capacity will need to be addressed, lengthier goals would also allow those capable employees to rise to the occasion and move the work forward.

On an individual role basis, the positions will need to be evaluated for restructure. According to our time span analysis, the university's divisions suffer from significant overlap within levels of work. The Jaques model proves that such overlap results in micromanaging and an inhibited level of work. Reassignment of tasks to spread positions across levels would reduce that redundant overlap, allowing individual roles and teams to be more effective. The spread of work will likely trend upward, pushing the outcome of work to a higher level overall, resulting in a more productive organization of work.

These newly defined parameters should be documented for positions university-wide, creating systemic title and pay structures. In order to accomplish long-term growth in the institution's human investment, definitions of performance and opportunities for advancement must be clearly stated.

These opportunity tracks should include requisite accomplishments within current roles and corresponding timelines for advancement consideration. Creation of such a platform is the foundation for building an organizational environment that attracts, utilizes and nurtures talent.

Individual employee capabilities will need to be assessed against the requirements of the new, correctly defined roles. In cases where individuals are either over or under qualified for their positions, adjustments must be made for the organization to have a proper alignment. Based on the match of the individual skill set and availability within the organization, employees can be moved into new positions.

Another option is an organizational investment in specialized training to enhance an employee's readiness for his or her position. In some cases, once large-picture impact is considered, the best option may be for the employee to be matched with a position outside the organization.

Our boldest recommendation is for the institution to restructure performance management, removing the ranking-based evaluations, and instead emphasizing constructive feedback and growth. While our theoretical models prove that this idea would result in a positive transformational change for the institution, we understand that a more practical recommendation should be made to result in immediate action.

Since the organization is not likely to eliminate its current performance review system at this point, we urge the incorporation of regular feedback that does not involve a rating scale into the institution's culture of performance management. A step in the right direction would be development of a culture of feedback that supports employee development and does not allow the annual performance review to take the place of regular conversations throughout the year.

We advise the organization to encourage and prioritize feedback conversations between employees and managers and across shared-team initiatives, and not just within each team's management structure.

The key to a productive feedback cycle that moves the institution forward is management that leads. An excellent organization can rely upon its leadership to accomplish goals, grow and retain talent, and define future progress. As leadership becomes recognized as a crucial part of the organization's success, the institution must invest in management and leadership training for all staff with supervisory responsibility.

Additionally, participation in such managerial training should be available on an optional basis to all staff without formal supervisory responsibility. This training opportunity serves to develop the future leaders of the institution and helps to retain talent. Since management and leadership are such crucial components of the newly improved organizational culture, evaluation of those skills in practice should be included in the feedback conversations of those with supervisory responsibilities.

In addition to general management and leadership skills, the management training should focus on strategic planning that helps higher strata positions develop longer-term goals that span generations (Ivanov, 2011, 2012, 2013, 2014, 2015). Further, coaching and mentorship should be incorporated for those in higher strata roles so they could perform better in management of longer-term initiatives while providing coaching to their direct reports who are working at the day-to-day or shorter-term levels.

While human capital is the most significant asset of any organization, particularly a knowledge-based organization, the other resources of the institution must also be considered. Like goals, the institution's budgets must be managed in longer time spans.

The effect is similar – the strategic planning of the organization can be elevated to incorporate greater constancy of purpose (Deming, 1986) with matching revenue, spending and debt projections. An appropriate adjustment is a sub-system currently managing one-year budgets to move to a five-year budget model.

Conclusion

After a thorough analysis of this university through the lens of general management theories of Elliott Jaques and W. Edwards Deming, we have identified many opportunities for sub-system and system-wide improvement. By investing in strategic planning, employee development, managerial training, and collaborative mentorship, this organization could drastically improve its chances of long-term survival and success.

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Appendix 1

Time Span – Sub-system 1

Appendix 2

Time Span – Sub-system 2

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THE RELATIONSHIP BETWEEN CONSTRUCTION SUPERVISOR AND PCM IN TAIWAN

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Abstract

This study explains the procurement of construction projects for private and public in Taiwan firstly. And introduce the sharing roles and responsibilities of project stakeholders for project delivery methods in Taiwan. Especially, a complicate project delivery system of PCM (Professional Construction Management), defined by Government Procurement Act of Taiwan is used to illustrate the relationship between supervisor and PCM. This project delivery method that combines pure CM and Design-Build is widely used for large engineering projects and clients who have little experience of construction projects. The framework of management in execution level is examined completely in case study. Finally, the merits and deficiencies of this system will be discussed in conclusion for the reference to improvement of other systems.

Keywords: Construction Projects, Construction Management

Introduction

Motive and Background of the Study

This study explains the procurement of construction projects for private and public in Taiwan firstly. And introduce the sharing roles and responsibilities of project stakeholders for project delivery methods in Taiwan. Especially,

a complicate project delivery system of PCM (Professional Construction Management), defined by Government Procurement Act of Taiwan is used to illustrate the relationship between supervisor and PCM. This project delivery method that combines pure CM and Design-Build is widely used for large engineering projects and clients who have little experience of construction projects. The framework of management in execution level is examined completely in case study. Finally, the merits and deficiencies of this system will be discussed in conclusion for the reference to improvement of other systems.

Basically, in public procurement, there are three ways to issue the bid.
1) Open tendering procedures: the procedures under which a public notice is given to invite all interested suppliers to submit their tenders.
2) Selective tendering procedures: the procedures under which a public notice is given to invite all interested suppliers to submit their qualification documents for pre-qualification evaluation basing upon specific qualification requirements and, after such evaluation, the qualified suppliers are invited to tender.
3) Limited tendering procedures: the procedures under which, where no public notice is given, two or more suppliers are invited to compete or only one supplier is invited for tendering.

And, there is little different to select the contractor in Public Procurement and Private Procurement.

The principles of awarding contract in Public Procurement are as below.
1) The Lowest Bid with government estimate: the lowest tender within the government estimate.
2) The Lowest Bid without government estimate: the lowest tender within the budget amount.
3) The most advantageous tender: may or may not consider tendering price when evaluating, tenders are allowed to submit tenders for construction work, property, and services with different qualities.
4) Multiple awards: awarded to different renderers by different items or different quantities

The lowest bid is the major type of awarding contract. Normally there is only one type of awarding contract in Private Procurement. The tendering procedure is invitation bid in generally, and principle of awarding contract is the most advantageous tender for client.

Sharing roles and responsibility in private project

The relationship of stakeholders of project as shown in Figure 1, and the major duties of stakeholders are as below. (Note: see all figures at the end of this article.)
1) The major duties of owner are budgeting for project (Needs analysis/Project planning), selection of suppliers (A/E, PCM, Contractor), execution of contract (Supervision/Inspection) and payment to suppliers. But owner must follow related Legal Systems to do his duties. Basically, owner is encouraged to hire PCM to provide technical/professional assistance, when he is lack of professional manpower/expertise, or he wants to downsizing of organizational structure.

2) The major duties of A/E are to provide professional services that are including planning, design, supervision, inspection, etc., and to follow professional codes and regulations.
3) The major duties of contractor are collection of construction resources that are including skilled teams, materials, equipment, etc., and management to complete construction works. Basically, contractor must follow design specs/drawings and various regulations to do his duties.
4) The major duty of PCM is to as the representative of owner to supervise/monitor/coordinate A/E and contractors to do their duties in the right time.

The relationship of stakeholders in PCM delivery project is to be used in largest building project of Taiwan. As shown in Figure 2, the similar concept is shown in the project organization of Taipei Financial Center (Taipei 101).

Sharing roles and responsibility in public project

The major construction companies in Taiwan include: architect firm, professional engineer (PE) firm, engineering consultant company, construction company (contractor), PCM firm, and developer company, as listed in Figure 3. An architect firm shall have at least one registered architect. Several architects can jointly run an associate architect firm. If necessary, an architect firm can hire in-house professional engineers for conducting specified technical works such as structural engineering works. Otherwise, the structural engineering works have to subcontract to other PE firm or engineering consultant company. PE firm shall have at least one registered professional engineer, while engineering consultant company shall have many registered professional engineers with different professional expertise so that the engineering consultant company can provide services that are matched with the expertise areas of the professional engineers. PCM firm shall hire engineering professionals who have same qualifications as that required for architects or registered professional engineers.

Construction company (contractor) shall have at least one registered professional engineer in the areas of civil engineering, structural engineering, hydraulic engineering, survey engineering, geotechnical engineering, environmental engineering, or architect. In order to operate its business, a constructor company has to hire registered professional engineer who has practical experiences of more than 2 years. At construction sites, constructor companies must hire a chief site manager, who has related engineering background and taken a training course designed by CPA, is responsible for all the activities. Quality control engineer is also required at the construction sites to make sure the desired quality is fulfilled. The registered professional engineer of a constructor company is primarily responsible for the issues of technical and safety at the sites. All the professional engineers at the sites must follow the process requested by government conduct tests on materials specified in construction codes, and fill out necessary documents for recording construction details. The main professional service is interface management,

including the interfaces of cost, schedule, quality, etc. The main technical services may have building, civil work, mechanic, electric, pluming, elevator, lighting, security, landscape, Eco. Certification, etc.

For example the quality management in PCM delivery method is implementation of 3-level quality control systems aims at upgrading the public construction quality. Effective quality control system should be established for motivating, remedying, preventing the defects of the construction company's (contractor's) quality control. Three levels of public project quality control systems are established to enhance public construction quality control. The content of the establishment are all parties respectively as the authority, the client supervision party, PCM, architect inspection and JV team (design architect, construction company, and MEP construction company). Their construction quality controls are as shown in the Figure 4. The construction quality of public projects must be independently completed and guaranteed by the JV team, i.e., the JV team itself must be capable of processing the quality control system through self inspection, quality assurance, quality directing and quality audit. The target of contractual construction quality shall be completed under such a system.

For confirming the execution result of the construction quality management, the construction authority should apply construction quality evaluation through a very objective manner. The construction quality's degree of good or bad should be determined according to the appropriate quality evaluation standards. The result of the evaluation can be applied as basis for evaluating the authority and it also can be used as reference for improving the contractor's quality control operation and selection of excellent bidder. Moreover, by convincing the client (or supervisory party) and contractor's substantial practice of quality control, it is intended to achieve the target of upgrading construction quality. Project inspection operation should be established with "Construction Evaluation Team's Operation Regulations". The regulations were established in accordance with the Government's Procurement Laws Clause 70, Sub-clause 4 and "Project construction evaluation team" should be stipulated according the laws. In their evaluation, the said team should process in compliance with the construction quality control system announced by the Public Construction Commission, Executive Yuan, relevant laws & regulations and the requirement of the contract conditions. Further, by referring to the construction evaluation operation reference standards in their evaluation on the items such as construction quality and progress etc.

The major evaluating items to be performed by the Evaluation Team are as follows:

1) Quality directing mechanism of the authority, the record of the reviewed supervision plan, construction progress management measures, handling of construction defect and the defect improvement tracing.

2) Supervision organization of the supervisory party, the review procedure of construction plan & quality plan, the evaluation procedures and standards of material/equipment random inspection

and construction evaluation, quality audit, document record management system etc from the supervision plan content and executed condition; the executed condition of defect remedy tracing and construction progress supervision etc.

3) Contractor's quality control organization, construction outlines, quality control standard, material & construction inspection procedure, self inspection checklist, control of unqualified product or work, remedy & prevention measures, internal quality audit, document record management system etc. in the quality plan content and execution condition; the execution condition of construction progress management, catch up plan, safety/hygiene & environmental protection measures etc.

4) Construction planning & designing, ecological environmental protection, material & equipment, significant defects of drawings & specifications, necessity of design change, whether the architect, contractor's professional engineer and quality control personnel perform their obligations in compliance with relevant laws & regulations and contractual requirement etc.

Case study

The case study is a culture center of public project, and the budget is about 2 billion NTD. The contractor include three construction companies and one MEP company should complete geotechnical, structure (SRC), finish for exterior wall and interior partition, mechanical/electrical/pluming, and facilities of site landscape. The main project participations, shown as figure 5, are client, PCM, supervisor and contractor. As shown in Figure 3, this delivery method has very complicate relationship for all participations. But the major roles in the framework of management are PCM and supervisor. Because the PCM involves in the project on very early stage, and settles the management system for project executed through the project. The framework of management is also developed by this management system. The supervisor plays as the role of inspection architect, whose rights and obligation are stipulated by Building Code and Architect Law, but not by Government Procurement Law. The conflicts of these regulation systems also make the defects of sharing roles and responsibilities of this delivery system. The framework of management for planning phase is shown in Figure 6, and for detail design phase is shown in is shown in Figure 7. Figure 8 to 13 are shown the construction phase for quality, schedule, interface, working item, inspection and improvement.

The main responsibility of PCM

The main responsibilities of PCM in case study, shown as figure 14, are to get the charter from client, to settle the management system for project, to assist the client selecting contractor, to manage the construction of contractor, and to coordinate the building handover. From the view of time series, PCM should settle management system for project to review design drawings, specification & budget, inspection plan of supervisor, approval flow of material & equipment, etc. And coordinate with client to make the decision whether issue the contract or not. In contract stage, PCM should review the proposals from contractors,

and decide which contractor is proper to client, then coordinate with client to sign the contract. A lot of activities like supervision, approval, execution and review will be processed concurrently to reach the objectives of project. Which objectives are concerning with cost, schedule, quality, and safety. The most important responsibility of PCM in construction stage is to coordinate designer and contractor to produce the completion drawings, then to get the usage permit. Finally, in handover stage, PCM should coordinate other participations to handover the project and complete records for client.

The main responsibilities of inspection architect

The main responsibilities of supervisor in case study as shown in Figure 8.

1) Providing inspection plan and bid document to explain quality assurance and information to estimation for contractors. And client can issue the bid and sign the contract in order to commence construction project and inspect construction activity.
2) Setting up the regular meetings which explain the details of project in order to build mechanism of project control through Q&A of specification and drawings, and coordination of interfaces among the contractors or subcontractors. In the same time, reviewing the construction method, construction plan, quality management plan, etc.
3) Structuring the document review system with other project participations on the principles of review then inspection, efficient and effective.
4) Making the conscience with client, PCM, user, contractor and inspector to realize the work standards for contractor, subcontractors, suppliers, specialists. And expedite the materials and equipment can be inspected then used in the job site.
5) Drawing out the major working items to discuss the construction method for the details of construction processes & checkpoints, quantified management for quality control and tracing & control base on concurrent management.
6) Inspecting the deficiency of activities and recoding on construction & inspection reports to require improvement.
7) Collecting the record document and rechecking the site condition to assist the client survey the real quantity of working items then asking client to sign the payment.
8) Constructing the working flow of change order to deal with conflicts between client and contractor rationally, completely and effectively. And making effort to tell the clear story of whole project for every party, in order to make the completion inspection smoothly.
9) Assisting the client to accept the project according to the specification and drawing, and handover to settle the account and make sure this project can be operated immediately.

Conclusion

As described before, the PCM project delivery method is widely used large engineering projects and clients who have little experience of construction projects. But the complicate and huge relationship of project participations and conflicts of professional law and Government Procurement Act make

the confusion and ambiguous of sharing roles and responsibilities in this project delivery method. And this paper may mark some conclusions as below.
1) The combination of pure CM and Design-Build defined by Government Procurement Act of Taiwan.
2) The major responsibility of PCM is to make sure every stakeholder of project is doing the right thing in the right time. But, actually these right things are already stipulated in the building codes and regulations which forgotten by stakeholders who should take the responsibilities.
3) But, extending the management process of project and increasing the interfaces of roles/responsibilities of project participations.
4) PCM may positively take over the role of inspection & supervision, but on the contrary, PCM may reluctant to take the responsibilities because the role conflicts with architects.
5) No one can promise PCM may make the project have a perfect ending, but a good performance of PCM may make the details of project processes to be visible.

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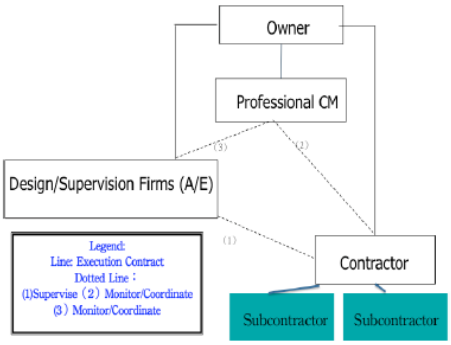

Figure 1. The relationship of stakeholders of project

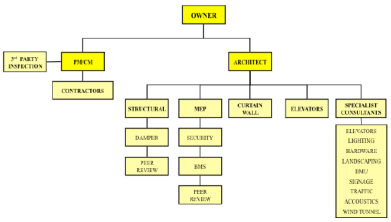

Figure 2. Project organization of Taipei Financial Center (Taipei 101)

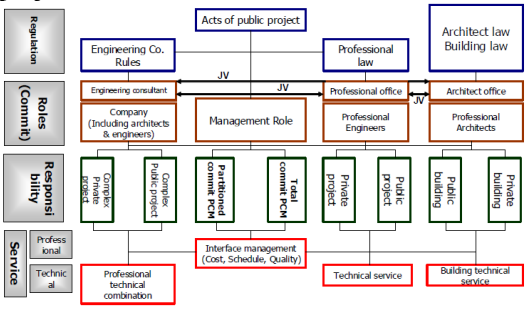

Figure 3. Sharing roles and responsibility in PCM

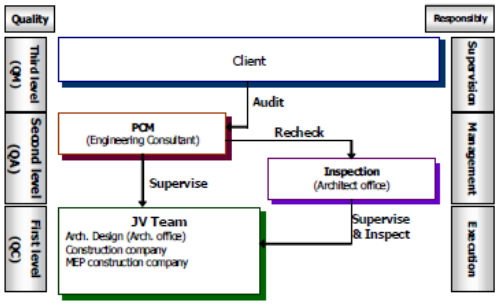

Figure 4. Quality management in PCM

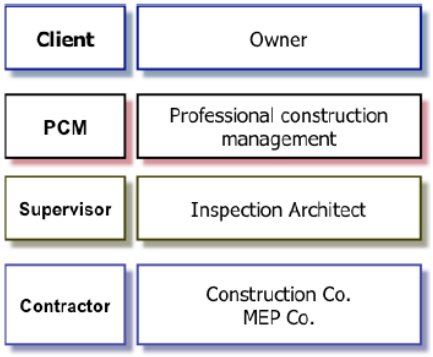

Figure 5. Introduction of case study

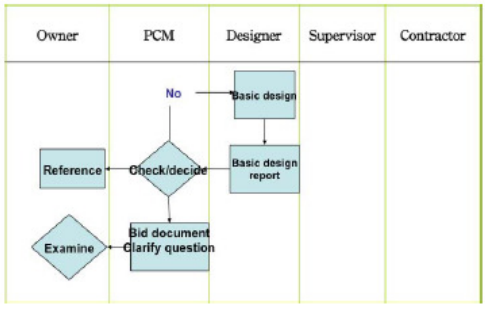

Figure 6. The planning phase

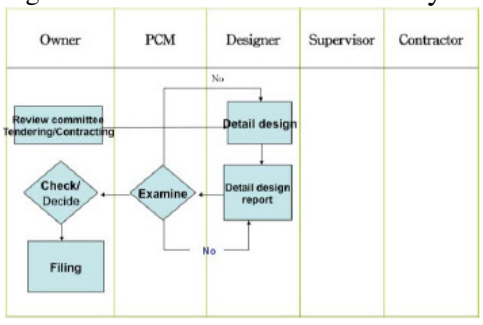

Figure 7. The detail design phase

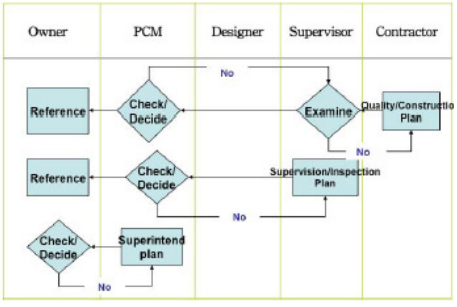

Figure 8. The construction phase for quality

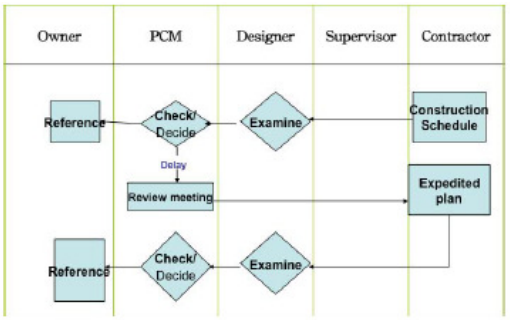

Figure 9. The construction phase for schedule

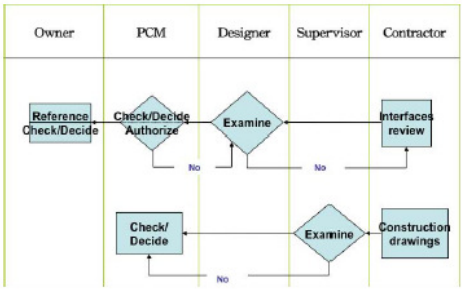

Figure 10. The construction phase for interfaces

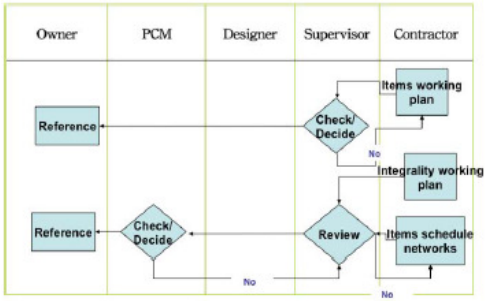

Figure 11. The construction phase for working items

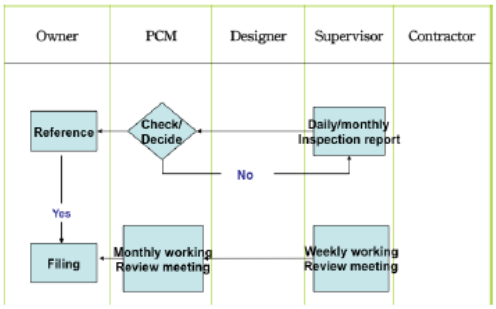

Figure 12. The construction phase for inspection

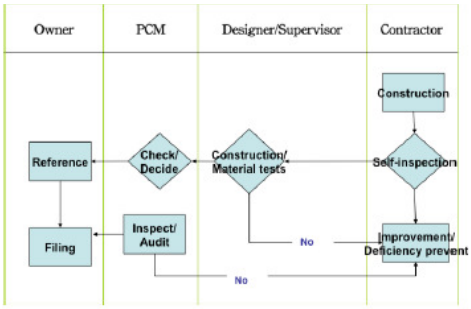

Figure 13. The construction phase for improvement

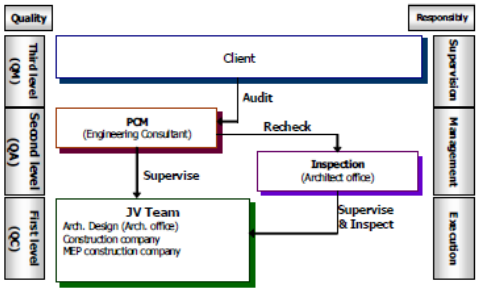

Figure 4. Quality management in PCM

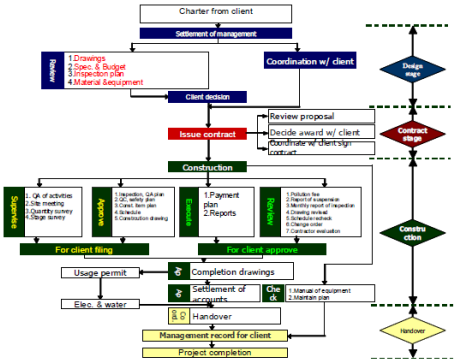

Figure 14. The main responsibilities of PCM

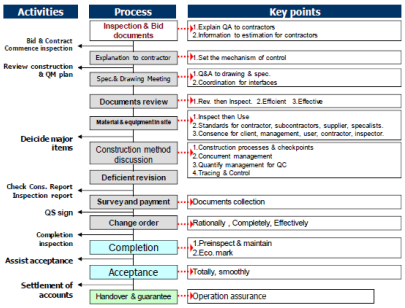

Figure 15. The main responsibilities of inspection architect

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EARNED VALUE MANAGEMENT VIEWS ON IMPROVING PERFORMANCE OF ENGINEERING PROJECT MANAGEMENT

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Abstract

The three most important objectives of project management (PM) are schedule, performance (quality), and cost. The success of a project involves nine major factors, including cost, schedule, quality, and risk, and requires project coordinators to be fully prepared in terms of management and monitoring to achieve PM goals. General PM focuses on the planning of schedules and control of progress, overlooking aspects such as cost and quality. Earned value management (EVM) includes cost control and considers resources planning and management techniques for schedule and technical performance. The present study incorporated EVM into engineering PM practices. In addition, indices such as budgeted cost of work scheduled, budget cost of work performed, and actual cost of work performed, as well as the correlation between the schedule performance index and cost

performance index were used to analyze the performance of EVM application in the PM of an engineering project.

Keywords: Earned value management, project management, engineering project

Introduction

Project management (PM) consists of a broad range of applications, such as resolving various construction and plant establishment issues in construction engineering, heavy machinery engineering, technology industries, cultural and creative industries, and weapons development for national defense. Apace with advancements in information and technology, enterprises are faced with increasingly complex environments, integrated development of technologies, and greater volumes of cross-function, cross- organization tasks, all of which highlight the importance of PM.

Heavy machinery engineering projects are typical representations of project engineering. Product manufacturing or technical services provided, construction conditions, indoor or outdoor environments, site installation, and environmental factors, such as weather and topography, differ depending on client requirements.

Currently, PM is largely employed to control progress, cost, quality, and safety. Although some project managers adopt relatively scientific PM techniques, such as Gantt chart, critical path method, and program evaluation and review when handling their projects, some other project managers tend to learn experience from practice and formulate impromptu strategies when encountering problems. This typically delays response time to prob lems, resulting in deferred progress or increased cost.

At present, small and medium engineering companies in Taiwan typically use Gantt charts, flow process charts, and milestone charts as the control methods for PM, whereas larger, more established companies may include the program evaluation and review technique and critical path method to facilitate planning and control. However, the aforementioned management tools mainly focus on schedule control, and are unable to display the interdependency between cost and schedule. They often create discrepancies between cost and schedule and overlook key improvement or remedial opportunities, increasing unnecessary cost or incurring loss to the entire project. In this context, the application of the theory of earned value management (EVM) can facilitate project directors or executives in optimizing cost and schedule control.

EVM consists of two key indices, namely, the cost performance index (CPI) and the schedule performance index (SPI). These indices are used to evaluate the realistic progress and status of projects and discrepancies between expenditures and approved cost budgets. The purpose and contribution of the present study is to use the theory of EVM in PM to analyze the cumulative experiences and process outcomes of engineering projects completed in roughly a decade, and internalize and integrate the results to create a feasi-

ble and truly practical management model. In future, EVM can be used to analyze relevant parameters when undergoing PM procedures, detect problems early, and propose solutions to these problems, thereby facilitating project directors or managers in formulating the optimal decision management model and increasing the success rate of projects.

Literature Review

Lewis (2002) defined projects as one-time jobs that contain objectives of performance, time, cost, and scope. Rakos (1990) described projects as the delivery of temporary work items or products. Wysocki, Beck, and Crane (1995) defined projects as the performance of a series of tasks or activities and the effective utilization of resources or labor to achieve a specific goal. The researchers also indicated that projects must clearly disclose activity content and objective, scope, schedule deadlines, and cost budgets. Kerzner (2013) maintained that project activities consist of specific start and finish dates, and use a specific amount of budgets and resources to complete tasks with clear goals. Berkun (2005) indicated that the core mission of projects is to combine individual tasks into a single, unified conglomerate, which is useful to people or customers. These activities contain clear start times and approved costs, and are often assigned to temporarily established organizations for completion.

EVM is an integrated PM system. It combines various management performance indices (scope, schedule, and cost) to provide clients and contractors an integrated method for monitoring the execution and measuring the performance of projects. EVM compares the workload of a project and expenditure to forecast whether cost and schedule performance are progressing according to project objectives.

The origin of EVM dates back to the formulation of PERT/COST by the US Navy in 1960. This technique was created to improve the cost management of the Polaris Projects. Subsequently, the US Air force employed EVM based on PERT/COST in its volunteer projects in 1963. Later, the US Air force announced he Air Force Cost/Schedule Planning and Control Specification (C/SPEC) in 1966, which was developed based on the cumulative PERT/COST experience gained by the US Navy and Air force. The US Defense Contract Management Agency published the *EVMS Manual* in August 2000, which contained extremely robust EVMS auditing procedures. Kim and Ballard (2002) proposed a study confirming that EVM is an advanced PM technique that can integrate schedule and cost. Fleming and Koppelman (2000) argued that since 1997, the US Department of Defense has employed EVM in over 800 projects, verifying the practicality of EVM.

Kim et al. (2003) conducted empirical research on specific PM personnel, and found that 82% of the subjects accepted earned value analysis (EVA) as a form of PM. EVA is not only suitable for complex projects, but can also be used in different types of projects and organizations. Cioffi (2005) proposed an S-curve to analyze project progress and cost that can be defined using two basic parameter values. Curves with favorable goodness-of-fit can then be incorporated into EVM. Vintner et al. (2006) evaluated the per-

formances of multiple projects by using Data Envelopment Analysis coupled with an EVM system and a multi-denominational control system. This novel approach minimized input and output volume while producing more accurate evaluation results. Vandevoorde and Vanhoucke (2006) developed two earned schedule performance index (SPI), SV(t) and SPI(t), to use alongside conventional earned value indices, which enabled the researchers to forecast the overall work duration of projects. In addition, the researchers compared their approach with three previous EV forecasting methods. Stratton (2006) adopted Earned Schedule Analysis to estimate project completion date. The researcher converted SPI into SPI(t). Noori et al. (2008) controlled the fuzzy semantic variance of EV performance indices by creating fuzzy control charts. The researchers used this approach to analyze real-time multi-period, multi-product cases.

The key constituents of EVM include three base values, budgeted cost of work scheduled (BCWS), budgeted cost of work performed (BCWP), and actual cost of work performed (ACWP), and numerous secondary values, namely, budget at completion (BAC), estimate at completion (EAC), estimate to complete (ETC), schedule variance (SV), cost variance (CV), variance at completion (VAC), SPI, and CPI. These secondary values are employed in accordance with the attribute class of PM, as illustrated in Figure 1.

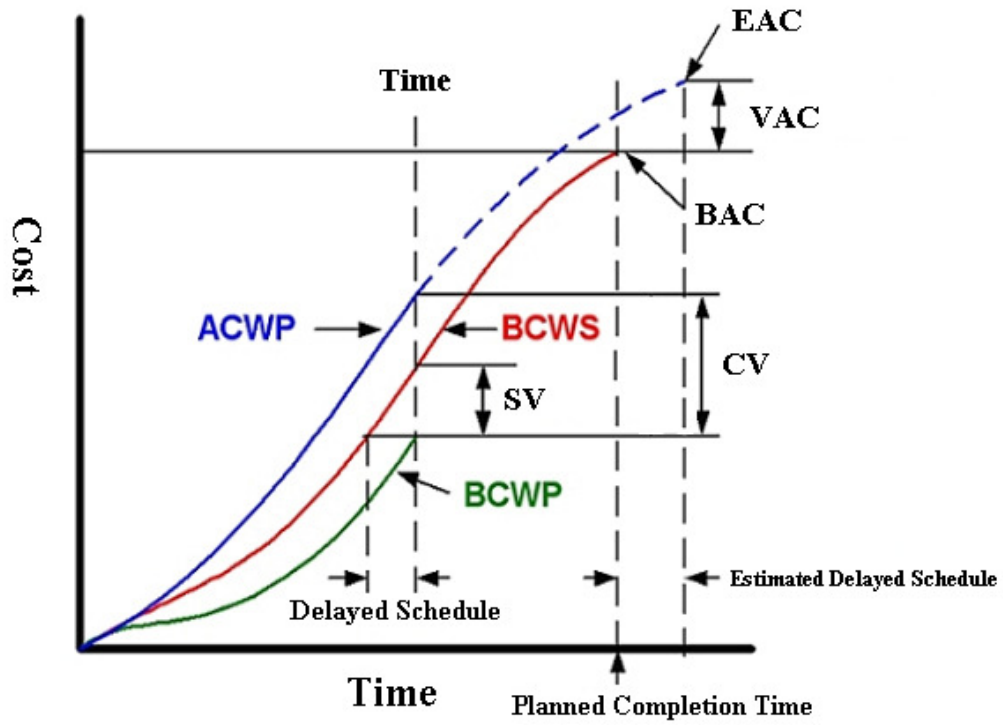


Figure 1. EVM Chart (Source: Chou, 2003)

The performance evaluation indices are as follows:

Percent Complete

PC represents the percentage of the work complete (based on BAC). That is, PC is the overall completion percentage of the project on a specific date.

Cost Performance Index

CPI displays budget efficiency. It is used to evaluate the overall cost performance of the project. A CPI value greater than 1 denotes that the output value of the task is higher than the cost, signifying favorable cost performance. By contrast, a CPI value less than 1 denotes unfavorable cost performance.

Schedule Performance Index

SPI displays the execution efficiency of a task. An SPI value greater than 1 denotes that the task has achieved expected output in the predetermined amount of time, signifying favorable execution efficiency. By contrast, an SPI value less than 1 denotes unfavorable performance.

To Complete Performance Index

TCPI refers to the ratio between unfinished tasks and remaining budget. This index displays the required performance to complete unfinished tasks. A value greater than CPI represents that without changing work methods, the completion of a project to the expected quality or within the budget would be difficult.

Estimate At Completion

EAC refers to the actual cost on completion calculated using the data and performance of the previous period at the end of each inspection control period. EAC is calculated by adding the accumulated project cost with the remaining estimated cost at completion.

Schedule Variance

SV refers to the difference between estimated progress and actual progress. A positive value denotes that the project is ahead of schedule, while a negative value denotes that the project is behind schedule.

Cost Variance

CV refers to the difference between actual budget and estimated cost. A positive value denotes that the project is operating at a surplus, yielding high cost performance, whereas a negative value denotes that the project is operating at a deficit.

Variance At Completion

VAC refers to the difference between the estimated cost at completion and approved budget at the completion of the project. This index enables project coordinators to understand the status of the project after each periodic review. It also helps coordinators estimate the deviation ratio between cost at completion and approved budget to determine whether execution efficiency can be improved.

Methodology

The present case study analyzed the engineering project of a heavy machinery company. The analysis procedures are as follows:

- Planning the execution of the project execution (importing the case):

  Define EVM procedures.

  Define scope of engineering PM.

Expanding the work breakdown structure (WBS)

The WBS clearly shows the range of work content properties. It is a guide map for analyzing the progress and execution efficiency of projects. The WBS is irregularly decomposed into a tree shaped structure based on different project attributes. Its expansion is primarily governed by the level of control or range of understanding of the project.

A more extensive understanding of the details of the project increases the safety of its execution.

- Establishing the project organization breakdown structure (OBS)

  This procedure establishes the responsibilities of every member of the project organization team. One or several tasks are assigned to each member of the team based on their specialization.
- Integrating WBS and OBS to create the project responsibility assignment matrix
- Calculating each work package classified in the project WBS

  The weight percentages of various projects tasks are calculated and the results are divided into percentages of overall cost. A project schedule is then formulated using the start schedules of each work package. During the execution of the project, coordinators regularly inspect audit, review, and report EVM efficiency of the project on a weekly or monthly basis.
- Calculating contract cost

  The cost breakdown structure is expanded to calculate the reasonable costs of each work package and create a cost budget table. This table can serve as a comparison when paying work expenses.
- Reviewing the consolidated baseline of the project

  When a contracted job is completed, a consolidated baseline review is conducted on the execution logs. The consolidated baseline is a performance index that combines schedule, performance (quality), cost, and risk. This baseline highlights work performance trajectories of time and cost. It is an effective management tool in EVM.
- Calculating EV and AC

  Actual earnings and actual cost are calculated periodically (weekly or monthly) to predetermine approved contract EV and actual use of budgets.
- Calculating variance and EVM-related performance indices.

  SV and CV can be obtained by comparing EV/AC with plan value (PV)

The other EVM performance indices are as follows:

- SV

  SV=BCWP－BCWS (a positive value is favorable)
- CV

  CV=BCWP－ACWP (a positive value is favorable)
- SPI

  SPI=BCWP/BCWS (a value greater than 1 is favorable)
- CPI

  CPI=BCWS/ACWP (a value greater than 1 is favorable)
- PC

  PC=BAC/BCWP
- TCPI

TCPI=EAC–ACWP/BAC-BCWP

- EAC

EAC=ACWP＋(BAC – BCWP / CPI*SPI)

- Illustrating the EVM chart, analyzing data, and formulating decisions

An EVM chart can be illustrated using the aforementioned data.

- CPI displays estimated cost utilization in the form of expenditure percentages on specific days. A CPI value greater than 1 represents that expenses are higher than work output value. In addition, CPI variance should not exceed 10%. Thus, CPI is an effective index in judging whether project goals can be successfully achieved.
- SPI displays work execution efficiency in the form of work achievement rate on specific days. SPI is an extremely effective index in identifying and comparing schedule problems. An SPI value greater than 1 represents that the current output value has achieved the estimated output value of a specific day in the future, which suggests favorable execution efficiency. Conversely, an SPI value less than 1 represents poor execution efficiency.

Case Study

Company A has been operating for approximately two decades, primarily involved in the design and manufacturing of industrial-grade heavy machinery for its clients. The company capital is roughly NT $150 million with an annual turnover of between NT $200-$400 million. The company specializes in manufacturing large machinery for steel plants, chemical plants, shipyards, and incineration plants. Due to the extreme size and weight of the products, the company deploys large machines and cranes in its manufacturing and transportation processes. The company did not adopt EV to manage and control past engineering projects, several of which performed extremely poorly. These projects were overstretched, resources were allocated and used poorly, and schedules were deferred. Moreover, these projects were at risk of operating at a loss. Thus, an effective management method was required. The case analyzed in the present study was a medium-scale engineering project. The execution procedures are as follows:

Project Planning – Ship Structure Engineering Project

Company A is a long-term collaborating manufacturer. The basic design of the ship structural engineering project was provided by the client. The manufacturer was responsible for detailed design, material provision, and manufacturing. This project is a classic heavy machinery project comprising an extremely large, extremely heavy device structure that attaches containers to the ship deck once they are loaded. The contract amount was NT $100 million and the contracted period was roughly one year. Therefore, the design, planning, manufacturing, and management of the project needed to be ideal.

Establishing the WBS and Project Budget

The approved cost budget table of the project can be divided into six major items, namely, management service cost, technical service cost, material cost, manufac-

turing cost, communal cost, and operating cost. Management and technical services were the core specializations of the company, communal and operating costs were the basic operating expenditures, and material utilization and manufacturing were broken down and outsourced based on specialization and manufacturing was initiated based on the planned project items. The cost of operations was 90.3%, becoming the focus of management for this project. The construction flow chart of Project A is illustrated in Figure 2.

Project OBS

The OBS is formulated by a designated project engineer based on the work content attributed of the project. The engineer was responsible for regularly and irregularly reporting project progress and quality conditions to the project manager. The manager then summarized the collected data for high-level executives and interested parties.

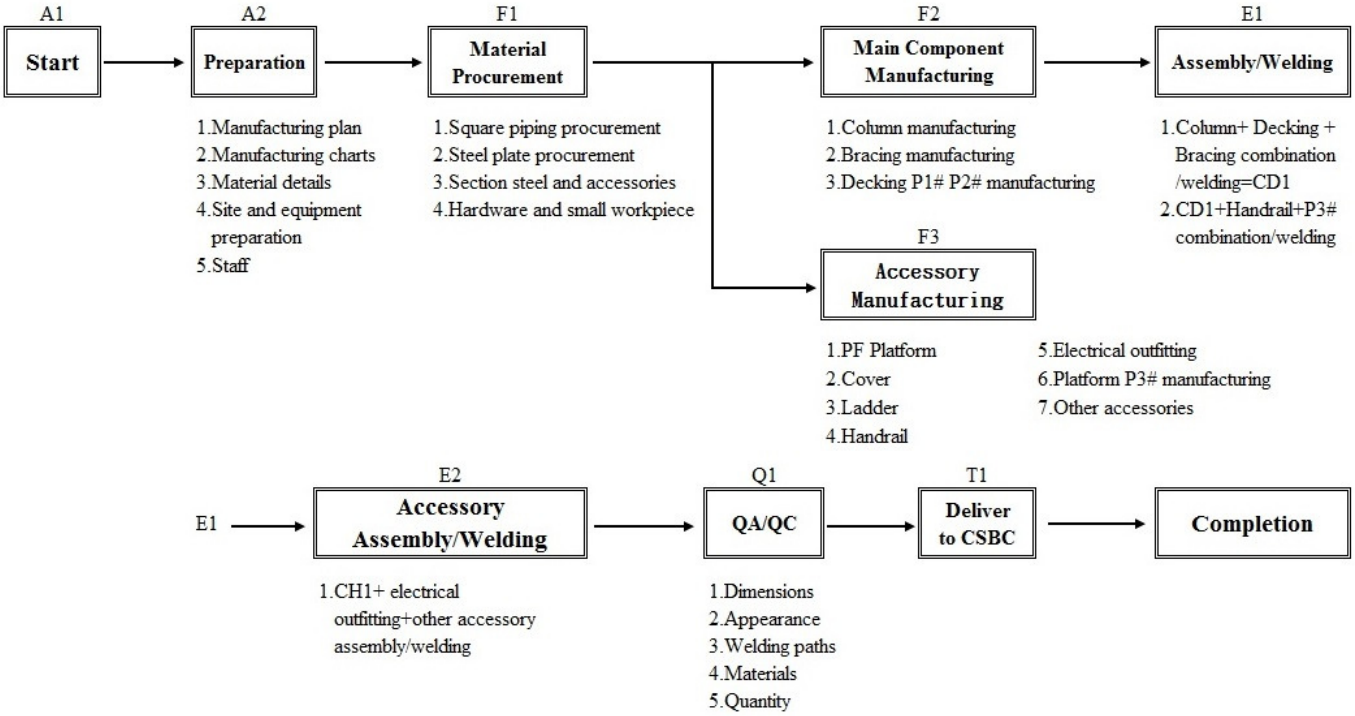


Figure 2. Construction Flow Chart of Project A

Applying EV

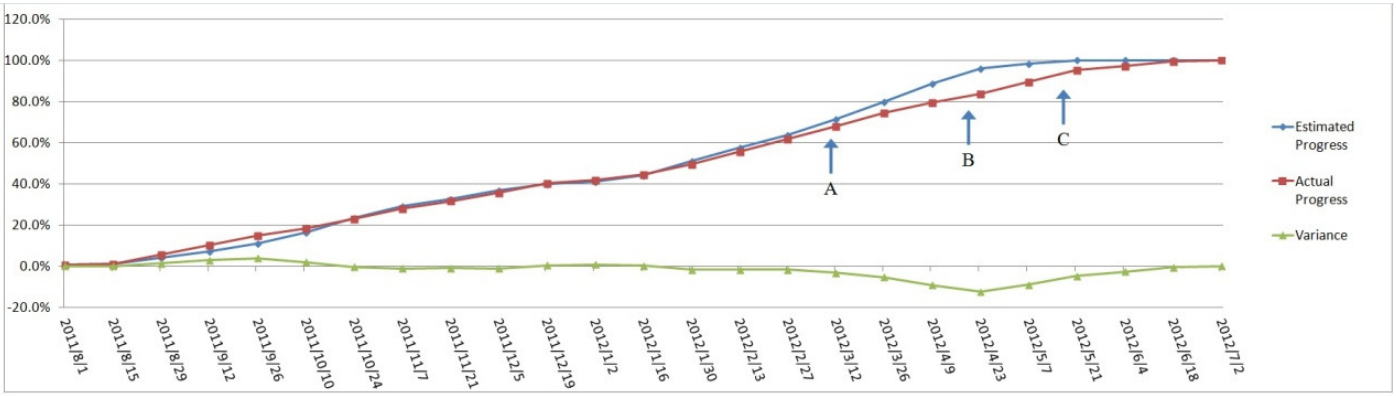
The project schedule was formulated based on the engineering sub-items. The project schedule was formulated based on the sub-item classifications (See Table 1). (Note: Please see Tables 1. and 2. at the end of this article.) Four key milestones were established for the period between 1 August 2011 and 2 June 2012.

- Engineering Management and Material Procurement
- E-Member Mark Fab
- LB-Assembly and Welding
- QA/QC Inspection

The actual progress table was created based on the percentage of completion every fortnight (See Table 2).

The SPI table was formulated based on the predetermined schedule and the actual progress. The weights of the engineering items displayed in the predetermined schedule and actual progress tables can be used to plot an SPI curve (Figure 3).

Each node constituting to the rising estimated progress curve represents the estimated progress percentage per fortnight. By contrast, each node for the rising actual progress curve represents the actual progress data collected per fortnight. The two curves were compared to illustrate the variance and safety zone.



Date	2011/8/1	8/15	8/29	9/12	9/26	10/10	10/24	11/7	11/21	12/5	12/19	2012/1/2	1/16	1/30	2/13	2/27	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2
Estimated Progress	0.8%	1.1%	4.2%	7.3%	11.0%	16.5%	23.3%	29.1%	32.6%	36.7%	39.8%	40.9%	44.2%	51.2%	57.6%	63.6%	71.3%	79.8%	88.5%	96.0%	98.5%	100.0%	100.0%	100.0%	100.0%
Actual Progress	0.8%	1.1%	5.6%	10.1%	14.7%	18.5%	22.9%	27.9%	31.6%	35.6%	40.1%	41.7%	44.4%	49.4%	55.8%	61.9%	68.0%	74.5%	79.4%	83.6%	89.4%	95.1%	97.3%	99.4%	100.0%
Variance	0.0%	0.0%	1.4%	2.9%	3.8%	2.0%	-0.4%	-1.2%	-1.0%	-1.1%	0.3%	0.8%	0.2%	-1.8%	-1.8%	-1.7%	-3.3%	-5.3%	-9.1%	-12.4%	-9.1%	-4.9%	-2.7%	-0.6%	0.0%
Safety Zone	1	1	1.33	1.39	1.34	1.12	0.98	0.96	0.97	0.97	1.01	1.02	1.00	0.97	0.97	0.97	0.95	0.93	0.90	0.87	0.91	0.95	0.97	0.99	1.00

Figure 3. Overall Progress of Project A (SPI)

Calculations are as follows:
SV=BCWP－BCWS
Safety Zone=BCWP/BCWS (actual progress/estimated progress)
Point A variance-3.3%=68% – 71.3%
Point B variance-12.4%=83.6% – 96%
Point C variance-4.9%=95.1% – 100%
Point A safety zone 0.95=68% / 71.3%
Point B safety zone 0.87=83.6% / 96%
Point C safety zone 0.95=95.1% / 100%

After the implementation of the improvement plans, a preparation period was required as a buffer for the delay in construction. This period included time for the collection and discussion of client's revisions and additional data, querying additional outsource companies, and the preparation of indoor construction equipment. Thus, progress continued to lag for approximately four weeks following estimation. The progress was behind the estimated schedule by approximately 12.4%, which was eventually improved to delay of 4.9%. The completion of the project was deferred by four weeks.

The cost plan was formulated based on the engineering sub-items. The project cost plan was formulated based on the classification of the sub-items and cost budgets. Schedule arrangements were consistent with the construction period between 1 August 2011 and 2 June 2012. Four key milestones were established for this period, namely:

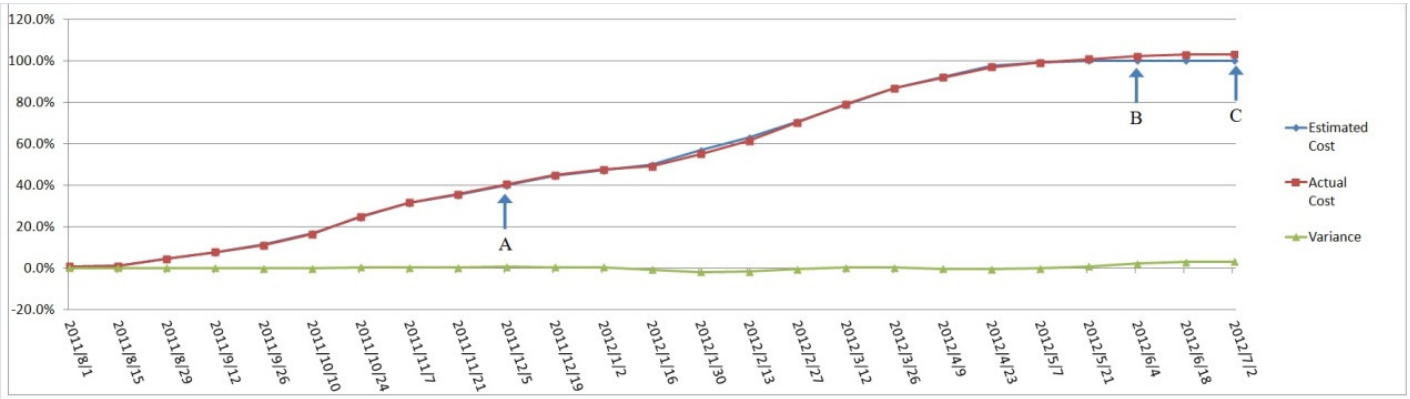
- Engineering & Material Procurement
- E-Member Mark Fab
- LB-Assembly and Welding
- QA/QC Inspection

Secondary items were expanded from the main items. The secondary items included contracted weights and amount percentages. The weight data were collected from the client's contract diagram, the percentages were collected from the classifications of the cost budget table, and time arrangements were based on the project schedule.

The CPI table was formulated based on the estimated cost schedule and actual expenditure. The weights of the engineering items displayed in the estimated cost schedule and actual cost table can be used to plot a CPI curve (Figure 4). Each node constituting to the rising estimated cost curve represents the estimated cost percentage per fortnight. By contrast, each node for the rising actual cost curve represents the actual cost data collected per fortnight. The two curves were compared to illustrate the variance and safety zone.

Calculations were as follows:
CV=BCWP－BCWS
Safety Zone=BCWS/BCWP (estimated cost/actual cost)
Point A variance+0.5%=40.4% – 39.9%
Point B variance+2.2%=102.2% – 100%
Point C variance+3%=103% – 100%
Point A safety zone 0.99=39.9% / 40.4%
Point B safety zone 0.98=100% / 102.2%
Point C safety zone 0.97=100% / 103%

The reasons for the over- expenditure of heavy engineering projects are common. However, CPI control can be incorporated into improvement endeavors to prevent current and future problems. At Point B, which was recorded on 4 June 2012, the over-expenditure condition was 2.2%. The project was nearing completion at this point.



Date	2011/8/1	8/15	8/29	9/12	9/26	10/10	10/24	11/7	11/21	12/5	12/19	2012/1/2	1/16	1/30	2/13	2/27	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2
Estimated Cost	0.8%	1.1%	4.4%	7.7%	11.3%	16.7%	24.4%	31.3%	35.3%	39.9%	44.4%	47.1%	49.8%	56.9%	62.9%	70.7%	78.7%	86.7%	92.3%	97.4%	99.1%	100.0%	100.0%	100.0%	100.0%
Actual Cost	0.8%	1.1%	4.4%	7.7%	11.1%	16.5%	24.8%	31.6%	35.5%	40.4%	44.8%	47.5%	49.1%	55.0%	61.2%	70.1%	78.9%	86.8%	91.9%	96.9%	98.9%	100.7%	102.2%	102.9%	103.0%
Variance	0.0%	0.0%	0.0%	0.0%	-0.2%	-0.2%	0.4%	0.3%	0.2%	0.5%	0.4%	0.4%	-0.7%	-1.9%	-1.7%	-0.6%	0.2%	0.1%	-0.4%	-0.5%	-0.2%	0.7%	2.2%	2.9%	3.0%
Safety Zone	1.00	1.00	1.00	1.00	1.02	1.01	0.98	0.99	0.99	0.99	0.99	0.99	1.01	1.03	1.03	1.01	1.00	1.00	1.00	1.01	1.00	0.99	0.98	0.97	0.97

Figure 4. Overall CPI table for Project A

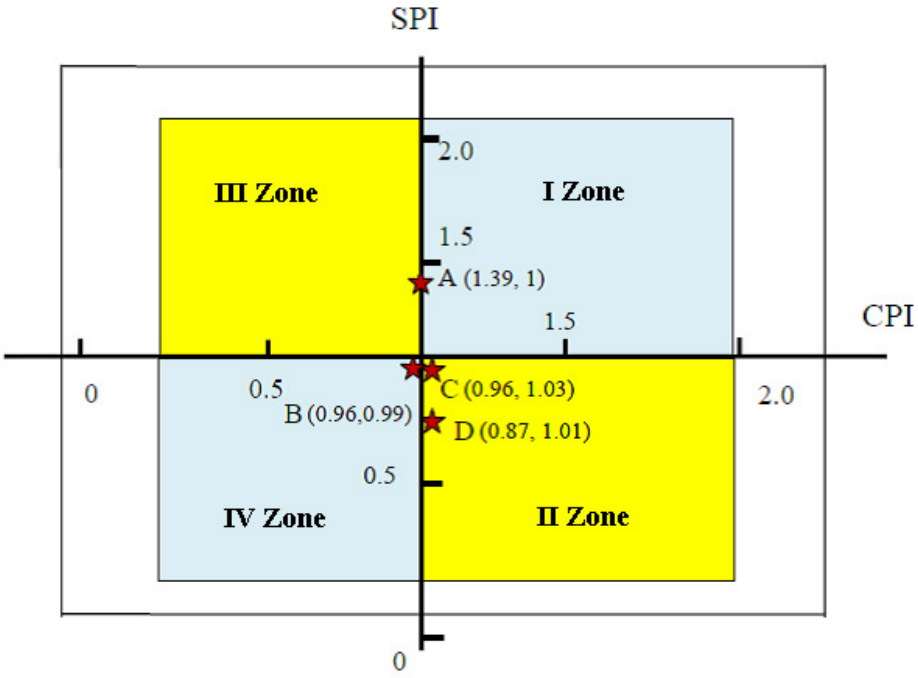


Figure 5. SPI and CPI Analysis Matrix of Project A

Finally, the over-expenditure condition at Point C was 3%, which was recorded on 2 July 2012. A summarized review revealed that the increase in over-expenditure was caused by the incomplete payment of additional modification costs by the client.

CPI and SPI Analysis Results and Safe Value Range

The SPI and CPI curves were plotted according to measured statistical data (Figure 5). The SPI and CPI curves showing that the maximum and mini-

- The SPI and CPI values of Point A on 12 September 2011 were 1.39 and 1, respectively. Thus, Point A is plotted in Quadrant 1, suggesting that both progress and cost are ideal.
- The SPI and CPI values of Point B on 7 November 2011 were 0.96 and 0.99, respectively. Thus, Point B is plotted in Quadrant 4, suggesting that the projected presented less than ideal conditions of delayed progress over-expenditure. The project may become unstable.
- The SPI and CPI values of Point C on 30 January 2012 were 0.96 and 1.03, respectively. Thus, Point C is plotted in Quadrant 3, suggesting that the expenditures were controlled, yet progress continued to deteriorate.
- The SPI and CPI values of Point D on 23 April 2012 were 0.87 and 1.01, respectively. Thus, Point C is plotted in Quadrant 3, suggesting that the expenditures were controlled, yet progress continued to deteriorate.

mum SPI interval values were 1.39 and 0.87, respectively, and the maximum and minimum CPI interval values were 1.03 and 0.97, respectively.

SPI=BCWP/BCWS, where a value greater than 1 is preferred (actual progress/estimated progress)

CPI=BCWS/ACWP, where a value greater than 1 is preferred (estimated cost /estimated cost)The risk position of the project can be controlled by using the SPI-CPI curve analysis, as explained in the following section.

A combined analysis of the SPI curve, CPI curve, and estimated progress curve lines indicated that the progress of the project on April 23, 2013 (Point A) was 96%, SPI was 83.6%, CPI was 96.9%, and variance was +13.3%. These percentages suggest the following:

- Scheduled was delayed by 12.4%=96% – 83.6% (estimated progress minus SPI)
- Variance +13.3%=96.9% – 83.6% (CPI minus SPI)

A variance of +13.3% does not represent a loss of 13.3, because of the subsequently increase in the schedule progress ratio with the addition of paint material procurement and vendor payments, which reduced the difference margin. The overall project progress chart shows the progress and cost differences of the overall project. The favorability of the curve values increases as the SPI and CPI curves approach the estimated progress curve. When increased difference margins are exhibited in the data, project managers or high-level executives can use the data to determine the cause, and then formulate response

strategies based on the curve with increased difference.

Analysis and Discussion

In this project, project managers were required to focus management decisions on controlling progress and cost budgets. The project was estimated for completion on June 2, 2012. In actuality, it was completed on July 2, 2012, which was delay of four weeks. The delay was caused by changes in design and a slight increase in workload. Requesting for extensions are common anomalies in such engineering projects, and thus no overdue fines incurred. The project exceeded the estimated budget by 3%. This was because the client's payment of additional fees for modification did not amount to 100%. This matter was not investigated further in consideration of preserving the continued partnership with the client. By adopting EVM concepts and SPI/CPI curves into the case study, the management, control, and decisions were digitally communicated, greatly reducing the management risks of the project and increasing the accuracy of the decision-making process. Alternatively, clients were also benefited because suppliers completed their tasks in the agreed upon time and quality, which facilitated the subsequent progress of the client's overall engineering project. Although the project exceeded the estimated budget by 3%, the projected gained an increase in client satisfaction, which is favorable for subsequent and sustained development of operations.

Conclusion and Suggestion

The method of EVM entails the comparison of actual performance with estimated periodic performance. Subsequently, performance indices (SPI and CPI) are calculated to generate curve diagrams, which can be analyzed to determine whether the performance of projects is within a safe range. In this case study, data analysis results indicated that according to the data obtained from previous processes, the final result performance of the project could be accurately estimated from the final actual cost. Thus, project managers or coordinators should immediately review the project or implement countermeasures when receiving warning data, to ensure the early control of cost and progress. In this context, the present study proposes several advantages of EVM:

- WBS and OBS method can be employed to integrate work items, schedules, and costs, and clearly identify omissions.
- Budgets are included in the calculation process and combined with schedules and costs for control and execution.
- CPI and SPI performance indices, as well as SV and CV indices, possess early warning functions.
- Analyzing performance indices can estimate the cost at project completion.
- Risk control mechanisms are easily distinguished.
- EVM reduces the fuzziness of communication models.

In addition, EVM observations can further be expanded to identify the causes of delay or over-expenditure. Thus, EVM not only enables project managers to consider the progress and cost when formulating decisions, but also allows them to comprehensively

review and evaluate the overall resource allocation of the project. Based on the aforementioned literature review and case study, this study indicates that the index estimation method of EVM can promptly issue warnings during the progress of the project, providing ample time for project managers to formulate contingency strategies and adjust subsequent costs and resources. This is the reason why EVM is emphasized and applied.

The case study adopted schedule and budget as the key aspects for analysis, and selected a heavy machinery engineering company. Based on the findings of the present study, future researchers can continue to expand the application of EVM into procurement management. Typically, the inquiry process of procurement departments is excessively long, and the lifespan of materials are extremely short, which delays demand schedules and wastes unnecessary resources of the company. Future researchers can also combine the method proposed in the present study with regression analysis to observe the mutual changes of two or more variables in multiple engineering projects.

Acknowledgements

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Table 1. Project A Schedule 1

Client	XXX	P/No		XXX Lashin								
Supplier	xxx Enterprise Co;Ltd	No:		Double Weekly Manuf								
NO.	DESCRIPTION	Q'ty tons,pcs	P-P %	Yr. 2011								
				Day	8/1	8/15	8/29	9/12	9/26	10/10	10/24	11/7	11/21
				Week No	31	33	35	37	39	41	43	45	47
Lashing Bridge Manufacturing													
A	**Engineering & Material Procurement**	tons	40%		0.8%	0.3%	3.1%	3.1%	3.7%	3.8%	3.7%	1.9%	0.5%
01	Detail Engineering and Shop Dwg	1748	3%		25	10	10	10	30	10	5		
02	Material Procurement -SQ pipe and Plate	1402	28%				10	10	10	10	10	5	
03	Material Procurement -Aux Steel and Accessories	346	8%								6	6	6
04	Mobilization and Preparation	1748	1%							70	30		
B	**E-Member Mark Fab**	tons	36%		0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	3.1%	3.9%	2.9%
01	Deck-Fab	559	11.5%							10	10	8	8
02	Colum and Bracing Fab	933	19.2%								10	15	10
03	Hand Rail	58	1.2%									10	8
04	Post,Platform ,Cover and Ladders	140	2.9%										
05	Gratting Pieces	27	0.6%										
06	Electric Pieces	11	0.2%										
07	Attachments Pieces and Accessories	20	0.4%										
C	**LB-Assembly and Welding**	tons	20.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
01	H958-U11-LB09~13 Assembly	177	2.0%										
02	H958-U21-LB06,07,08,14,15 Assembly	249	2.8%										
03	H958-U31-LB03,04,17~19 Assembly	199	2.3%										
04	H958-U41-LB01,02,15,16 Assembly	249	2.8%										
05	H960-U11-LB09~13 Assembly	177	2.0%					,					
06	H960-U21-LB06,07,08,14,15 Assembly	249	2.8%										
07	H960-U31-LB03,04,17~19 Assembly	199	2.3%										
08	H960-U41-LB01,02,15,16 Assembly	249	2.8%										
D	**QA/QC Inspection**	tons	4%		0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.1%
01	Material Inspection-PMI	1748	1.0%							60			
02	Dimension Inspection	1748	1.0%										6
03	Visual Insp and Q'ty Inspec	1748	1.0%										
04	Transport, delivery to CSBC Shop	1748	1.0%										
	Total:	1748	100.0%										
	Unit Weekly Progressing-%				0.8%	0.3%	3.1%	3.1%	3.7%	5.6%	6.8%	5.8%	3.5%
	Lashing Bridge Total Planning-%				0.8%	1.1%	4.2%	7.3%	11.0%	16.5%	23.3%	29.1%	32.6%

Table 1. Project A Schedule 1-Continued

	Client:	Supplier:	Delivery Date:	AUG. 15, 2012	Doc. No.	
g Bridge Supply	xxx	xxx	1st Issue On:	NOV-27-2011	JA11-70-E1	
			Rev. No.	0	Issue No.	1
acturing Schedule-Planning	YMMTC	xxx	CSBC	xxx	Date	18-Jul-11

		2012 (1/21----1/29)																	
12/5	12/19	1/2	1/16	1/30	2/13	2/27	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16	7/30	8/13	total
49	51	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
0.5%	0.5%	0.4%	0.0%	3.4%	3.1%	3.5%	2.2%	2.5%	1.6%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0%
																			100
				12	11	11	5	6					※Mile Stone 2012/06/02						100
6	6	5				5	10	10	20	20									100
																			100
3.5%	2.4%	0.6%	0.5%	0.4%	0.1%	0.7%	4.1%	3.6%	4.6%	4.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	36.0%
8	8					6	10	10	10	12									100
10	5						15	10	15	10									100
8	10	10	10	10			6	8	5	5	10								100
20	10	10	6	6				12	10	14	12								100
		15	20	10	5				10	20	20								100
	10	10	10	5	5			10	15	15	20								100
	10	10	10	10	10			10	20	10	10								100
0.0%	0.0%	0.0%	2.6%	2.9%	3.0%	1.4%	1.2%	2.2%	2.3%	1.7%	1.4%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%
			60	40															100
			50	50															100
				30	70														100
					50	50													100
							60	40											100
								50	50										100
									40	60									100
										10	50	40							100
0.1%	0.2%	0.2%	0.3%	0.2%	0.2%	0.5%	0.1%	0.2%	0.3%	0.3%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%
						40													100
9	10	8		8	5		6	8	10	10	10	10							100
5	10	10	10	6	6		6	5	5	10	12	15							100
			15	10	10	9		10	10	10	10	16							100
4.1%	3.0%	1.1%	3.4%	6.9%	6.4%	6.1%	7.6%	8.5%	8.7%	7.5%	2.4%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
36.7%	39.8%	40.9%	44.2%	51.2%	57.6%	63.6%	71.3%	79.8%	88.5%	96.0%	98.5%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 2. Project A Progress Table

Client	XXX	P/No		XXX Lashin
Supplier	xxx Enterprise Co;Ltd	No:		Double Weekly Manu

NO.	DESCRIPTION	Q'ty tons,pcs	P-P %	Yr.	2011								
				Day	8/1	8/15	8/29	9/12	9/26	10/10	10/24	11/7	11/21
				Week No	31	33	35	37	39	41	43	45	47
Lashing Bridge Manufacturing													
A	**Engineering & Material Procurement**	tons	40%		0.8%	0.3%	4.5%	4.5%	3.5%	2.4%	3.2%	1.8%	0.4%
01	Detail Engineering and Shop Dwg	1748	3%		25	10	10	10	15	15	15		
02	Material Procurement -SQ pipe and Plate	1402	28%				15	15	10	5	0	5	
03	Material Procurement -Aux Steel and Accessories	346	8%								30	5	5
04	Mobilization and Preparation	1748	1%						20	50	30		
B	**E-Member Mark Fab**	tons	36%		0.0%	0.0%	0.0%	0.0%	1.2%	1.2%	1.3%	3.2%	3.2%
01	Deck-Fab	559	11.5%						10	10	10	10	10
02	Colum and Bracing Fab	933	19.2%								0	10	10
03	Hand Rail	58	1.2%								10	10	10
04	Post,Platform ,Cover and Ladders	140	2.9%										
05	Gratting Pieces	27	0.6%										
06	Electric Pieces	11	0.2%										
07	Attachments Pieces and Accessories	20	0.4%										
C	**LB-Assembly and Welding**	tons	20.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
01	H958-U11-LB09~13 Assembly	177	2.0%										
02	H958-U21-LB06,07,08,14,15 Assembly	249	2.8%										
03	H958-U31-LB03,04,17~19 Assembly	199	2.3%										
04	H958-U41-LB01,02,15,16 Assembly	249	2.8%										
05	H960-U11-LB09~13 Assembly	177	2.0%										
06	H960-U21-LB06,07,08,14,15 Assembly	249	2.8%										
07	H960-U31-LB03,04,17~19 Assembly	199	2.3%										
08	H960-U41-LB01,02,15,16 Assembly	249	2.8%										
D	**QA/QC Inspection**	tons	4%		0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%
01	Material Inspection-PMI	1748	1.0%							30			
02	Dimension Inspection	1748	1.0%										10
03	Visual Insp and Q'ty Inspec	1748	1.0%										
04	Transport, delivery to CSBC Shop	1748	1.0%										
	Total:	1748	100.0%										
	Unit Weekly Progressing-%				0.8%	0.3%	4.5%	4.5%	4.6%	3.8%	4.4%	5.0%	3.7%
	Lashing Bridge Total Planning-%				0.8%	1.1%	5.6%	10.1%	14.7%	18.5%	22.9%	27.9%	31.6%

Table 2. Project A Progress Table-Continued

	Client:	Supplier:	Delivery Date:	AUG. 15, 2012	Doc. No.	
g Bridge Supply	XXX	XXX	1st Issue On:	NOV-27-2011	JA11-70-E1	
			Rev. No.	0	Issue No.	1
facturing Schedule-Actual	YMMTC	xxx	CSBC	xxx	Date	18-Jul-11

		2012 (1/21----1/29)																	
12/5	12/19	1/2	1/16	1/30	2/13	2/27	3/12	3/26	4/9	4/23	5/7	5/21	6/4	6/18	7/2	7/16	7/30	8/13	total
49	51	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
0.4%	0.8%	0.8%	0.0%	1.4%	2.8%	3.2%	3.2%	3.2%	1.8%	0.4%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0%
																			100
				5	10	10	10	10	5										100
5	10	10				5	5	5	5	5	5	5	※Mile Stone 2012/06/02						100
																			100
3.5%	3.5%	0.5%	0.5%	0.4%	0.1%	0.6%	2.5%	3.0%	3.0%	2.9%	3.0%	2.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	36.0%
10	10					5	5	5	5	5	5								100
10	10						10	10	10	10	10	10							100
10	10	10	10				0	5	5	5	10	5							100
10	10	10	10	10				10	10	10	10	10							100
		10	10	10	10			10	10	10	10	10	10						100
	10	10	10	10	10			5	5	10	5	10	5	10					100
	10	10	10	10	10			10	10	5	10	5	5	5					100
0.0%	0.0%	0.0%	1.7%	2.9%	3.2%	1.9%	0.3%	0.0%	0.0%	0.6%	2.3%	2.7%	2.0%	1.9%	0.6%	0.0%	0.0%	0.0%	20.0%
			30	40	30														100
			40	40	20														100
				40	40	20													100
					40	50	10												100
										30	70								100
											30	70							100
												30	50	20					100
													30	50	20				100
0.2%	0.2%	0.2%	0.5%	0.3%	0.3%	0.4%	0.2%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	4.0%
			30			30	10												100
10	10	10		10	10		5	10	5	5	5	5	5						100
5	10	10	10	5	10		5	10	10	5	5	5	5	5					100
			10	10	10	10		10	5	10	5	10	5	10	5				100
4.0%	4.5%	1.5%	2.8%	4.9%	6.4%	6.1%	6.2%	6.5%	5.0%	4.2%	5.8%	5.6%	2.2%	2.1%	0.6%	0.0%	0.0%	0.0%	100.0%
35.6%	40.1%	41.7%	44.4%	49.4%	55.8%	61.9%	68.0%	74.5%	79.4%	83.6%	89.4%	95.1%	97.3%	99.4%	100.0%	100.0%	100.0%	100.0%	

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MAJOR CAUSES OF CONSTRUCTION-INDUCED NEIGHBOR DAMAGE AND NULL-NEIGHBOR-DAMAGE METHOD

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Abstract

Even though there have been laws or identification manuals stipulated by countries all over the world to deal with the construction-induced neighbor damages among neighboring buildings, they haven't been able to effectively inhibit the occurrence of such issue. In light of this, in this paper the actual cause of construction-induced neighbor damage of a special case has been investigated, and a null-neighbor-damage method has been proposed to inhibit the occurrence of construction-induced neighbor damage.

Keywords: buildings, construction, neighbor damages, null-neighbor-damage.

Introduction

Currently laws (Ministry of the Interior of ROC, 2011) or identification manuals (Taipei Professional civil Engineers Association, 2006) related to neighbor damages are based on the protection of existing buildings with the construction-induced neighbor damage defined as infringement (Taipei Professional civil Engineers Association, 2006). Under the protection of laws or regulations, the foundations of existing buildings are mostly right next to the boundary line such that the occurrence of construction-induced neighbor damage is inevitable.

With the huge amount of compensation and prolonged litigation process, the neighbor damages induced during the construction of large build-

ing often results in the loss-loss situation between the plaintiff and the defendant.

Even though there are scholars submitting research papers (Chang, 2009; Chen, 2009; Huang, 2005; Hung, 2013; Lai, 2003; Tsai, 2014) every year in light of constantly increasing issues of construction-induced neighbor damages, these papers are mostly focused on the handling method and solution after the problem occurred, such that they cannot be used to substantially and effectively inhibit the occurrence of construction-induced neighbor damage.

From the perspective of engineering ethics (Harris, Pritchard, Rabins, James and Englehardt, 2014), engineers indeed should be held accountable for the construction-induced neighbor damages in order to achieve the objective of null-neighbor-damage. Therefore, the first thing in this paper is to investigate the actual cause of one special case of construction-induced neighbor damage, and then the mechanism of construction-induced neighbor damage induced by factors such as foundation load distribution, distribution of vertical stress under foundation load, distribution of groundwater level after water drainage, and distribution of shear structure has been revealed while the corresponding null-neighbor-damage methods have been proposed respectively. In the end it can be shown by the actual case that the null-neighbor-damage can be expected.

A Special Case Of Construction-Induced Neighbor Damage

This case took place during the foundation excavation of Taipei Cathay Tianmu Shopping Center, and the content of this case is as described below:

Construction project overview

The entire construction area of Cathay Tianmu Shopping Center includes Site A and Site B as shown in Figure 1, where the area of Site A is 4419 square meters for a building with 4 underground levels and 9 floors above ground; and the area of Site B is 3810 square meters for a building with 4 underground levels and 10 floors above ground; the onsite excavation will be implemented in 6 stages, and it is set to reach GL. -19.05m (Chen and Ou, 1992).

Geological conditions

The boring logs of Site A and B are as shown in Figure 2, which indicates that the onsite geological conditions include fill soil (SF), fat clay (CH), lean clay (CL), silty sand (SM), sandy silt (ML), volcanic breccias (VB) and mudstone.

Underground water conditions

The groundwater tables for both sites are at GL.-1.5m. Among onsite soil layers, fat clay (CH) and lean clay (CL) are aquitards, silty sand (SM) and volcanic breccias (VB) are confined aquifers, while the pressure heads of confined aquifers are 2 m above ground surface (Chen and Ou, 1992).

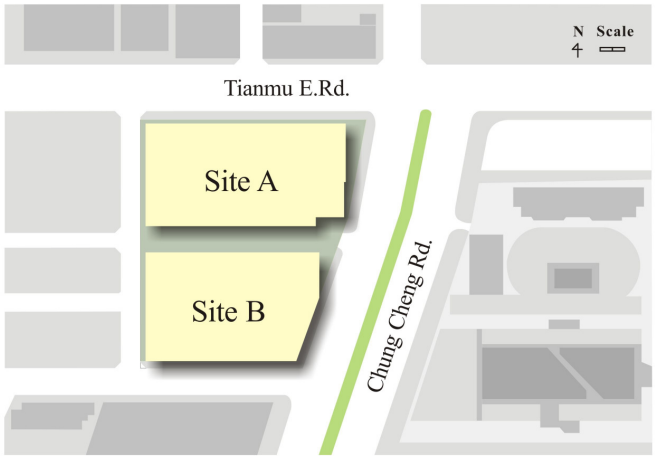


Figure 1. The map of Sites A and B and neighboring areas (Chen and Ou, 1992)

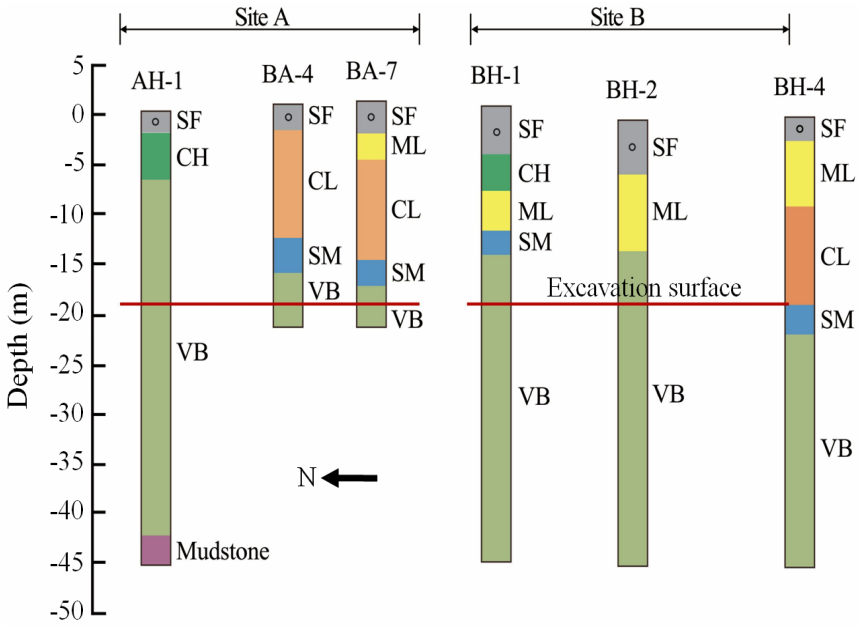


Figure 2. Boring logs for sites A and B (summarized from Chen and Ou, 1992)

Ground modifications

In response to the huge amount of groundwater discharge during grouting trial before official grouting, the design personnel has increased the number of drilled holes and modified the ground improvement method in addition to changing the construction method. The modified ground improvement method is as shown in Figure 3, which includes: (1) the adoption of 1.2m thick and 30m deep diaphragm wall; (2) the adoption of soil-cement mixing wall (SMW) with a diameter of 60 cm; (3) the adoption of jumbo-jet special grout (JSG) within the depth range of 26~32m, with the q_u of improved ground to be >1961kPa and the improvement rate =100%; (4) the adoption of jumbo special pile (JSP) within the depth range of 0~5m; (5) the adoption of JSG within the depth range of 4~20m with the cohesion of improved ground to be □85kPa and the improvement rate □18%; (6) the adoption of JSG within the depth range of 20~25m with the cohesion of improved ground to be □147kPa and the improvement rate □31%; (7) the adoption of JSG within the depth range of 25~31m with the q_u of improved ground to be >1961kPa and the improvement rate =100%.

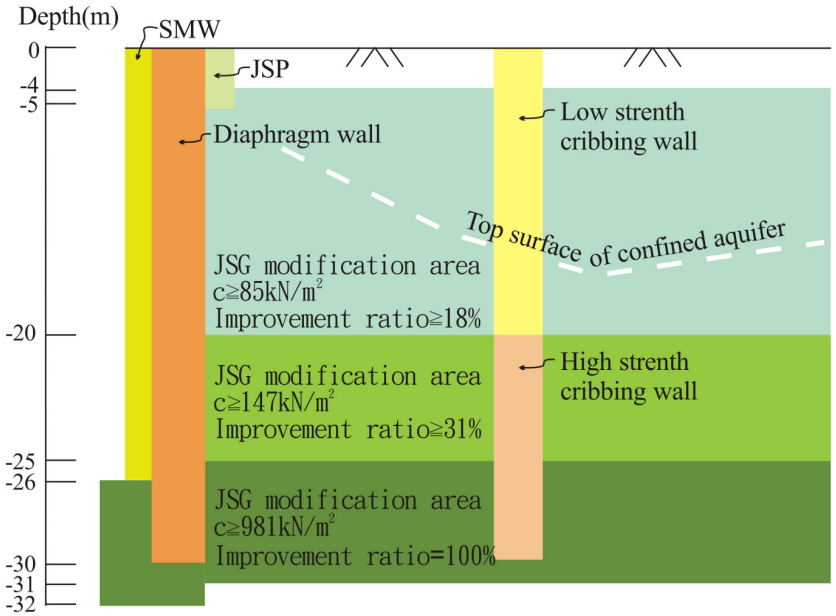
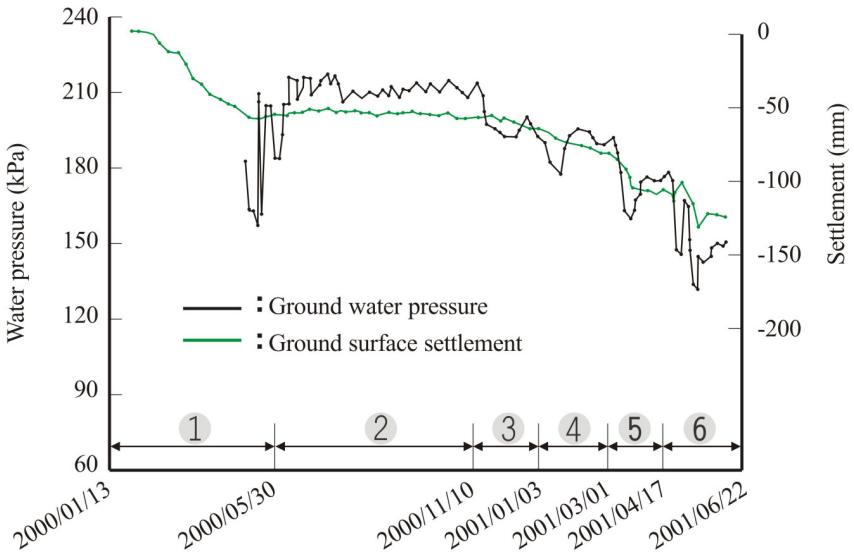


Figure 3. The adopted ground modification methods for site A (reproduced from Chen and Ou, 1992)

Problems induced from base excavation

The variations of groundwater pressure and the subsidence of ground surface during the ground improvement and various excavation stages are as shown in Figure 4, which indicates (1) there is constant groundwater discharge during JSG ground improvement with subsidence reaching 58mm; (2) groundwater pressure rises due to the sealing grouting operation (refer to Figure 5), and it shows slight variation during the construction of diaphragm wall such that the subsidence is slowed down; (3) groundwater pressure continues to drop from stage 1 to stage 4 of excavation, with the maximum subsidence of 134mm.



Legend: ①JSG modification period, ②Diaphragm wall construction period, ③Excavation stage 1, ④Excavation stage 2, ⑤Excavation stage 3, ⑥Excavation stage 4

Figure 4. The variations of groundwater pressure and ground surface subsidence during the ground improvement and various excavation stages (replotted from Chen and Ou, 1992)

The relationship between the location of neighbor damage and site A is as shown in Figure 6, which indicates that all neighbor damages are located in areas beyond three times the excavation depth.*Causes of neighbor damages suggested by Chen and Ou*

With the locations of neighbor damages being rather unique, the construction unit had delegated academic institution to carry out investigation. The main causes of neighbor damages suggested by Chen and Ou (1992) after investigation include:

1. The JSG improved layer with 100% improvement rate was fractured and the water in confined aquifer was discharged upward along the cracks, and the reduced groundwater pres-

sure resulted in uneven subsidence of neighboring buildings.

2. With the sealing grouting not being effective, groundwater continued to be replenished at all excavation stages, yet the groundwater pressure continued to be declined.
3. The actual water discharge path could not be found, so the water sealing could not be done at all excavation stages, thus leading to worsening neighbor damage issue.

Causes of neighbor damages suggested by the author of this paper

The continuously worsened neighbor damage issue indicates that the causes of neighbor damage suggested by Chen and Ou (1992) may not be consistent with the real situation, thus the authors of this paper has supplemented six causes of neighbor damages as shown below:

1. JSG method is applicable to the improvement of sandy soil or clayey soil stratum, while the dual-tube double-packer grouting method is applicable to crushed rock stratum (Construction and Planning Agent, Ministry of the Interior of Taiwan, 2014). As for the VB stratum at both sites, with the particle composition similar to crushed rock, the more appropriate ground improvement method should be dual-tube double-packer grouting method instead of jumbo-jet special grouting method。 With the adoption of improper grouting method, the phenomenon for water discharging continuously is due to poor ground improvement rather than the fracture of JSG improved layer addressed by Chen and Ou (1992).
2. When the diaphragm wall and SMW are extended deep into the confined aquifer, it is difficult for the initial setting of cement to take place in gushing groundwater, such that the quality of diaphragm wall and SMW have been greatly reduced.

Chen and Ou (1992) did not figure out the reason for the neighbor damages to take place in areas beyond three times the excavation depth eventually, so the authors of this paper has introduced the model as shown in Figure 7 as the explanation. As indicated by Figure 7, when the excavation requires the groundwater level to be reduced by water pumping, the neighbor damage will not take place if the pressure water levels on both sides of the neighboring building drops evenly (as shown by building B in Figure 7); if the pressure water levels on both sides of the neighboring building drops unevenly (as shown by building A in Figure 7), the neighbor damage issue will occur.

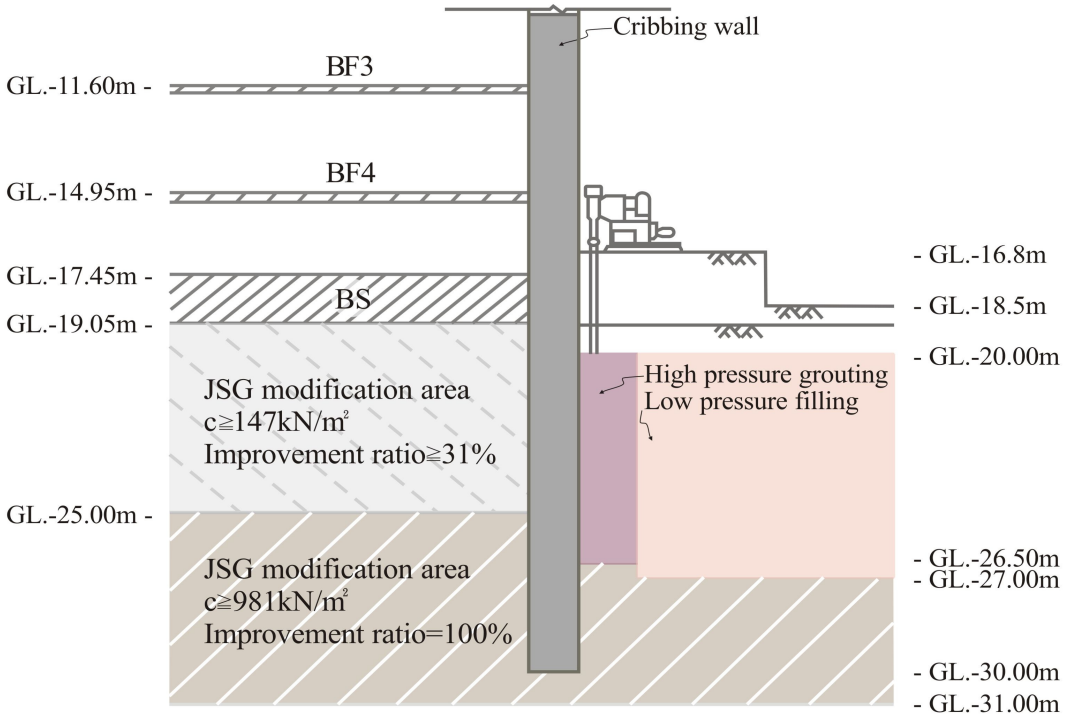
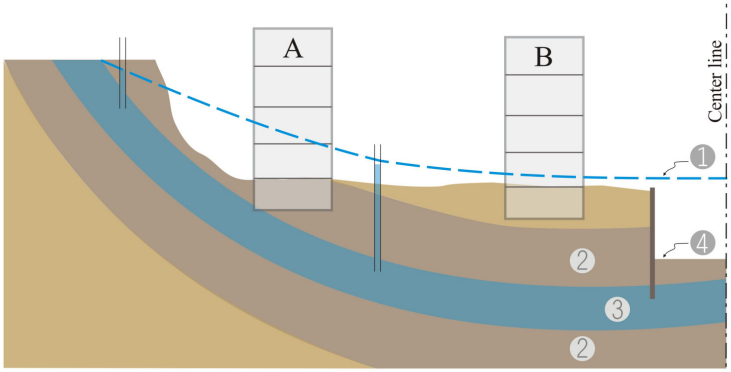
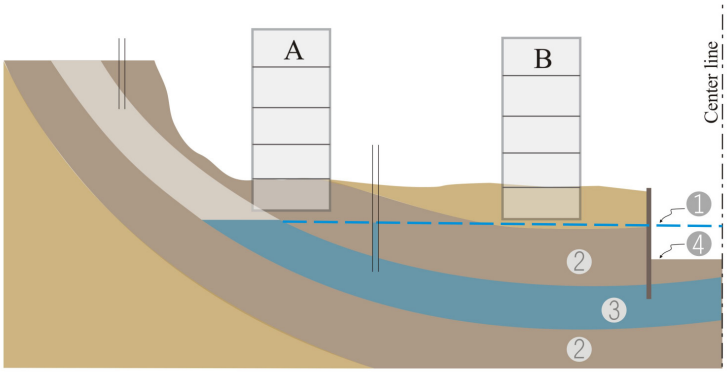


Figure 5. Layout of sealing grouting operation (reproduced from Chen and Ou, 1992)

Figure 6.. The relationship between the location of neighbor damages and site A



(a) Before water drainage

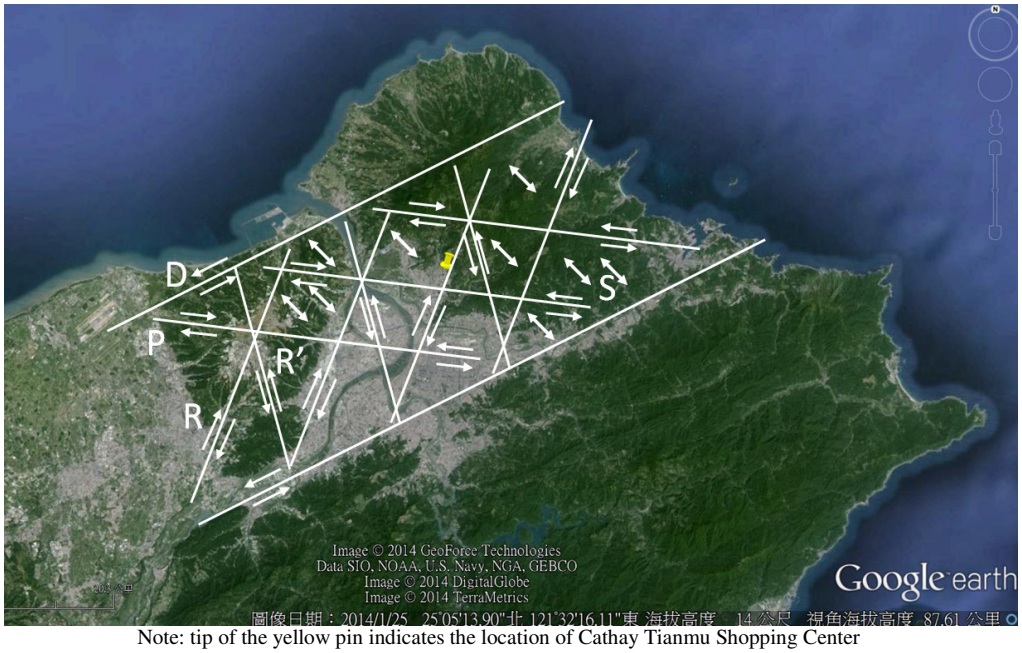


(b) After water drainage

Legend: ①Potentiometric surface, ②Aquitard, ③Aquifer, ④Excavation surface,

Figure 7. The model dropping pressure water levels in slope land induced by water drainage

3. Another reason for the neighbor damage to take place in area beyond three times the excavation depth is that area happens to be the curved pressure water layer with the greatest curvature (at the location of building A in Figure 7), and the geological structure in this area actually includes the shear band related to the ground uplift (Sibson, Moore and Rankin, 1975); under such circumstance, uneven decline of groundwater pressure will cause uneven displacement of shear band, thus making it easier to induce neighbor damage issue.
4. First of all, the shear textures in a shear band (Tchalenko, 1968) existing in areas near the location of construction induced neighbor damage of Cathay Tianmu Shopping Center can be identified in the satellite image as shown in Figure 8, which include principal displacement shears D, thrust shears P, Riedel shears R, conjugate Riedel shears R', and compression textures S.



Note: tip of the yellow pin indicates the location of Cathay Tianmu Shopping Center

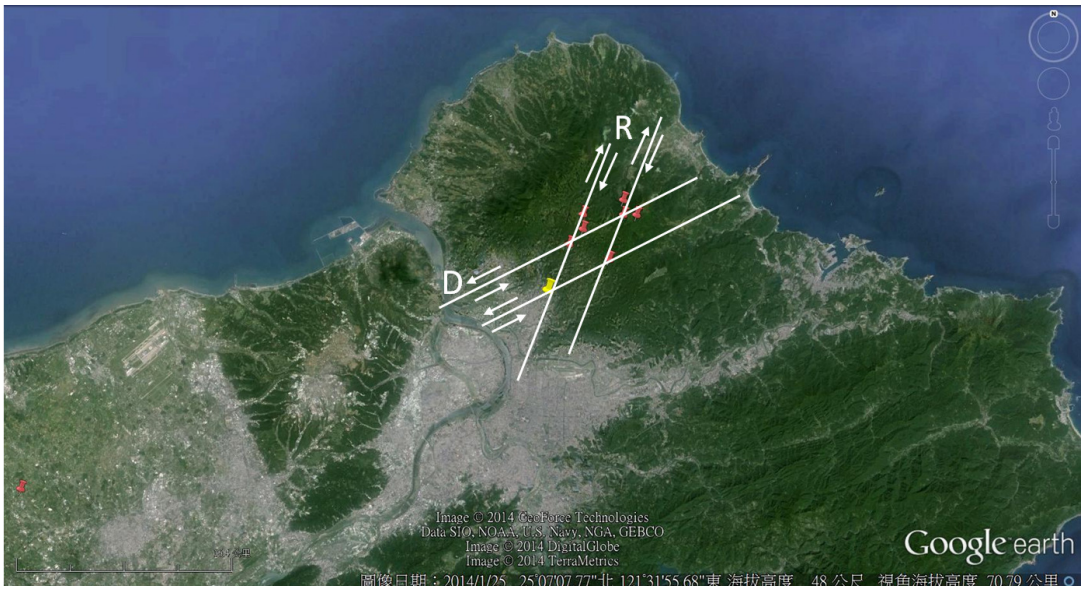
Figure 8. Various shear textures in a shear band existed in Taipei area (the background map is cited from Google Earth)

Secondly, based on the satellite image as shown in Figure 9 and the felt earthquakes (Central Weather Bureau of Taiwan, Collecting of Earthquake Activity) with epicenters located in Taipei since 2006, the location of construction induced neighbor damage of Cathay Tianmu Shopping Center is identified to be at the intersection of principal displacement shears D and Riedel shears R as shown in Figure 8. The degree of brittle fracture of stratum at the intersection of two shear textures is higher, such that the building foundation is more likely to suffer from subsidence during felt earthquakes or decline of pressure water level.

Null-Neighbor-Damage Method

The null-neighbor-damage method related to ultimate bearing area

With the foundation of building constructed earlier is right next to the property line, it is shown in Figure 10 that the ultimate bearing capacity area on the left hand side of the foundation has actually gone beyond the property line under the ultimate load q_u. In other words, the stability of such a building foundation constructed earlier actually relies on the stratum beyond the property line. Therefore, this kind of foundation design is in fact a kind of infringement.



Note: yellow tip indicates the location of Cathay Tianmu Shopping Center

Figure 9. The intersection of shear textures resulted from the epicenters of felt earthquakes in Taipei (the background map is cited from Google Earth)

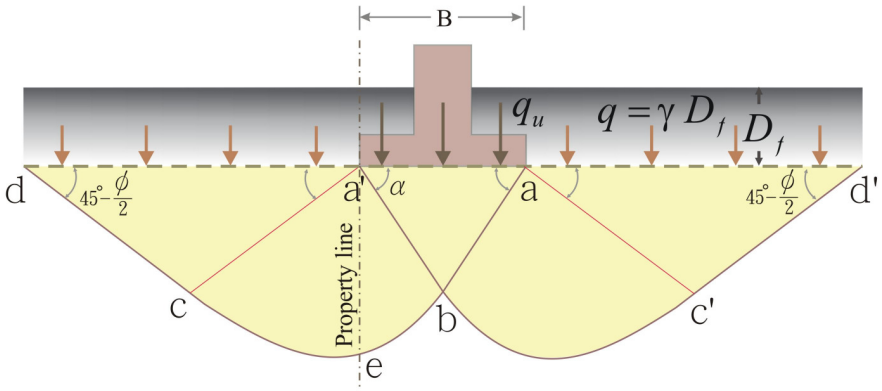


Figure 10. The bearing area surrounded by sliding failure surface under foundation ultimate load

When the excavation of a nearby building constructed later reaches a certain depth, it is shown in Figure 11 that the ultimate bearing capacity area of the building foundation constructed earlier will be reduced significantly from the total area surrounded by $\overline{abecd}$ and $\overline{abc'd'}$ in Figure 10 to the area surrounded by $\overline{abea'}$ in Figure 11. Such a significant reduction for the ultimate bearing capacity is found to be caused

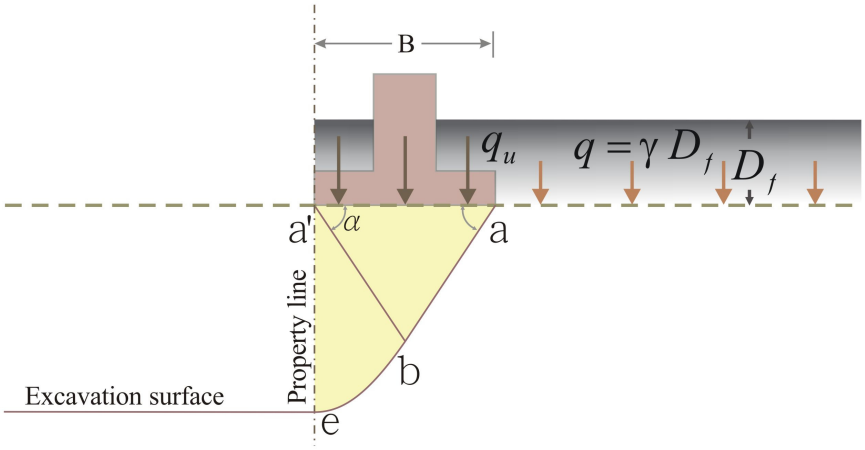


Figure 11. The ultimate bearing capacity area of a foundation left after excavation of a nearby building

by both the nearby excavation and the loss of symmetry.

To ensure the whole ultimate bearing area of a building foundation is located within the property line, the foundation right next to the property line must be retreated by a distance w_b (refer to Figure 12).

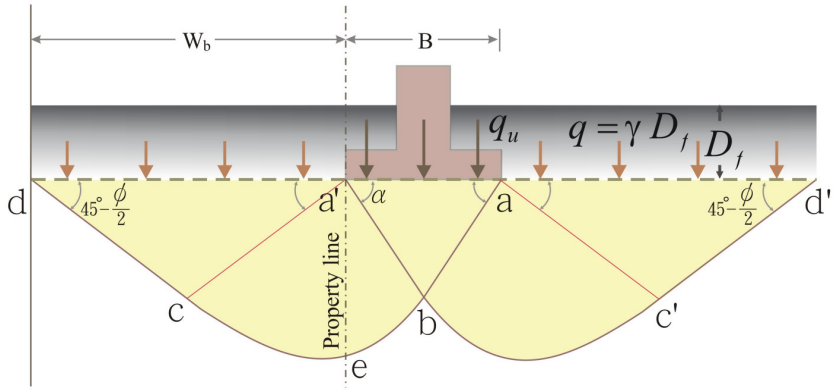
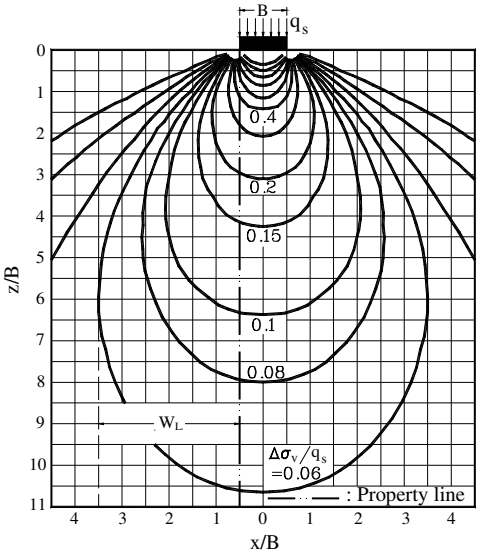


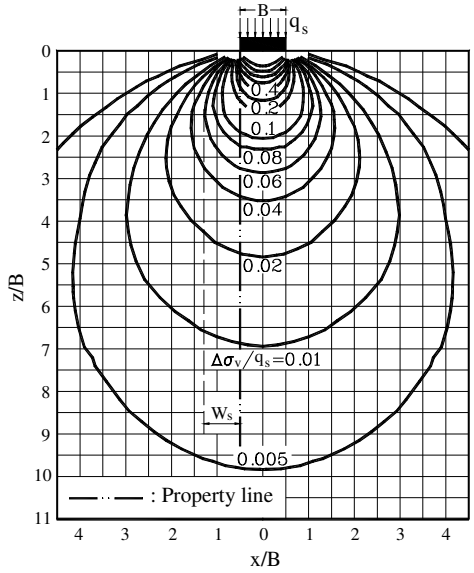
Figure 12 The retreat distance of a building foundation

The null-neighbor-damage method related to vertical stress distribution

When the foundation is right next to the property line and under the vertical pressure q_0, it is indicated in Figure 13 that the vertical stress σ_v of either long strip or square foundation will be distributed to areas beyond the property line; and the behavior



(a) Long strip footing



(b) Square footing

Figure 13. Vertical stress increment $\Delta\sigma_v$ under foundation load q_s

produced by such vertical stress distribution is in fact a kind of infringement.Under the foundation load q_s, the vertical stress increment $\Delta\sigma_v$ distributed to areas beyond the property line (as shown in Figure 13) must be less than the allowable value (such as $\Delta\sigma_v \leq 0.06\, q_s$) such that the stability of foundation will not be affected by the excavation. In other words, the location of foundation must be retreated from the property line, and such retreat dis-

tance shall be determined based on the shape and the width B of a foundation. If the allowable value is $0.06\,q_s$, it can be found from Figure 13 that the retreat distance W_L for a long strip foundation next to the property line is 3B; and the retreat distance W_S for a square foundation next to the property line is 0.75B.

The null-neighbor-damage method related to decline of groundwater level

When the groundwater level needs to be lowered by water pumping before performing excavation, it is shown in Figure 14 that the groundwater level in areas outside the excavation area will also be lowered nonuniformly, thus leading to nonuniform subsidence; when the drawdown goes beyond the allowable value $D_{allowable}$, such water pumping is deemed as a kind of infringement.

To avoid the infringement induced from water pumping, the distance between the retaining wall and the location of the allowable drawdown $D_{allowable}$ must be greater or equal to W_d shown in Figure 14; in other words, the area with the drawdown greater than $D_{allowable}$ must be located within the property line. Monitoring of groundwater level should be enforced during discharge period in order to ensure that the drawdown in areas beyond the property line is less than $D_{allowable}$

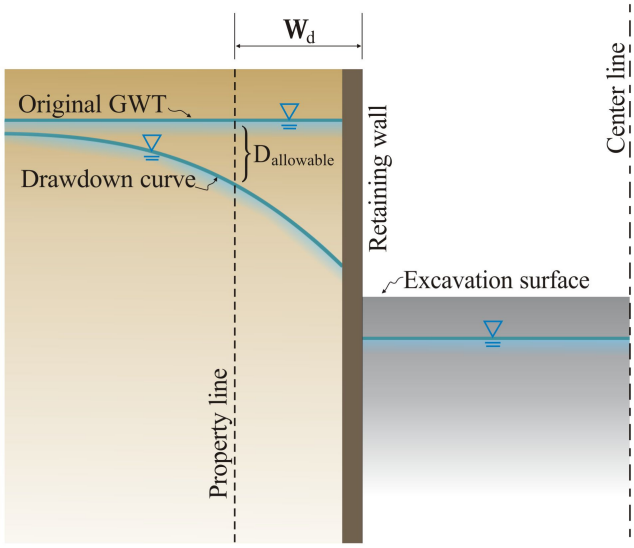


Figure 14. The retreat distance of the lowered groundwater level

The null-neighbor-damage method related to decline of pressure water level

When the pressure water level needs to be lowered by water drainage during excavation period, the pressure water level in area outside the excavation area will also be lowered unevenly,

thus leading to neighbor damage issue. So this kind of water drainage is also deemed as a kind of infringement.

In order to ensure that the water drainage will not result in neighbor damage issue, governments of all countries should announced the slope lands with shear bands which must not be developed and the distribution of pressure water levels (as shown in Figure 7a) of the slope lands which can be developed, and there should also be regulations requiring that the retaining wall and the ultimate foundation bearing area should both be above the pressure water level; if the retaining wall and the ultimate foundation bearing area are allowed to be lower than the pressure water level, there should be a maximum permissible value.

The null-neighbor-damage method related to shear band displacement

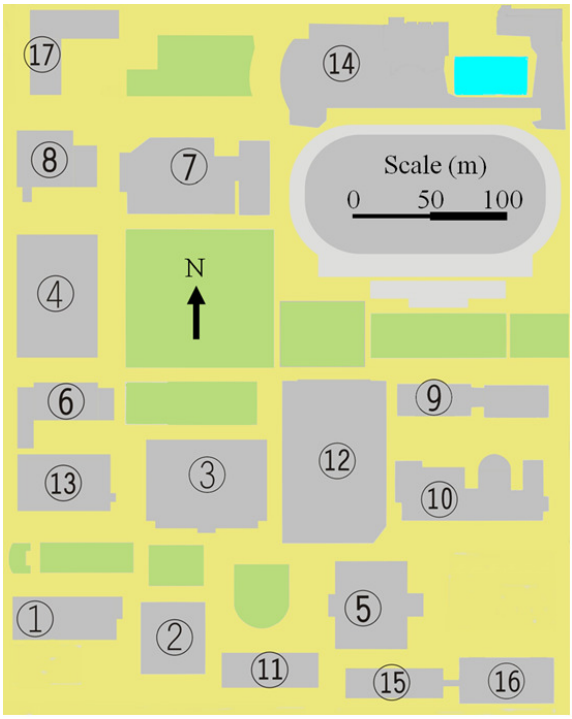
When there is shear band in the area near the construction site, the construction might induce shear banding thus causing the reduced foundation load capacity of neighboring building. In this case such construction behavior is deemed as a kind of infringement.

To avoid the construction-induced shear banding, the government should announce the active faults and shear bands in the slope lands, while requesting engineers to fully investigate the degree of brittle fracture for the shear band soils or rocks prior to the construction. This is how we can avoid the neighbor damage issue resulted from the shear banding during construction periods.

The application cases of null-neighbor-damage methods

A total of 17 buildings (refer to Figure 15) have been constructed in Feng-Chia University ever since 1960. With sufficient distance preserved between any given two buildings, the foundation ultimate bearing area or vertical stress distribution of the building which is constructed earlier is in compliance with the regulation of null-neighbor-damage listed in section 3.1 or 3.2.

Secondly, in Figure 16 it is shown that Feng-Chia University is located on a flat modern alluvium (refer to website of Central Geological Survey of Taiwan, Observation System of Active Faults in Taiwan), and this kind of modern alluvium contains a 1m-thick fill soil (SF) and a rather thick layer of well graded gravel (GW) as shown in Figure 17; the maximum particle diameter of gravel layer is around 30cm, and the N value of standard penetration test is greater than 50, such that it is regarded as a very dense layer; the groundwater level is at 4m below ground surface without any pressure water level. With the excavation depths of all buildings less than 6m, and the rather large distance between foundations of each building, the water drainage operations during construction period are all in compliance with the rules of null-neighbor-damage in section 3.3 and 3.4.



Legend: 50 years old buildings: ①3-story Administrative Hall No. 1, ②4-story Administrative Hall No. 2, ③5-story Engineering Building, ④3-story Recreational Hall; 40 years old buildings: ⑤4-story library, ⑥4-story Architecture Building, ⑦4-story Science Building, 30 years old buildings: ⑧5-story Civil Engineering Building, ⑨4-story Humanities and Social Science Building, ⑩5-story Information Technology and Electrical Engineering Building, ⑪5-story Chiu Feng-Chia Memorial Hall, 20 years old buildings: ⑫12-story Renyan Building, ⑬8-story Zhongchin Building, ⑭5-story gymnasium, 10 years old buildings: ⑮8-story Science Building, ⑯11-story Business building, ⑰9-story Xuesi Building

Figure 15. Floor plan of main buildings in Feng-Chia University

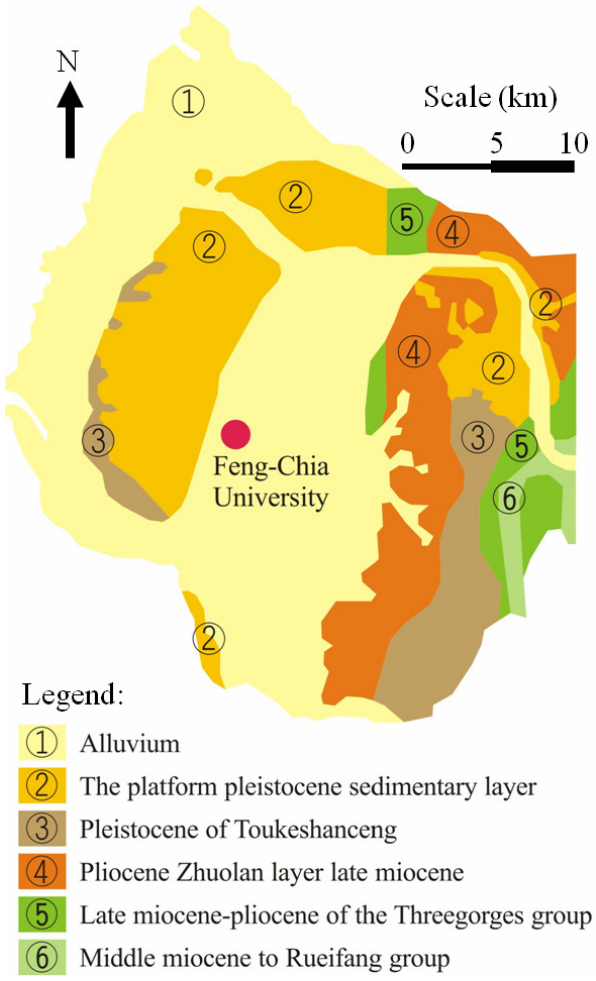


Figure 16. Geologic map of west Taichung, Taiwan (reproduced from System of Geology in Taiwan, Central Geological Survey of Taiwan)

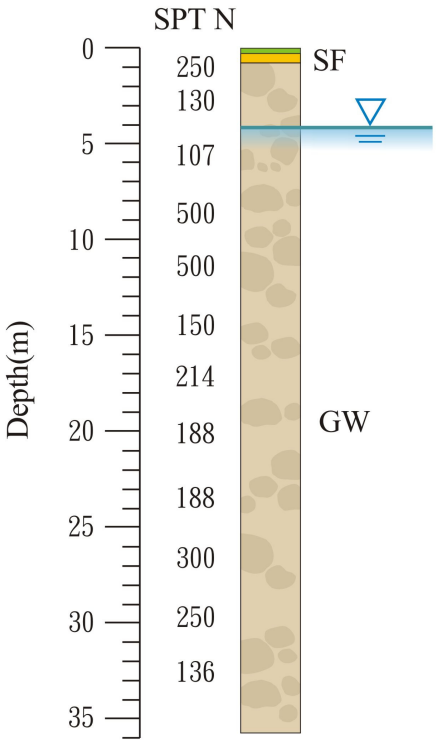


Figure 17. Drill hole cross section and the result of standard penetration test (reproduced from Central Weather Bureau of Taiwan)

In Figure 17 it is shown that there is a thick gravel layer at the location of Feng-Chia University, and N-values from standard penetration tests for different depths are all greater than 100. It is shown in Figure 18 that even with the support-less excavation of 5m deep into this gravel layer and with the excavated gravels being stacked on top of the hill, this gravel layer remains stable.

For a thick gravel layer with high values of the peak and residual angles of internal friction, the influence of shear banding which is propagating upward from underneath is gradually reduced. Thus the shallow foundation and the building on top will not be affected by the shear banding. The rule of null-neighbor-damage in section 3.5 can therefore be met during shear banding in an earthquake.

With all 17 buildings in Feng-Chia University meeting the null-neighbor-damage rules of section 3.1 to 3.5, there has not been any construction-induced neighbor damage issue among all buildings in 50 years since the school founding.

(a) Almost-vertical support-less excavation

(b) Localized magnified photo of Figure 18a

Figure 18. Excavation into a thick gravel layer

Conclusion

In this paper, first the actual cause of construction-induced neighbor damage is investigated based on a special case. The result indicates that the volcanic breccias stratum is pressure water layer with high permeability. The selection of improper grouting method

will result in continuously worsened neighbor damage issue even with the constant sealing grouting and re-injection of groundwater during construction period.

Secondly, for revealing the actual causes of construction-induced neighbor damage, by utilizing the proposed model of pressure water table declined by pumping water in a hillside together with the satellite images and epicenter distribution data, the main cause for the construction-induced neighbor damage to take place in areas beyond three times the excavation depth has been found to be that these areas happen to be located at the intersection of shear textures in a shear band.

In the end the null-neighbor-damage methods have also been proposed based on various factors including foundation load capacity, distribution of vertical stress, water level decline distribution due to water drainage, pressure water level distribution of slope land, and degree of brittle fracture of shear band rock. It has been shown by an actual case that null-neighbor-damage methods can indeed help prevent the occurrence of construction-induced neighbor damage issue.

Acknowledgements

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THE ROLE OF SELF COMPETENCE ON AFFECTIVE ORGANIZATIONAL COMMITMENT OF VOCATIONAL HIGH SCHOOL TEMPORARY TEACHERS

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Abstract

This study aims to determine the role of self-competence on affective organizational commitment. The study was conducted in the scope of vocational high school organizations in Surabaya. The sampling technique used purposive random sampling. The total sample involved 110 temporary teachers working in vocational high schools. In this study, the instruments used were questionnaires of self competence and affective organizational commitment. Each statement on both types of questionnaires provides a choice of seven alternative answers. The data analysis technique used linear regression analysis with SPSS program version 20. The findings suggest that self-competence has an important role in influencing the affective organizational commitment. This implies that teachers who have high self-competence will be more committed affectively to the school where they work.

Keyword: self competence, affective organizational commitment, teacher

Introduction

An organization consists of a variety of individual characteristics. The difference of individual characteristics can lead to the diverse attitude to each other. The different attitude of each individual in an organization needs to be managed properly in order to achieve the expected goals. Goals can be reached if the organization is capable of managing the individuals working in it as these individuals become assets of human resources that are important to note. One form of organization is school organization.

School organization selected as the focus of this study is vocational high schools since Indonesian government is recently improving the quality and function development of vocational high schools comparing to the general high schools. Another reason is that vocational high schools aim to produce graduate students who are ready to work. To achieve the goals, the role of teachers working in vocational high schools is deemed necessary. The teachers' role can function properly if these teachers have a commitment to the school organization where they work. The organizational commitment is a reflection of how an individual identifies himself to an organization and bound by its goals (Kreitner & Kinicki, 2003).

According to Meyer & Allen (1997) and Allen & Meyer (1991), there are three components of organizational commitment, namely affective commitment, continuance commitment and normative commitment. Affective commitment is related to the existence of emotional attachment, identification, and involvement of an employee to the organization. Continuance commitment is related to cost-benefit consideration if the employee leaves the organization, while normative commitment is related to his feeling of obligation to keep working in the organization. Dependent on the situation and condition of certain organizations, these three components can emerge at dissimilar degree. Therefore, one component or three of them can arise in different organization.

This study emphasizes more on affective commitment. The selection is due to the meta-analysis study conducted by Meyer et al. (2002) who indicate that among the three components of organizational commitment, the most prominent component is affective commitment.

Affective commitment refers to emotional attachment, identification, and involvement of employee to the organization (Allen & Meyer, 1991). In the scope of school organization, affective commitment is emotional attachment, identification, dedication and involvement of teachers to the school organization (Izzati & Suhariadi, 2015). The reason of selection of affective commitment in this study is with consideration that teachers are required to have a deeper commitment involving emotional attachment. Teachers who have emotional attachment to the school will have willingness to involve themselves by shedding all the skills to progress the school.

The importance of affective commitment in an organization is also supported by some research on the impacts that will arise if an individual does

not have affective commitment in an organization. Research by Luchak and Gellatly (2007) found some results that affective organizational commitment has a negative correlation with turnover and absenteeism while it shows positive correlation with performance. This might imply that the higher affective commitment owned by an individual, the lower absenteeism and turnover will be, and if an individual has high affective commitment, the individual will produce a high performance. Furthermore, study by Benjamin (2012) on bank employees in Nigeria suggests that affective organizational commitment has an important role in influencing the employees' organizational citizenship behavior and turnover in the banking institution. This shows that employees who have high affective organization commitment will improve the employees' organizational citizenship behavior and reduce the staff turnover.

There are various factors that can influence affective organization commitment, one of which is self competence. This is supported by some studies by experts. Research conducted by Moris & Sherman (1980) aimed to test individual characteristics which include age, education, role conflict, role ambiguity, structure initiative, judgment, and self competence to organizational commitment. The findings suggest that perception of self competence is the highest predictor of organizational commitment compared with other predictor variables. Meanwhile, Mathieu & Zajac (1990) conducted a meta-analysis study of factors which influence the formation of self competence and its impact on affective organization commitment. This study revealed that there was a strong relationship between self competence and affective organization commitment. Both studies indicate that self competence has an important role to improve affective commitment. The selection of self competence in this study is with consideration that teachers are required to have a pedagogical competence. At vocational high schools, teachers have to be able to equip their students with competence required in the workplace.

Self competence is defined as individual's subjective assessment of his competence related to his performance, self-esteem, and what he is capable of doing in certain situations (Ford, 1985; McCombs, 1986 in Battistelli et al., 2006). This study is different from previous researches, which show that self-competence viewed is still general. Meanwhile, in this study, self-competence is more specialized on competence as a teacher, which refers to one of the laws about teacher and lecturer in Indonesia.

According to Law No. 14 of 2005, teachers are required to have competence. Competence is a set of knowledge, skills, and behaviors that must be owned, internalized, and mastered by teachers in carrying out their duties. Self competence consists of four competence, namely pedagogical competence, personality competence, social competence, and professional competence. It can be explain in detail as follows: a) pedagogical competence is the ability of teachers to manage learning that include understanding of the learners, the design and implementation of teaching and learning, evaluation of learning, and the develop-

ment of learners in actuating their various potentials; b) personality competence is the ability of teachers to have stable personality, mature, noble, wise and dignified as well as become role models for the students; c) social competence is the ability of teachers to communicate and interact effectively and efficiently with students, fellow teachers, parents or guardians of students and the surrounding community; d) professional competence is the ability of teachers to master the learning materials broadly and deeply that allows the teachers to guide the students to meet the minimum competency standards that should be mastered by students. The four competences are important for teachers to perform their daily tasks. Due to their equal importance, this study views competence as a unity.

In this study, self competence is done through a self assessment of each individual. Self assessment is the assessment made by the individuals with the hope that they can get to know their own strengths and weaknesses so as to identify the aspects of what needs to be improved in the future. One of the merits of this method is that it can prevent the occurrence of self-justifying behavior (Rivai & Sagala, 2009). In this study, self assessment toward self competence used parameters that can help individuals identify their weaknesses, thereby minimizing the occurrence of self justifying behavior.

Based on the description above, the researcher was interested to determine whether there is an influence of self-competence on affective organizational commitment.

Method

This study uses quantitative research method. The research design of this study is a field study. The data collection was done by distributing questionnaires to the study sample. The characteristics of samples taken in this study involved temporary teachers working in private vocational high schools, aged at least 25 years old, and have a minimum education of undergraduate degree. In this study, the sampling technique used purposive random sampling taken from teachers working in vocational high schools in Surabaya. The number of samples in this study was 110 teachers. The instrument used in this study is a questionnaire of self competence developed by the researcher herself based on Law No. 14 of 2005. There are 24 statement items used to measure self-competence. Another questionnaire related to affective organizational commitment is used based on the concept by Allen & Meyer (1991) developed by Izzati & Suhariadi (2015). There are 20 statement items used to measure the teachers' affective commitment. Each statement on the scale of affective commitment and self-competence provides a choice of seven alternative answers. Measurement method used is self rating, where respondents choose one of the alternative answers among seven possible answers.

Data were analyzed using linear regression with SPSS 20. The collected data were analyzed using simple linear regression analysis to determine the effect of self-competence on affective organizational commitment.

Hypothesis

H1- Self-competence has an effect on teachers' affective commitment.

Results

This study used linear regression analysis with SPSS version 20.

Table 1. Regression Analysis

	β	t	Sig.
Self competence	0,810	110.21	0,000
R^2		0,99	
F		12145,99	
Significance		0,000	

Based on Table 1 above, the regression equation presented shows that self-competence has contributed β as much as 0.810. Therefore, it can be said that self competence has considerable effect on affective organizational commitment. Meanwhile, it is 10.209 (positive) with significant value of 0.000 smaller than the significance level used (α=0,05). This indicates that self competence has a strong influence on the affective organizational commitment. Thus, the hypothesis stating that there is an effect of self competence on affective organizational commitment is accepted.

Conclusions and suggestions

The results of this study indicate that self competence has an important role to affective organizational commitment. This suggests that teachers who have high self-competence will have a high affective commitment to the schools. Teachers who have high self competence will be able to demonstrate capability and knowledge required as a teacher which include pedagogical competence, personality competence, social competence, and professional competence so that it makes them attached emotionally to the vocational high school organizations where they work. Teachers who have high self competence are able to demonstrate self identification. The existence of high self competence enables these teachers to devote their capabilities and get involved in the school organizations as well as demonstrate high dedication towards the school.

This study also supports the results of research by Moris & Sherman (1980). The previous researches show that self competence has an influence on organizational commitment. Meanwhile, studies conducted by Mathieu & Zajac (1990) and Batistelli et al. (2006) also showed that self competence affect the affective organizational commitment. This study discusses specific self-competence that must be owned by teachers disregarding their status either as permanent or temporary teachers in Indonesia. This study also discusses specific commitment, that is, affective organizational commitment of vocational high schools.

This study contains a number of limitations that should be considered. First, the study was only conducted on temporary teachers working in vocational high schools in Surabaya in small quantity, while the whole number of temporary teachers working in vocational high schools amounts far more. Under these

conditions, the results of this study cannot be generalized but is limited to non permanent teachers of vocational high schools who became respondents of this study. Second, this study has not considered the demographic variables such as length of service and marital status which can affect the affective organizational commitment (Meyer et al., 2002). This was done since the researcher considered that of the three factors, the comparison of participants was very unbalanced, especially length of employment, age, and marital status. Based on this matter, it is possible to conduct a further research by considering a number of demographic factors.

This study can be considered a preliminary study and could continue for further research because to the knowledge of the researcher, study on temporary teacher's self competence with affective organizational commitment in vocational high schools has never been done in Surabaya. Although this study has some limitations but this research has contributed to the understanding and explanation of vocational high school teachers' affective organizational commitment, particularly in terms of internal factor, that is, self competence reviewed in the field of organizational behavior.

Based on the research and discussion above, several suggestions might be considered, as follow: 1) other researchers who are interested in the same issue are expected to conduct research involving more numerous participants temporary teacher in another country; 2) in addition, it is also advisable to involve other variables that can influence affective commitment such as personal values and demographic factors.

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THE COACHING PRINCIPAL: BUILDING TEACHER CAPACITY THROUGH THE TEXAS TEACHER EVALUATION AND SUPPORT SYSTEM (T-TESS)

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Abstract

In response to mandates from the United State Department of Education, Texas revamped its educator evaluation systems to better support teacher professional growth. This best practice research informs practitioners of strategies to build teacher capacity through the leadership coaching attributes necessary for effective implementation of the Texas Teacher Evaluation and Support System (T-TESS).

Key words: Coaching, mentoring, professional development, goal setting, observation, capacity building

Introduction

Texas is slated to fully launch the new Texas Teacher Evaluation and Support System (T-TESS), which is designed to support teachers in professional development and growth beginning with the 2016-17 school years. According to the Texas Education Agency (TEA), T-TESS uses three measures to gauge teacher effectiveness:

observation, goal setting and professional development, and student growth (TEA, 2015). Historically, teacher effectiveness has been determined by the educator's ability to impact gains in student achievement scores. While student achievement remains at the forefront of the national discourse on school accountability, improving student learning as evidenced by gains on standardized tests is but one measure of teacher effectiveness (Goe, Bell, & Little, 2008). The author's further postulated how crafting a well-designed teacher evaluation system must collectively engage the synergy of administrators and teachers in order to create a system that not only evaluates, but also enhances professional practice through individualized support.

Individualized support must begin with an understanding that changes in behavior are in response to an individual's response to events (Wong, 2006). In a related study, Cooper, Heron, and Heward (2007) discussed building behavior by shaping. Shaping refers to reinforcing small steps in the direction of the ultimately desired behavior. In most teaching situations, shaping is combined with modeling and coaching to produce collaborative inquiry (Cooper, et al., 2007). Therefore, principals must support teacher learning by inspiring and sustaining a school culture that functions as a reflective learning system. Learning systems are not independent communal organizations. By contrast, they are systems of interconnected components with entrenched structures involved in common problem solving to achieve joint objectives (Jaquith, Mindich, Wei, & Hammond, 2010).

In a similar study, Fullan (2014) argued that collaborative inquiry tasks the campus principal to become a systems leader who fosters leadership in others as a means of sustaining organizational change.

With intentionality, principals should define the teachers' role as one of learner and teacher, while redefining their own role as the architect of learner centered capacity building. Cooperatively, teachers and principals share what they know, identify challenges in need of further investigation, and connect newly acquired concepts and strategies to allow for significant growth and development. Fullan (2014) suggested five qualities that leaders must possess:

- The strong intellect of moral drive with consideration of the underlying forces of change
- Sensitive intelligence as they build connections
- Commitment to increasing and sharing fresh knowledge
- Ability for coherence building

Jaquith, et al. (2010) further suggested that teachers need time to integrate theory with classroom practice. Principals must provide this time, while coaching the educator toward exploration of knowledge about the nature of new learning and how it might be implemented in different domains.

Principals should also provide:

- Opportunities for teacher enquiry and collaboration
- Strategies to reflect teachers' questions and concerns
- Access to successful models of new practice

Therefore, the purpose of this research is to inform practitioners of strategies to build teacher capacity through the leadership coaching attributes necessary for effective implementation the Texas Teacher Evaluation and Support System with fidelity.

Teacher Effectiveness

The manner in which teacher effectiveness is defined impacts how it is to be evaluated. T-Tess measures teacher effectiveness in four domains: Planning, Instruction, Learning Environment, and Professional Practice & Responsibilities (TEA, 2015).

Table 1: T-TESS Evaluation Domains

Domain 1 Planning	**Domain 2 Instruction**	**Domain 3 Learning Environment**	**Domain 4 Professional Practice & Responsibilities**
1.1 Standards & Alignment	*2.1 Achieving Expectations*	*3.1 Classroom Environment, Routines, & Procedures*	*4.1 Professional Demeanor & Ethics*
1.2 Data & Assessment	*2.2 Content Knowledge Expectations*	*3.2 Managing Student Behavior*	*4.2 Goal Setting*
1.3 Knowledge of Students	*2.3 Communication*	*3.3 Classroom Culture*	*4.3 Professional Development*
1.4 Activities	*2.4 Differentiation*		*4.4 School Community Involvement*
	2.5 Monitor & Adjust		

While teacher effectiveness is often difficult to define, measurement can be influenced by the development of new instruments and technologies (Goe, Biggers, & Croft, 2012). "The five-point definition of teacher effectiveness consists of the following:

- Effective teachers have high expectations for all students and helps students learn, as measured by value-added or other test-based growth measures, or by alternative measures.
- Effective teachers contribute to positive academic, attitudinal, and social outcomes for students such as regular attendance, on-time promotion to the next grade, on-time graduation, self-efficacy, and cooperative behavior.
- Effective teachers use diverse resources to plan and structure engaging learning opportunities; monitor student progress formatively, adapting instruction as needed; and evaluate learning using multiple sources of evidence.
- Effective teachers contribute to the development of classrooms and schools that value diversity and civic-mindedness.
- Effective teachers collaborate with other teachers, administrators, parents, and education professionals to ensure student success, particularly the success of students with special needs and those at high risk for failure" (Goe, et al., 2008, p.8).

Specifically, T-TESS undergirds teacher effectiveness by ensuring that teaching extends beyond achievement gains toward a deeper understanding of how the educator impacts learning through improving student attitudes, motivation, and confidence.

Observation

Classroom observations continue to be the most common platform for evaluating teachers and are considered the most direct

manner to measure teaching practice because the evaluator can see the full dynamic of the classroom. However, the frequency and method of evaluating teacher performance should depend on what administrators want to learn from the process (Heneman, Milanowski, Kimball, & Odden, 2006). Perhaps the most notable difference between T-TESS and recent teacher evaluation instruments (PDAS) is the requirement for principals and other evaluators to provide factual evidence to support the evaluation through scripting. Scripting is not new in formal evaluations; however, the value of scripting in T-TESS is to support how a teacher contributes to student learning while lessening subjective judgments from the evaluator. Secondly, by using direct statements and reflections from the observation allows for conversation starters between the evaluator and educator. Often, educators view the evaluation cycle as a power struggle. What did I do, versus what did my principal (or other evaluator) witness during instruction? Scripting evidence compels principals to be aware of the power structures that control their ability to act on behalf of the organization, while ensuring that observations provide useful and significant tools for improving teacher practice (Moore, Gallagher, and Bagin, 2014).

Goal Setting

To implement T-Tess with fidelity, perhaps the most crucial knowledge that principals must acquire is to understand the inductive relationship between goal setting and improved teacher performance (Locke & Latham, 2006). Goal setting bridges the gap between task perception and actual performance. More importantly, goal setting contributes to increased teacher motivation and workplace satisfaction. With regard to T-TESS, goal setting is cyclical and not only requires that the educator reflect on current practice, but also to establish a professional development plan to achieve stated goals. As hypothesized by Locke and Latham (2006), goals must be inclusive of the following dimensions: clarity, challenge, commitment, feedback and complexity. Goals need to be clear and measurable; but more importantly, subordinates must share an integral part in the goal-setting process in order to be committed to goal attainment. Most notably, principals must provide frequent feedback through multiple checkpoints, recognize opportunities to celebrate growth, and commit time and resources to assist educators in the realization of their goals.

Implications for Practice

Leadership should be geared towards fostering change; unlike management that tends to preserve or manage a certain state of order. Change is one of the main aspects of leadership but change that is focused towards achievement of a certain goal while promulgating growth in all parties is value adding (Jacob & Lefgren, 2008). Principals should view T-TESS as the opportunity for value-added leadership by embracing the notion of truly becoming the instructional leader…or even better – leadership coach of the campus. Leadership coaching is targeted coaching that builds stronger organizations by developing capacity in others (Bolman & Deal, 2011). Coaching others to success also triggers psycho-physiological effects in the body that facilitates healing and sustainability (Boyatzis, Smith, & Blaize, 2006; Hargreaves, 2007).

With certainty, principals must embrace the coaching of teachers as the focal point of retaining educators and reducing the attrition rate for early career professionals in the school setting (Kutsyuruba & Walker, 2015). Moreover, through the richness of

collective inquiry, coaching establishes an environment of trust. Through collaboration, principals and teachers begin to focus on the "why' and "how" aspects of learning. Principals must become intentional about reducing teacher isolation by encouraging educators to assume the role of learner. In keeping with the continuous improvement mindset of T-TESS, the principal should allow for self-report of practice. Self-report measures ask teachers to report on what they are doing in the classroom by collecting and assembling artifacts, such as portfolios and examples of student learning. Artifacts provide a glimpse into actual classroom practice (Borko, Stecher, & Kuffner, 2007). Likewise, portfolios not only exhibit evidence of teaching practices and student progress; portfolios also require teachers to reflect on the inclusion of certain materials and how they relate to particular standards. Both are excellent tools to consider for the end of year conferences.

Admittedly, higher education must do a better job, as well. Dodson (2015) acknowledged that the field experience component of school principal preparation programs must be strengthened. Specifically, four key areas are illuminated as critical: (1) budget and finance training, (2) teacher observation and evaluation training, (3) curriculum training and (4) student discipline. Each of the areas mentioned represents major functions that can have an effect on school climate and culture and may even hinder student learning and achievement. However, specific to this research is the need for improved training and support for school principals in the areas of instructional observation and evaluation training. For too many years policy makers have focused on doing what is best for children without assuming how the improvement of professional practice for teachers accomplishes the same. T-TESS is new. T-TESS is different. In education, change is often viewed as a novelty. T-TESS is only a novelty if it's allowed to be.

Intentional coaching that should frame <u>*every*</u> effective school will challenge the process, model the way, inspire a shared vision, and enable others to act, and encourage the heart. (Kouzes & Posner, 2012).

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INTEGRATING THE TALENT MANAGEMENT PROGRAM AS A NEW CONCEPT TO DEVELOP A SUSTAINABLE HUMAN RESOURCE AT HIGHER EDUCATIONAL INSTITUTIONS

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Abstract

Both the higher education institutions and students have been significantly increasing from year to year in order to meet the intensive needs of industrial development. These soaring universities and student population, on the other hand, accordingly burden the national finance and dilute educational resources. To respond it, the higher institutions as an educational organization that has a high hope to work professionally and to improve the quality of its employees should manage the existing resources. A solution proposed in the development of human resource quality is by implementing the integrated talent management program as a new concept to develop human resources in the higher educational institution. This article is to discuss about the importance of the role of talent management, to plan human resource for the talent management, and to implement the talent management program that is integrated in the higher educational institution that has a high hope to create graduates appropriate labor market needs. The talent management program is also more optimal if it supported by a good communication between all managers and employees in the organizational environment.

Key Words: Talent Management, Human Resource, Higher Educational Institution, Integrated, Organization

Introduction

As stated in Law on the national educational system in Indonesia (2003), higher education refers to an educational stage, post-secondary education, including the educational program of diploma, diploma, bachelor, magister, specialist, and doctor. The National Center for Public Policy and Higher Education (2008) also explains that higher education has to become one of the most intellectual and creative resources to cope with any challenge being faced by people to enhance the opportunity of state in pursuing and reaching the high-qualified education. The aim of higher educational institution, meanwhile, is to support the students to be successful in life either in work place, society or even in their personal life (EDUCAUSE, 2010). Higher educational institution, in other words, has a high expectation for being a media that mostly can help an individual to reach his or her future goal enabling him or her to work professi-onally (Immerwahr & Foleno, 2000).

In this globalization era, it is deemed essential for a developing country to prepare the knowledge-based economic era in higher educational institution to generate resource and strengthen the better educational quality (Pausits & Pellert, 2009). Higher educational institution in Indonesia currently has been rapidly increasing in number from 2.566 institutions in 2005 (Ministry of Education and Culture, 2012) to be 4.327 institutions with 5.454.688 students in 2015 (Directorate General of Higher Education, 2015). The rapid growth in the number of educational institutions and number of students, however, is potential to weaken the educational resources and threat the educational quality. Human resource in higher institutions is required to integrate the existing resource for a better educational quality. Hence, a range of internal and external activities needs to be managed through the quality enhancement of the teaching staffs and administrative staffs of higher institutions to obtain the largest benefits from the limited resources for the improvement of educational quality.

In common, the enhancement of the quality of the teaching staff and administrative staffs is conducted through the training of human resources, in this case, presented energetically and explained in a more interesting method (Dunn, 2011) in addition to be relevant with the development of their work field (Dumitru, 2014). Professional training becomes a solution in the reform era and modern educational system. The sustainable training concept is defined as a set of theoretical and practical activities, instituted in an educational system in which they can be directly involved in order to broaden their knowledge, attitude and professional skill in line with the qualified educational management (Rotaru, 2014).

However, in consideration to the conflict saying that the development of human resources conducted in higher

institution in Indonesia commonly is less effective and not oriented to the optimization of manpower competencies, two questions are emerged on how to make the human resource as a talent of higher institution more effective and optimal and what kind of human resource management system that can enhance the quality of human resource in higher institution is. The main of this article is to describe how the implementation talent management program is integrated as a new concept to sustainably develop human resource in higher educational institution in Indonesia.

The Importance of Talent Management for the Enhancement of Human Resource in Higher Educational Institution

Talent management is highly crucial in a decision making that involves an individual to run the mission or task of organization (Boudreau & Ramstad, 2005). Talent management is not merely about the best practice, but also about compatibility with the strategic objective, organizational culture, rules and organization capacity (Garrow & Hirsch, 2008). A number of different approaches related to talent management are presented in Table 1 in which each of approach shows its weaknesses and strengths. A talent management approach will produce a better output that tends to be compatible in an organization that has a competitive culture, diversity and teamwork such as higher institution (Larsen, London, Weinstein, & Raghuram, 1998). Meanwhile, some different definitions of talent are found in literature of academic human resource management as seen in Table 2.

As stated by Odden (2013), many schools and higher educational institutions still have unqualified human resources. Some have done some initiateves to reform for having the talent management as the main element. The achievement of higher educational institution to be able to compete internationally is for being focused on the talent management in which the concept of its development approaches the balance between planning and action. Talent management has been proven to be effective to realize the talent of institution and contributes to the work performance that will build the qualified institutional capacity of higher educational institution in future (Utterfield, 2008).

Some benefits obtained by the higher educational institution that has implementted the talent management include: (1) to support the effective planning of human resource in higher educational institution; (2) to help the higher educational institution to develop the talent pool; (3) to develop the better career and career management program; (4) to support the sustainable business; (5) to focus on the provision of excellences in public service; (6) to support the improvement of human resources; (7) to make the work performance of the employees and the objective of higher educational institution balanced and (8) to improve the productivity of employees (Dhanabhakyam & Kokilambal, 2014; Public Service Secretariat, 2008).

Table 1. Summary of relevant theoretical perspectives on talent by Dries, 2013.

Literature stream	*Operationalization of talent*	*Main criterion*	*Main contribution*	*Main gap*
HRM	Talent as capital	Contribution to organization	Links individual talent to organizational context	Lack of theory and empirical evidence
I/O psychology	Talent as individual difference	Predictive validity	Long research tradition in personnel selection, promotion systems, and performance appraisal	Criterion problem-talent for what?
Educational psychology	Talent as giftedness	Domain-specific excellence	Strong (causal) theoretical frameworks	Mostly conceptual work; no research in adult populations
Vocational psychology	Talent as identity	Self-concept crystallization	Recognition of the dynamic nature of talent, as a construct, over the course of a person's life	Mostly narrative research; difficult to reconcile with more positivistic approaches
Positive psychology	Talent as strength	Self-actualization	Treats positive outliers as research subjects of choice, rather than measurement error	Assumption of strength-based approach as 'win–win' for individuals and organizations
Social psychology	Talent as the perception of talent	Rater accuracy	Brings in element of social perception—i.e., talent that is not acknowledged does not 'exist'	Generalization of experimental findings to real-life settings?

Table 2. Different definitions of talent according to literatures

Definition of talent	*Source*
"(…) superior mastery of systematically developed abilities or skills" (p. 67)	Gagné (2000)
"describe those people who do one or other of the following: regularly demonstrate exceptional ability – and achievement – either over a range of activities and situations, or within a specialized and narrow field of expertise; consistently indicate high competence in areas of activity that strongly suggest transferable, comparable ability in situations where they have yet to be tested and proved to be highly effective, i.e. potential." (p. 35)	Williams (2000)
"Talent should refer to a person's recurring patterns of thought, feeling, or behavior that can be productively applied." (p. 21)	Buckingham & Vosburgh (2001)
The implemented capacity of a committed professional or group of professionals that achieve superior results in a particular environment and organization. (p. 428)	Jericó (2001)
"(…) the sum of a person's abilities—his or her intrinsic gifts, skills, knowledge, experience, intelligence, judgment, attitude, character and drive. It also includes his or her ability to learn and grow." (p. xii)	Michaels, Handfield-Jones, & Axelrod (2001)

"(…) is essentially a euphemism for 'people'" (p. 141)	Lewis & Heckman (2006)
"Talent can be considered as a complex amalgam of employees' skills, knowledge, cognitive ability and potential. Employees' values and work preferences are also of major importance." (p. 2)	Tansley, Harris, Stewart, & Turner (2006)
"A select group of employees – those that rank at the top in terms of capability and performance – rather than the entire workforce". (p. 4)	Stahl, Björkman, Farndale, Morris, Paauwe, & Stiles (2007)
"Talent consists of those individuals who can make a difference to organizational performance, either through their immediate contribution or in the longer-term by demonstrating the highest levels of potential." (p. 8)	Stahl, Harris, Stewart, & Turner (2007)
"Talent equals competence (able to do the job) times commitment (willing to do the job) times contribution (finding meaning and purpose in their work)" (p. 3)	Ulrich (2007)
"Essentially, talent means the total of all the experience, knowledge, skills, and behaviors that a person has and brings to work." (p. 46)	Cheese, Thomas, & Craig (2008)
A set of competencies that, being developed and applied, allow the person to perform a certain role in an excellent way. (p 22)	González-Cruz, Martínez-Fuentes, & Pardo-del-Val (2009)
"An individual's skills and abilities (talents) and what the person is capable of doing or contributing to the organization." (p. 14)	Silzer & Dowell (2010)
"Talent = competence (knowledge, skills and values required for todays' and tomorrows' job; right skills, right place, right job, right time) × commitment (willing to do the job) × contribution (finding meaning and purpose in their job)" (p. 60)	Ulrich & Smallwood (2012)

Planning the Human Resource for Talent Management of Higher Educational Institution

The process of traditional human resource planning mostly used by higher educational institutions only presents a little illustration of talent requirement. The plan of human resource conducted is only limited to the budget requirement such as the amount of the existing budget and many people participating in the resource development. In contrast, the modern human resource planning is used to predict the needs of talent of higher educational institution in future for the long-term achievement. This plan is conducted to prevent any talent decline and to guarantee the strength to stimulate the talent competency (Ruse & Jansen, 2008). The analysis process of human resource plan to predict the future talent of higher educational institution is illustrated in Figure 1.

As shown in Figure 1 the plan of human resource for the talent management in higher educational institution can be done through four phases: (1) *Type of Talent* – to determine the type of the talent required to interpret the strategy becoming operational requirement,

identify and prioritize the scope of talent and role that will be the key to fulfil this requirement; (2) *The number of People* – to describe the number of people needed during the process of operational planning of higher educational institution through the assessment of current talents, to identify the capacity that will be required in future and to check the potential of change occurred and influencing the number of people required in each part of talent; (3) the gap and priority – it is to identify the gap and priority of the talent and to determine the best approach to cover the gap by considering the relative size, strategic values and the importance of each gap and check the cost directly or indirectly in employing and develop the existing talents and (4) *Action and Investment* – to determine what action and investment are needed to be taken to harmonize the entire strategy, strategy of human resource and the process of talent management in line with the operational requirement focused on the talent management to cope with any needs in each part of talent, assess each performance and recommend the action for the work performance improvement.

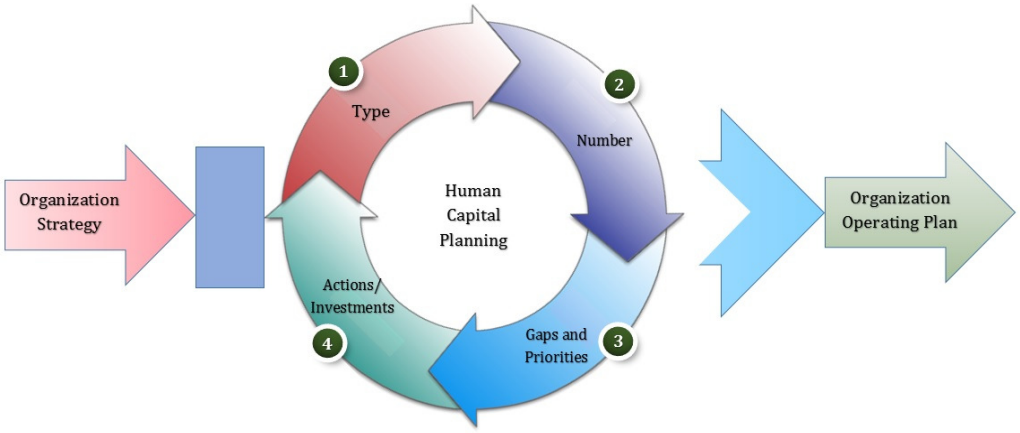

Figure 1. Human capital planning process to talent management in higher educational institution.

Strategy to Implement the Program of Talent Management in Higher Educational Institution

Talent Management Strategy

Talent management strategy is defined as an activity and process to involve the systematic identification of key position with different contribution for the benefit of competition of organizational sustainability and the development of highest talent potential and to ensure their commitment for the organization. The key position is not only limited to the top management team but also included the key position at the subordinate level (Collings & Mellahi, 2009). Chartered Institute of Personnel and Development (2012) stated that to obtain the competitive excellences, an organization needs to develop a strategic approach to talent management complementing the organizational values and in

line with the main goal of organization to make human resource can reach their potential optimally.

Meanwhile, the activity of talent management strategy is implemented by involving human resources as the main driving force of organization and by promoting a strategy and systematic approach to build and maintain the workers as a very important resource of organization (Fox, Bunton, & Dandar, 2011). UKCES (2012) argues that there are two types of talent management stra-tegies that can be used. First, *single stage strategy*, a talent management approach that has one flow of talent focused on the development of the recognized leader or professional potentials. Commonly, it is related to the achievement qualification, membership of professional institution and time required for the achievement qualification. Second, *strategy of some stages*, an approach of talent management that has some talent flows for any pools of human resources in organization of higher educational institution such as graduates, senior management and general staff aimed to maintain any skills-not merely leadership and management.

The organization of higher educational institution in implementing the strategy of talent management must develop a set of focused and integrated practice that resulted in a measured output (Ford et al., 2010). To reach an accurate integration, an organization must ensure that the talent management is the main responsibility of human re-sources including recruitment, work performance of management, substi-tution planning, development of profes-sional and diversity. This will ensure that the talent management strategy will possibly emerge the development of individual and organization of higher educational institution entirely.

UKCES (2012) stated that there are five different methods that can be selected to implement the talent management strategy:

- ✓ *The inclusive approach* in which all people in higher educational institution are viewed as a part of talent management program.
- ✓ *The executive talent pool approach* in which the focus of talent management is at the level of senior management.
- ✓ The future leaders' approach in which the staff of all levels in higher educational institution identified to have potential to be a leader as a part of initiative of talent management.
- ✓ *The succession planning approach* in which the key role (role of senior management) is identified as a needs of staff with skills and competency to take a position when someone leaves the work or retired.
- ✓ *The blended approach* in which two or more than four approaches have been previously used in the combination of one to other.

Strategy to integrate the talent management program

Strategy to implement a talent management has been developed through the phase of research and practice of efficiency of organization including the individual development in organization, process, information and structure help-

ing an organization to develop and maintain the human resources as an important and productive matter (Fox, Bunton, & Dandar, 2011). A number of methods that can be applied to imple-ment the talent management in higher educational institution is by recruiting the qualified human resource, an oppor-tunity given by higher educational insti-tution to educational staff to develop their career through any programs as an effort to support and stimulate the qua-lity of the talent of higher educational institution and the proactive role of ad-ministrative staff to develop their talent to support the development of the capa-city of the talent of their institution (Edwards, 2008). Meanwhile, Huse and Jansen (2008) mentioned that the first step to implement the talent management is by using the plan of human resource of higher educational institution. This step was done to predict the needs of their future talent to support the aim of established higher educational institution capacity.

Talent management is not merely to withdraw and maintain the talent but also to research, develop and implement idea of a set of human resources and to see how this idea is jointly compatible to manage the talent provided in higher educational institution. The strategy of implementing the talent management to enhance the potential of worker is not only benefiting the workers but also to support the purpose achievement and the target of higher educational institution (Public Service Secretariat, 2008). Thus, the development of talent management program can be used by the higher educational institution as a key strategy to cope with the problem of human resource. Meanwhile, managing the human resource and available talent is a priority needed to be done in higher educational institution. An illustration of human resource development strategy for the integration of talent management program in higher educational institution is presented in Figure 2.

Figure 2 shows the frame of the strategic development towards the talent management development program integrated between the planning process of human resource or worker and the development of talent management program. This process is conducted to integrate the talent management program in higher educational institution consisting of five phases: (1) being a preferred leader, (2) developing internal talent pools, (3) building external talent pools, (4) organizational culture, and (5) organizational readiness (Public Service Secretariat, 2008).

Being a preferred leader

Being an ideal leader is an integral part of competition for talent. This is needed to recruit some new employees for the higher educational institution and to maintain the talent of the existing human resource in higher educational institution today. Being a leader where people are willing to work well is more than leading and paying the employees. There are many factors influencing the traction and retention of the employees such as compensation. Compensation that is important for the competition sometimes is not used as the most important single factor for the employees or the candidate of the employees. People would like to

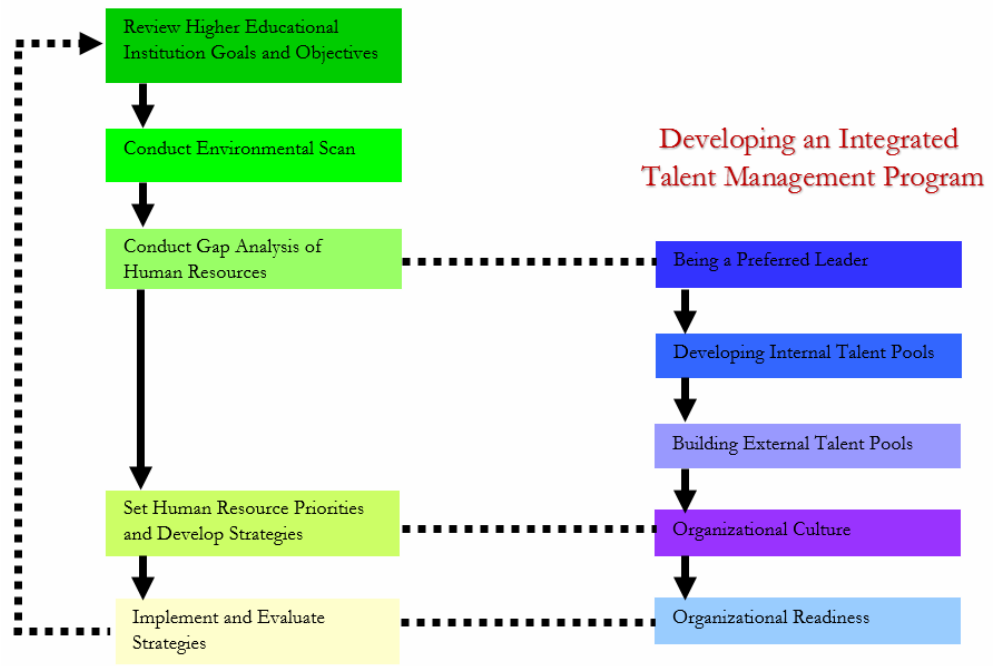

Figure 2. Framework to develop a strategic for talent management program in higher educational institution.

work in an organization where they are proud of working in.Other factors for the leader that influences the decision of an individual to be committed to work well in an orga-nization include: (1) support for the pro-fessional development; (2) give an op-portunity for career develop-ment; (3) respected and accountable; (4) compe-tent in leading the individual work; (5) competent to influence the initiative and direction of an organiza-tion; (6) flexible workplace; (7) having work innovation; (8) having good com-munication skill and (9) give recogni-tion and respect with the work perform-ance of employees (Public Service Se-cretariat, 2008).

Developing internal talent pools

Building the existing organization-nal talent can support the effort of orga-nization to plan and cope with the needs of required skills. Furthermore, the in-vestment of human resource of organiza-tion today is also benefitting the em-ployees in which this in turn improves the retention and work performance of individual and organization.

In terms of the internal talent man-agement, Public Service Secretariat (2008) mentioned that there are three main influencing elements: (1) the de-velopment of professional, including: assessment access; center and tools, tar-geted training and learning, educa-tional supports, programs and coun-selling; (2) the development of high potential in-

cluding: the program of career task, functional-cross opportuni-ties, involvement in national and inter-national programs, counselling parti-cipation in professional organization, involvement with group, internal work committee and society; (3) work perfor-mance management including improve-ment of work performance through the determination of individual and priori-tized objective, competency assessment and work performance feedback, appreciation and recognition; workload analysis and fully supporting the work in a full scope.

Building external talent pools

The key to build a talent pool to support the development of long-term organization or higher educational institution is to have an effective leader that supports to put a foundation occurred. The development of university students to get involve in the first stage of their study is necessary to build the external talent pool. Encouraging the students to reach their career in public service that helps the higher educational institution in building the base of potential talent and offers to the higher educational institution are an opportunity to not only start a long-term development for students but also develop a set of certain skill needed in public service.

The strategy to improve the role of students in the development of external talent pool is through: (1) student work, (2) part-time work and (3) other supporting program such as traineeship, fellowships, scholarship, student exchange program and joint project. In addition, higher educational institution can also have cooperation with upper secondary school to develop specific competency to prepare the well-prepared graduates in labor market, actively participating in exhibition and career expo and participating in student intern-ship to start specific training needed by society (Public Service Secretariat, 2008).

Organizational culture

An important component in managing an organization talent is by developing the strategy to develop the cultural elements of organization and work environment. The improvement of work performance in organization is a result of the labor/worker satisfaction determined by a number of factors involved: work relationship, work environment and quality of work life.

Public Service Secretariat (2008) explained some questions that can be developed to understand the organizational culture include: (1) what values does the organization have? (2) What are process and organizational culture supporting the values? (3) Is organization diverse? (4) Is the organization flexible? (5) What are the creative values and innovation of organization? (6) To what extent the effectiveness of organizational leadership in determining the vision for higher educational institution and in articulating the vision for administrative staff? (7) What kind of management practice and style of supervision that can be proven? (8) How effective is the internal communication method applied in organization? And (9) what are effort and decision-making process taken by organization?.

Organizational Readiness

Preparation for the development of integrated talent management program is conducted through the understanding, preparedness of organization, other resources preparation and moving forward. Thus, the preparedness of organization is a component that determines in supporting the realization of a development program.

For the first step prior to start developing the integrated talent management program, it is essential for the leader to have a good understanding about the essence of talent management for organization and commitment in the process. The next step is the preparedness of organization that can be recognized by giving a number of questions: (1) To what extent the preparedness of higher educational institution to start the development process?; (2) has the higher educational institution supported the existing human resources program?; (3) are the employees of the higher educa-tional institution actively involved in this program?; (4) to what extent is the accountability of the top management/ leaders for the development of their employees?; (5) How is the commitment level of the leaders?; (6) do the existing organization culture support?; and (7) how is the openness of the leaders of higher educational institution for change?. The third step is other human resource strategy by asking what other strategies are needed to be developed for supporting the integrated talent manage-ment program. Meanwhile, the last step is moving forward to ensure the human resource planning as a sustainable pro-cess.

The human resource planning is also important in identifying the critical needs and resource needs including showing the gap in skill and predicted requirements. The data collection from other resources is also conducted to ensure that this program is proven informed. If the information accepted is invalid to be used in developing a program, then the effectiveness of the program comes to be limited or even nothing. For this, the development of the project plan needs to be done through an evaluation and sustainable program modification (Public Service Secretariat, 2008).

Conclusion

The implementation of integrated talent management as a new concept for human resource development in high educational institution will give some benefits in supporting an effective human resource development, assisting the high educational institution to develop the talent groups, developing the better career and career management program, supporting the effort being done, focusing on the provision of the excellences in public service, harmonizing the employees and the organization goal of higher educational institution and improving the productivity of employees. (Dhanabhakyam & Kokilambal, 2014; Public Service Secretariat, 2008).

The phase of human resource planning for the integrated talent management in higher educational institution can be implemented through four phases: the type of talent needed to implement the strategy, number of people needed during the process of operational

planning, gap and priority of the talent and actions and investment needed to be taken to completely harmo-nize the strategy (Ruse & Jansen, 2008).

The frame of the development of integrated talent management program strategy between the process of the human resource planning and the development of the talent management program consists of five phases: being a preferred leader, developing internal talent pools, building external talent pools, organizational culture, and organizational readiness (Public Service Secretariat, 2008).

The implementation of integrated talent management also needs to sustainably manage and evaluate the priority of talent management started from how the higher educational institution can describe the competency of work performance and capacity of the resource in future. This evaluation is focused on the strengths and differences both in present and in being developed. It has some phases including planning, determining the purpose, investing, conducting and measuring the output to be compared with initial prediction (Butterfield, 2008; Oracle Corporation, 2012). Furthermore, the optimization of higher educational institution talent is created also due to the entire activities supported by a good communication among all university members (leaders, educational staffs and administrative staff) in the environment of higher educational institution (Kim, Williams, Rothwell, & Penaloza, 2014).

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HOW WORKERS ENGAGE IN SOCIAL NETWORKING SITES AT WORK: A USES AND GRATIFICATION EXPECTANCY PERSPECTIVE

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Abstract

As social networking sites (SNSs) are becoming more popular at workplace, it is important to understand what motivates professionals to engage in SNSs and the factors influencing SNSs use. Recently there has been a dramatic proliferation in the number of SNSs users; however, little is published about what motivates workers to use SNSs at work. The purpose of this study is to investigate workers' motives for using SNSs in Taiwan. We proposed and tested a model that measured the workers' motivation perspectives by examining the influence of these factors in an empirical survey of 131 SNSs workers. The causal model was validated using PLS-Graph 2.91; six out of nine study hypotheses were supported. The results indicated that perceived ease of use, perceived usefulness, personal integrative uses and gratifications expectancy, and entertainment uses and gratifications expectancy significantly influenced the attitude to use SNSs while others did not. In addition, the results also showed that the attitude of using SNSs affected behavioral intention, and SNSs use activities were influenced by behavioral intention.

Key Words: Social networking sites, SNSs usage, Workers

Introduction

SNSs, also known as social networking sites, belong to social software that enables people to gather, connect or collaborate. In the era of knowledge economy, SNSs are expected to play important parts in providing relevant information and knowledge for people. The growing phenomenon of SNSs offers a chance to complement knowledge management with tools that are simpler and more flexible. The recent, rapid rise of online social networking tools has been made doing this on a large scale easy and efficient. In contrast to traditional expertise finding tools, SNSs provide a wider range of functions. SNSs (Facebook, MySpace, LinkedIn and the like) have become truly significant new phenomena in human communication and interaction patterns and may have a profound impact in the way people communicate and connect with each other. It is thought that SNSs is easily used for the knowledge management and collaboration.

The use of SNSs for various purposes, people may focus on building and strengthening a particular kind of relationships in collaboration. More particularly, in professional setting, people gain more precise awareness of others' information, knowledge, and expertise that are useful for task completion or intellectual support. There has been increasing interest within organizations in the development and support of communities to promote collaboration, improve social interaction, increase productivity, and to improve organizational performance. To workers as they attempt to not only generate creative solutions but also develop new products and services. Obviously, SNSs enables individual to send, respond and share knowledge and information each other. SNSs would be important mechanisms that enable personnel to mutually share and create useful knowledge for their works. Therefore, we argue that workers require unique combinations, or syntheses, of existing knowledge by using SNSs possibly. In SNSs, interaction between users is an exchange process which shares valuable information, individual contribute and exchanges their knowledge with others. Also, users can extend their social networking that connects friends in SNSs for sociability. In other words, people may use SNSs for communication personally as well as professionally to seek information or get answers to the questions that they have. SNSs provide unprecedented platforms for users to collaborate, create, publish, exchange, and share any type of information and knowledge.

While SNSs have been hot issues in online social network research in general, there is little work investigating the SNSs usage of this practice at workplace. As Richter and Koch (2008) mentioned, due to the importance of SNSs for companies, IS research should try to provide practitioners with some insights into success factors of SNSs introduction and usage. However, until now not much work has been published in this direction. In Taiwan, few studies have examined SNSs adoption for workers at work. This study constructs a comprehensive model which incorporates TAM and UGE theories from motivational perspectives and thus enhancing its predictive power. Among them, UGE approach is benefi-

cial to exploring relative questions because its principle elements include people's psychological and social needs as well as how media can gratify needs and motives to communication. This theory is particularly suitable for studying SNSs.

Literature Review

Recently SNSs have been introducing by many firms for means of sharing information inside the firm. SNSs allow users to generate, share and combine information. According to FaceTime (2008) report, enterprise employees using SNSs at workplace is a fact and there is a significant amount of usage of SNSs at workplace-79% and 82% of users use SNSs at work for business and personal reasons, respectively. The following sections describe SNSs concept and identify the important factors that affect SNSs usage from different perspectives and theories.

SNSs at Work

In addition to social uses, many users are harnessing SNSs as source of information and knowledge. In the past two years, SNSs has established a significant presence in enterprises. Managers send messages to their employees by SNSs, and they function as bulletin boards similar to an administration report, an in-house rule, and news of one's death information, etc. The members who take charge of the same job must share specific information such as the daily report, the project, the information about customers, and the technical intelligence using SNSs. Focusing on the use of SNSs at work, Skeels and Grudin (2009) found that Microsoft employees use general SNS (e.g. Facebook) extensively to "maintain awareness of colleagues and to build rapport and stronger working relationships". At the other hand, DiMicco et al. (2008) found that IBM employees use their internal social network, Beehive, mainly as a social tool "to strengthen their weak ties and to reach out to employees they do not know". Skeels and Grudin (2009) point out those one-third employees in the enterprise use Facebook and LinkedIn doing with social networking. From these studies we can see that SNSs usage at workplace is either for social purposes to connect with others or for work-related to seek information and get answers to the questions that they may have.

SNSs are used either for work-related purpose to seek information or for social purpose to connect with co-workers (Wang & Kobsa, 2009). Social network, the essence of SNSs, is about all kinds of relationships between people. In this way, social network has been transformed into "knowledge network" where the relationship is the channel of flow of information and knowledge. Therefore, in the study two purposes of SNSs use are discussed at work along the dimension of professional/personal closeness based on Wu, DiMicco, and Millen (2010). One is for work-related purpose that work together and exchange information relating to work tasks and critical job-related information. The other is for personal purpose that also communicate regularly, and the primary basis of their communication is for emotional, or non-task oriented, support.

Motivation Theory

Psychologists often explain the differences in behavior strength with the concept of motivation and consider strong behavior as the result of high level motivation. Previous research has widely used motivation theory to explain individual's behavior of accepting information technology. They found that both extrinsic and intrinsic factors affect the motivation to use information technology systems (Davis et al., 1992). For the SNSs studies, Dholakis et al. (2004)'s research shows that the personal motivations influencing users of SNS websites are purpose value, self-identification, interpersonal relationship maintenance, social reinforcement and entertainment value. Kwon and Wen (2009) suggests that the components of SNS website users' motivations are social identify, altruism, and perceived identification. After surveying 178 SNS website users, Chen and Yin (2010) hold that SNS users' motivations can be classified into six types: information and instrumental motivation, recreational and aesthetic motivation, socializing motivation, altruism motivation, ascription and identification motivation, and intrinsic motivation. Such as mentioned, there are no universal sets of motivations for use SNSs, where motivations vary across situations (Omoush et al., 2012). What's the relationship between SNSs users' motivation and behavior? In this study, we will specify the key factors divided the motivations underlying individual's behavior into extrinsic and intrinsic motivations from motivational perspective in understanding the use of SNSs (Deci, 1975). Among them, extrinsic motivation refers to committing an action because of its perceived helpfulness in achieving value, while intrinsic motivation refers to committing an action because of interest in the action itself, rather than external reinforcement (Davis et al., 1992).

Uses and Gratifications Expectancy Theory (UGE Theory)

According to the uses and gratifications (U&G) perspective, media use is determined by a group of key elements including "people's needs and motives to communicate, the psychological and social environment, the mass media, functional alternatives to media use, communication behavior, and the consequences of such behavior" (Rubin, 1994). U&G has been successfully used in recent research on social-networking sites such as Facebook, MySpace, and Twitter. The relevant studies also suggested that the U&G approach is suitable for studying SNSs and provides the theoretical framework for understanding what specifically drives users' adoption of SNSs. However, some researchers argue that U&G approach is too simplistic to accurately account for users' gratification sought or gratification obtained from the media (Littejohn, 1996). In response to this criticism of U&G, Mondi, Woods, and Rafi (2008) posed UGE model which integrated Expectancy-value theory into U&G to extend and add detail to the basic tenets of U&G idea. The underlying principle of the perspective is that people will choose media according to their expectations and their drive to attain a gratifying experience. As the number of members of SNSs increases, so does the popularity of using the sites for satisfying cognitive

and affective needs. This study seeks to understand the factors that motivate individuals to use SNSs to fulfill their needs and wants. SNSs have become a central component of many users' lives for the simple reason that members desire to engage in forms of interaction online. This question seeks to reveal the motivations behind these desires and also the tactics employed by members to fulfill their needs and wants. Based on the review of literature, we believe that UGE is beneficial to exploring relevant questions because its principle elements including people's psychological and social needs as well as how SNSs can gratify needs and might provide another perspective to understand users' behavior of SNSs.

The research of SNSs is discussed in various contexts with different perspectives, including TAM, TPB, motivation theory, and network externalities on SNSs use. However, as the results of most studies have been either based on data derived exclusively from university students or in western societies, generalizability to Taiwanese SNSs users is limited. In response to these issues, the current study is designed to investigate the relationships between motivations and SNSs usage in Taiwan context.

Research Methodology

Research framework

This study applies Brocke, Richter, and Riemer (2009)'s contextual factors framework of social motives and interest motives as conceptual foundations for an investigation into the factors that lead to SNSs usage for workers in Taiwan. We propose an integrated framework and empirically test the research model (Figure 1) using online survey to collect data.

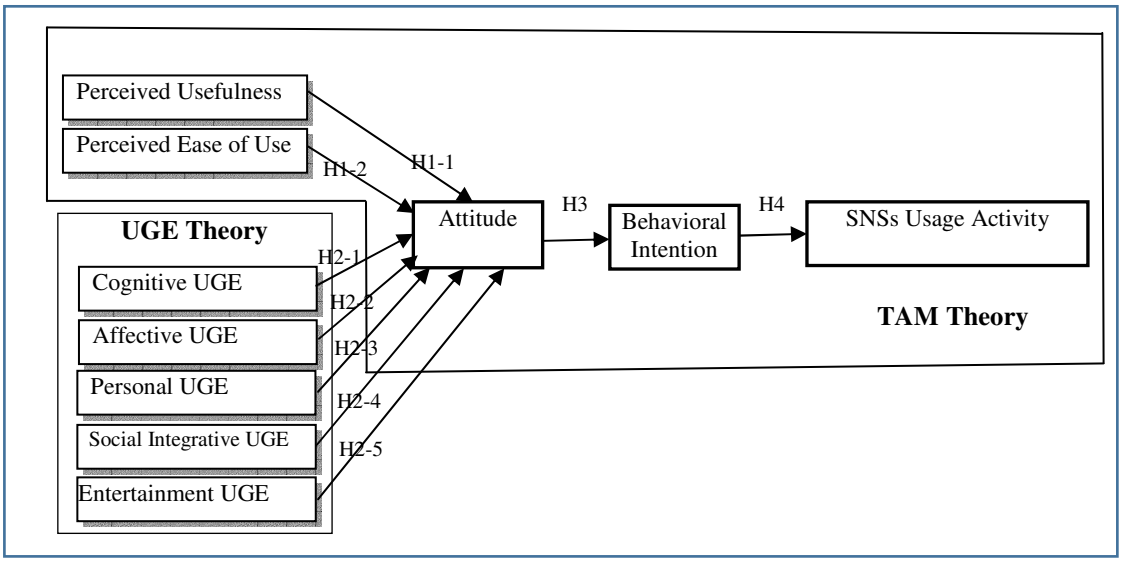

Figure 1. Reseach model of a comprehensive theory for using SNSs at work

The constructs in the model are grouped into three fundamental areas related to SNSs usage: the motivation and UGE theories. In other words, five UGE concepts were added to TAM to collectively explain the usage of SNSs.

The common purpose of SNSs is to provide users with online platform for social interaction and communication, the patterns of usage among various users are vary significantly across different services. In IT adoption research, TAM is the dominant theory explaining user acceptance of IS. However, with the changing use of IT in many contexts, added factors need to be included to enhance TAM explanatory power. In general, TAM theorizes that Perceived Usefulness and Perceived Ease of Use influence attitudes toward technology usage and are important determinants of individuals' intentions to use the technology. There is a great body of previous research discussing the relationship between motivations and usage of SNSs in the context of relevant theories (Barker, 2009), and is the resulting theoretical and empirical evidence supports motivations as one of the key determinants to the use of IS (Guriting & Ndubisi, 2006; Mckechnie et al., 2006). In Taiwan environment, recent researchers have found significant relationship between motivations and the use of SNSs (Lu & Hsiao, 2010). Based on the above, we hypothesize the following:

H1-1: There is a significant relationship between Perceived Usefulness and the attitude of SNS usage for workers.

H1-2: There is a significant relationship between Perceived Ease of Use and the attitude of SNS usage for workers.

UGE theory is used in many previous studies to represent intrinsic motivation and discuss how intrinsic motivators influence individuals' IT acceptance behavior (Zhang et al., 2008; Davis et al., 1992). When a technology is fun and pleasing to use, users will be intrinsically motivated to adopt it. Previous studies have documented the importance of perceived enjoyment, particularly in electronic usage (Amin et al., 2007; Nysveen et al., 2005). According to Nysveen et al. (2005), perceived enjoyment and intention to use mobile communication have a significant correlation. In an early study by Teo et al. (1999), it was found that perceived enjoyment had a positive correlation with the frequency of internet usage; however, in more recent findings by Amin et al. (2008), in an SNS exam result query system model (SERQSM), the study that found no relationship between perceived enjoyment and usage intentions existed. Moreover, Igbaria et al. (1995) also noted that perceived enjoyment does not significantly affect the acceptance of data processing systems. The concept of UGE maintains that if users' expectancy for SNSs is positive, it is likely that they would use them; if negative, then they would tend to avoid them (Littlejohn, 1996). From this perspective, the integration of expectancy-value theory and uses and gratifications theory serves to accommodate the suggestions that SNSs offer gratifications which are expected and valued by users. Based on the above findings, we hypothesize the following:

H2-1: Cognitive UGE positively affects the attitude of SNSs for workers.

H2-2: Affective UGE positively affects the attitude of SNSs for workers.

H2-3: Personal Integrative UGE positively affects the attitude of SNSs for workers.

H2-4: Social Integrative UGE positively affects the attitude of SNSs for workers.

H2-5: Entertainment UGE positively affects the attitude of SNSs for workers.

Across industries and cultures, attitude has long been a cause of intention (June et al., 2003). According to Azjen and Fishbien (1980), attitude can be classified into two main constructs: attitude toward objects and attitude toward behavior. Fusilier and Durlabhji (2005) found that the effect of attitude on intention appeared to be attractive, with subjective norms as the main effect. Results suggested that those with highly positive attitudes were relatively unaffected by subjective norms or others' opinions; hence, we expect that attitude has a positive influence on behavioral intention to use SNSs, and, as such, the following hypothesis is presented:

H3: There is a significant relationship between the attitude and behavioral intention of SNS usage for workers.

Studies have supported the notion that behavioral intention is found to have a positive effect on behavior, particular in electronics usage (Nysveen et al., 2005; Amin et al., 2007). Given a sufficient degree of actual control over behavior, people are expected to carry out their "intentions" when the opportunity arises. "Intention" is thus assumed to be the immediate antecedent of behavior (Azjen, 1991). In summary, attitude toward the behavior, social norms, and perceptions of behavioral control lead to the formation of a behavioral intention. Based on the above arguments, the following hypothesis is presented:

H4: There is a significant relationship between behavioral intention and SNSs usage activity for workers.

Sample and procedure

The present study employed survey research to examine the influence of SNS motives on SNS use. The purposive sampling was used to collect the data from Internet users who have participated in social networking websites (e.g., Facebook, Line, XING, and others) between February 2014 and April 2014. Participants (N = 131) were 61.1% female and 38.9% male. They ranged in age from 18 to 48 years. There were from different occupations: 86.3% of the participants were IT workers; 13.7% were non-IT workers. Majority of the participants 29% earned a Master degree, 11% earned Bachelor degree, and 39% received a Doctor degree. The most frequently used SNSs are Facebook (92%), Line (6%), and others (2%) respectively. The questionnaire was consisted of four main sections: SNSs motives, SNSs Uses and Gratifications Expectancy, SNSs use activities and demographics.

Measure

To test the hypotheses, all constructs are measured using multiple-item scales, wherever possible, drawn from

pre-validated measures. The questionnaire used for data collection contained scales to measure the various constructs of the research model. The scales are adapted from Luo, Chea, & Chen (2011)'s, Chen (2012)'s, Mondi, Woods, & Rafi (2008)'s, Michiko (2010)'s, Warnakula & Manickam (2010)'s, and Omoush et al. (2012)'s studies, which established their reliability and validity. The measures for motivations to use SNSs not only are based on existing research on motivations theory and UGE theory, but also we gather the comments from the interviews to make the items relevant to Taiwanese SNSs context.

According to Hamilton (1998), these dimensions of uses and gratifications expectancy (UGE) are defined as (1) Cognitive UGE, which refers to users tendency to seek acquisition of information, knowledge, understanding and critical thinking skills; (2) Affective UGE, which refers to users search for emotional fulfillment, pleasant feelings and aesthetic experience; (3) Personal Integrative UGE, which refers to users seeking credibility as capable self-regulated learners; (4) Social Integrative UGE, which refers to users seeking interaction and collaboration among the community; and (5) Entertainment UGE, which refers to users' tendency to seeking resources that are fun and exciting, or soothing and calming.

Data Analysis and Results

Analysis of reliability and validity

Individual item reliability of this study was measured by each factor according to Cronbach's alpha. Average Variance Extracted (AVE), Composite Reliability (CR), and factor loading were performed in order to verify validity, and internal consistency was calculated in order to assess the reliability of all variables. Table 2 shows average item scores and standard deviations of constructs. The perceived ease of uses and personal integrative uses and gratification expectancy scales had the highest and second highest score, respectively. This suggested that workers generally agreed that using SNSs is easy and gave them seeking credibility as capable self-regulated learners. To estimate scale reliabilities, Cronbach's alpha and average variance extracted (AVE) for each construct were computed. As shown in Table 1, Cronbach's alpha ranged from 0.83 to 0.96 and AVEs ranged from 0.58 to 0.90; these all exceeded the recommended score of 0.7 and 0.5, respectively, indicating adequate reliability. To determine item-construct loadings, a factor analysis was conducted using SPSS. The results of principle component analysis are shown in Table 1. All loadings were larger than 0.6, demonstrating an adequate convergent and discriminant validity.

Convergent validity is the degree to which multiple attempts to measure the same concept are in agreement. This was checked by factor loadings, CR, and AVE. Results of the factor loadings analysis showed no items with values less than 0.5; thus, these items were restricted from further analysis. In addition, we assessed convergent validity by examining CR and AVE, as seen in Table 1. The AVE for constructs was above 0.5, and the CR was over 0.7, which

Table 1. Summary of reliability and validity for measures.

Measure Item	CR	AVE	Cronbach's alpha	Factor Loading
Perceived usefulness (PU)				
PU 1: Using SNSs enables me to accomplish tasks more quickly.				0.87
PU 2: Using SNSs improves my work performance.				0.75
PU 3: Using SNSs increases my productivity.	0.96	0.80	0.95	0.83
PU 4: Using SNSs enhances my effectiveness at work.				0.74
PU 5: Using SNSs makes it easier to do my work.				0.86
PU 6: I find SNSs useful at work.				0.89
Perceived ease of use (PEU)				
PEU 1: Learning to read SNSs is easy for me.				0.85
PEU 2: I find it easy to navigate SNSs.				0.84
PEU 3: I find SNSs to be flexible to interact with.	0.92	0.68	0.90	0.80
PEU 4: My interaction with SNS is clear and understandable.				0.69
PEU 5: It is easy for me to become skilful at using SNSs.				0.87
PEU 6: I find SNSs easy to use.				0.90
Cognitive UGE (CUGE)				
CUGE 1: I use SNSs to help me to know many things.				0.83
CUGE 2: I use SNSs to search for new information.	0.89	0.67	0.83	0.83
CUGE 3: I carry out SNSs searches to answer questions coming.				0.82
CUGE 4: I use SNSs to explore topics of work.				0.80
Affective UGE (AFFUGE)				
AFFUGE 1: I like to talk to others about SNSs.				0.83
AFFUGE 2: I like showing my friends how to use SNSs.	0.89	0.68	0.84	0.80
AFFUGE 3: SNSs layout are good to look at.				0.81
AFFUGE 4: I enjoy working with SNSs.				0.87
Personal UGE (PUGE)				
PUGE 1: Using SNSs is easy for me.	0.93	0.82	0.89	0.90
PUGE 2: Using SNSs allow me to be virtually anywhere.				0.91
PUGE 3: I can search and navigate through multimedia content.				0.92
Social Integrative UGE (SIUGE)				
SIUGE 1: Using SNSs give me the feedback I need from others.				0.79
SIUGE 2: I use SNSs to interact with my friends.		0		0.85
SIUGE 3: Using SNSs prepare me to join the extended community.		.	0.	0.88
SIUGE 4: Using SNSs improve my ability to communicate.		7	91	0.70
SIUGE 5: Using SNSs keep me from feeling lonely.		3		0.87
Entertainment UGE (ENUGE)				
ENUGE 1: On the SNSs, they make using them fun.		0		0.89
ENUGE 2: I like playing games.		.	0.	0.72
ENUGE 3: I find SNSs to be interesting.		6	84	0.88
ENUGE 4: It is fun to experiment with technology.		8		0.80
Attitude (ADE)		0	0.	

ADE 1: Using SNSs is very enjoyable.		.	94	0.95
ADE 2: Overall, using SNSs is a pleasant experience.		9		0.96
ADE 3: My attitude toward using SNSs is very favourable.		0		0.94
SNSs Activity				
Usage 1: To develop new products in the same divisions.				0.75
Usage 2: To develop new products in different divisions.				0.72
Usage 3: To send office memos to other employees.				0.73
Usage 4: To manage schedules and equipment.				0.75
Usage 5: To let employees express themselves creatively.				0.73
Usage 6: To share job-related experiences or ideas.				0.75
Usage 7: To influence and compete with other employees.				0.66
Usage 8: To encourage or make other employees happy.				0.78
Usage 9: To clip and store important information.		0		0.71
Usage 10: To co-create documents between employees.		.	0.	0.85
Usage 11: To be aware of trending issues.		5	96	0.70
Usage 12: To ask questions related to work and get answers.		8		0.83
Usage 13: Make connections with superiors at the work place.				0.77
Usage 14: Learn new skills related to my current job.				0.85
Usage 15: To share information on customers and clients.				0.77
Usage 16: To accept feedback from consumers or clients.				0.75
Usage 17: Make connections with peers at work.				0.78
Usage 18: Make connections to colleagues.				0.73
Usage 19: Stay connected from external organizations.				0.78
Usage 20: Make contacts with customers/suppliers.				0.81

Table 2. Correlations of latent variables.

Variables	Mean	SD	AVE	1	2	3	4	5	6	7	8	9	10
1. PU	3.25	1.05	0.80	**0.89**									
2. PEU	4.05	0.79	0.68	0.43	**0.82**								
3. CUGE	3.79	1.05	0.67	0.63	0.72	**0.81**							
4. AFFUGE	3.51	1.04	0.68	0.67	0.60	0.69	**0.82**						
5. PUGE	4.12	0.78	0.82	0.44	0.74	0.71	0.69	**0.90**					
6. SIUGE	3.64	1.01	0.73	0.68	0.56	0.69	0.74	0.54	**0.85**				
7. ENUGE	3.69	1.04	0.68	0.57	0.63	0.70	0.79	0.71	0.76	**0.82**			
8. ADE	3.98	0.80	0.90	0.53	0.69	0.66	0.64	0.67	0.64	0.59	**0.94**		
9. BI	4.20	0.73	1.00	0.49	0.68	0.63	0.58	0.66	0.57	0.65	0.82	**1.00**	
10. Activity	3.43	-1.16	0.58	0.79	0.45	0.65	0.63	0.45	0.73	0.59	0.51	0.44	**0.76**

Note. Square root of AVE is on the diagonal.

means that the convergent validity of the scales was acceptable. Additional assessment of discriminant validity was verified by looking at the square root of the AVE. The results in Table 2 confirmed the discriminant validity. We could then see that all square roots of AVE were larger than their corre-

sponding correlation coefficients with other factors. In summary, these analyses demonstrate that the study scales possess both convergent and discriminant validity.

Structural model assessment

We used PLS-Graph Version 2.91, which allowed for the simultaneous testing of all hypotheses. Table 3 and Figure 2 illustrate the path coefficients, t-values, and the R2 values. The R2 values indicated how well the antecedents explained an endogenous variable. For all respondents, the model explained 68% and 20% of the variance in behavioral intention and SNSs usage activities, respectively. In terms of hypotheses, perceived usefulness and perceived ease of use significantly affected attitude to SNSs. H1-1 and H1-2 were thus supported. However, the effect of Cognitive UGE, Affective UGE, and Social Integrative UGE on the attitude of SNSs were not significant.

Table 3. Summary of PLS analysis model

Hypothesized path	β	t-value	R^2
PU→ADE	**0.13**	1.50†	
PEU→ADE	**0.30**	2.94***	
CUGE→ADE	0.00	0.06	
AFFUGE→ADE	0.09	0.93	0.64
PUGE→ADE	**0.14**	1.61†	
SIUGE→ADE	0.04	1.24	
ENUGE→ADE	**0.41**	2.90***	
ADE→BI	**0.83**	28.98***	0.68
BI→ SNSs Activity	**0.45**	5.95***	0.20

Note. † $p< 0.1$. * $p< 0.05$. *** $p< 0.001$.

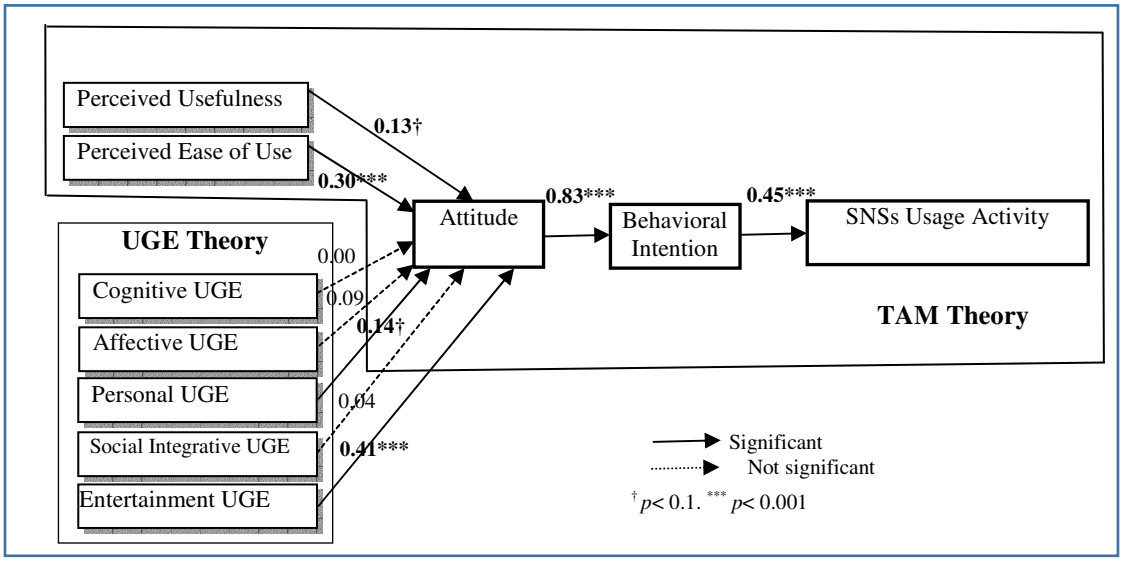

Figure 2. Hypothesis testing results of PLS analysis.

Thus, H2-1, H2-2, and H2-4 were not supported. In addition, the attitude of SNSs significantly influenced behavioral intention, and behavioral intention significantly influenced SNSs usage activities. Hence, H3 and H4 were supported.

Conclusion and Discussion

The study aimed to understand the factors affecting workers use SNSs. In general, the results offer additional theoretical implications of Uses and Gratifications and TAM to understand SNSs motivation and SNS usage in work environment. The findings showed that workers were motivated to use SNSs for four reasons: perceived ease of use, perceived usefulness, personal integrative Uses and Gratifications Expectancy, and entertainment Uses and Gratifications Expectancy. Especially, Entertainment UGE of SNSs was an important predictor of users' attitude. Workers might be more likely to use SNSs if provided with a higher fun and exciting, or soothing and calming. Additionally, positive attitude of SNSs would be increased with a raise in perceived ease of use, perceived usefulness, and personal integrative UGE.

In addition, the findings indicated gender differences in time spent on SNSs, particularly Facebook. Females would spend more time using Facebook than males. Also, females tended more to use SNSs at work than did males. Prior studies showed gender differences in using new media technologies and social media, for example, Dumrongsiri and Pornsakulvanich (2008, 2009) found that female participants were more likely to send short messages via mobile phone and spend more time using SNSs than were male participants. Consistently, the present study indicated that females spent more time than did males using SNSs for most of the social networking sites being investigated. It was rather surprising to find that female participants significantly spent more time than male participants in certain SNSs like Facebook and Twitter. The results also support TAM in that the attitude is influenced by perceived ease of use and perceived usefulness for SNSs usage. This study showed that workers would use or not use SNSs depended more on their perceptions for SNSs.

The findings added on the knowledge of the Uses and Gratifications perspective pertaining to needs fulfillment and media motivation. According to Rubin (2002), people are selective media users to fulfill their needs, and they are more influential than media. A new communication technology has impact on workers' behavior, it is created as an additional media choice. This study could be beneficial to both academic and practical areas. For the academic area, this research would extend the body of knowledge in the interdisciplinary research. Specifically, this study would add on the body of knowledge of two theories: TAM and UGE to understand the factors affecting the use of social media at workplace. In addition, this study would serve as a preliminary stage to examine and provide in-depth understanding of the use of SNSs in Taiwan. For the practical area, this research would provide the empirical evi-

dence that benefits in the work environment for a better understanding the uses and effects of the fast growing SNSs in Taiwan. It would provide fruitful information for the business sectors to understand SNSs users to provide policy or framework to gratify workers' needs effectively.

Limitations and Future Directions

The study contains several limitations that should be addressed. First, the nature of new media technologies like SNSs are fast growing and new applications have been continuously developed. This study has observed in the numbers of the users in Facebook. Future research should take into consideration on the fast growing and changing nature of SNSs applications and may select the specific SNSs that are most relevant for examining. Second, this study did not examine the differences of these influences among different demographic segments.

The differences are promising to be observed in the future research. Third, this study has not yet examined the effects of SNSs motives on SNSs use cross-culturally. The international comparison studies on SNSs use will be worthwhile and promising areas to test the cultural differences framework and the use of social media. Fourth, even though survey research with a cross-sectional design conducted in this study could provide meaningful results, other research methods such as focus group research and a content analysis might be needed to gain a better understanding of the results. These could help us understand more about the differences on SNSs usage and preferences.

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IDENTIFYING LEISURE CONSTRAINTS AMONG COLLEGE STUDENTS – APPLICATION OF A FUZZY APPROACH

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ABSTRACT

The study identifies activities of leisure constraints among college students by ways of an importance-performance analysis. Leisure constraints are mostly recreational rather than sedentary leisure. Gender differential exists among activities of leisure constraints. Causal recipes of fuzzy evaluation showed key contributors of non-participation in leisure activities are lacks of time, facility, interest, and money, as well as bad weather and safety concerns. The structural aspect of leisure constraints slightly outweighs the intrapersonal component. The interpersonal aspect plays lesser role of leisure constraints.

Keywords: leisure constraints, intrapersonal, interpersonal, structural

Introduction

Leisure constraints have been a major focus of theoretical and empirical leisure studies over the years. Leisure studies in the early stages are more theoretical (Crawford et al., 1991; Jackson et al., 1993; Samdahl & Jekubovich, 1997). Since the new millennium, empirical results have been presented across wide segments of population, from adolescents (Casper et al. 2011) to ethnic women (Skowron et al. 2008; Anaza & McDowell, 2013) and individuals with disabilities (Lyu et al. 2013). One of the most often cited articles tested models of multivariate analyses involving relationships among constraints, negotiation, motivation, and participation (Hubbard & Mannell, 2001). Never the less, cross cultural college students have been studied extensively with varying

degrees of differences (Walker et al. 2008; Tsai & Coleman, 2009; Guo & Schneider 2015). Confirmatory factor analyses have been the popular choice of methodology where the results are highly dependent of respondents' perceptions in which each respondent may have different scaling standards.

The study seeks to identify leisure constraints among college students while taking out effects of perceptual differences as indicated by individuals. The elimination of varied perceptual differences can be accomplished via a fuzzy-set approach. Fuzzy theory was first introduced in engineering applications where fuzzy control strategies would smooth out problems of oscillation. Since then, the fuzzy approach has been gaining popularity among economic and social science researchers because fuzzy-sets offer a middle path between quantitative and qualitative measurement, allowing continuous set-calibration (Ragin, 2008). By ways of a fuzzy approach, each individual's response would be normalized so that data are calibrated from 0 to 1, ensuring normalized responses from the study population.

Literature Review

Scholars of leisure researches have given considerable amount of attention to leisure constraints since the 1980s (Crawford & Godbey, 1987; Crawford et al., 1991). Meanwhile, existing literatures have contributed significantly to a body of knowledge on leisure constraints and provided insights into the relationship between leisure constraints and leisure experiences. For example, Jackson et al. (1993) reported leisure participation to be dependent of the negotiation through the absence of constraints rather than the sole absence of constraints. In other words, people may negotiate through constraints and succeed in initiating or continuing leisure participation (Crawford et al., 1991; Jackson & Rucks, 1995).

Crawford and Godbey (1987) first proposed three possible distinct barriers to family leisure: intrapersonal, interpersonal, and structural. Examples of intrapersonal barriers involve psychological states of individuals such as anxiety, depression, religiosity, stress, perceived self-skill, and similar others. Interpersonal barriers are the result of interpersonal interaction between individuals' characteristics. Examples of structural barriers include climate, season, availability of opportunity, financial resources, work schedule, and similar others. Later, Crawford et al. (1991) elaborated the hierarchically ordered categories of leisure constraints.

Raymore et al. (1993) presented a comprehensive measure of leisure constraints based on the literatures (Crawford & Godbey, 1987; Crawford et al., 1991). Each of the constraints is consisted of seven aspects. Intrapersonal constraints include: religion, self-conscious, shy, skill, uncomfortable, alright with family, and alright with family. Interpersonal constraints include: others' know activities, others' money, others' obligations, others' skills, others' time, others' transport, and others too far. Structural constraints include convenient, know what's

available, money, not crowded, other commitments, and time.

Methodology

Instrument

The literature review provided insights to the construction of the questionnaire. The questionnaire contains three parts. The first part measures leisure participation in which respondents are also asked to evaluate their perceived level of importance and enjoyment. Importance-performance analysis (IPA) would be performed for importance versus participation, enjoyment versus participation, and importance versus enjoyment. Leisure activities are categorized by recreational leisure and sedentary leisure, each containing eight items.

Recreational leisure contains (R1) basketball, (R2) table pool, (R3) jogging, (R4) bicycling, (R5) theme parks, (R6) traveling, (R7) camping, and (R8) water sports. Sedentary leisure contains (S1) socializing, (S2) reading newspapers/magazines, (S3) watching sports, (S4) online social media, (S5) watching TV/movies, (S6) computer games, (S7) music, and (S8) poker.

The second part of the questionnaire measures leisure constraints that were adopted from Guo and Schneider (2015). A total of 14 items were chosen and modified as follows: (1) I don't have the time; (2) I don't have the energy; (3) I don't have the interest; (4) I don't have the required skills; (5) I don't have the transportation means; (6) I don't have the money; (7) I don't have many friends; (8) My friends don't have time to participate with me; (9) My friends live in inconvenient locations; (10) My friends don't have the transportation means; (11) Factor of safety affects my participation; (12) Information factor affects my participation; (13) Weather (climate) factor affects my participation; and (14) Factor of facility affects my participation.

The third part concerns respondents' personal information. Since the targeted respondents are college students of Taiwan in which Mandarin-Chinese is the predominant language of communication, a translation-back-translation procedure was used to construct the questionnaire.

Sampling

A convenient sampling approach was used to choose the samples. Questionnaires were randomly distributed to college students of north, central, and south Taiwan. The sampling areas were positioned at campus sites that would attract students during their class breaks in each of the three chosen colleges. Questionnaires were randomly distributed by assistants of the investigators to students of the three campus sites. Respondents were asked to participate in the survey on a voluntary basis in which small gifts were given as incentives. Acceptance of the returned survey is strict to ensure validity of the returns. A total of 225 questionnaires were collected with initial screen. During data coding, 204 responses were used for data analysis after excluding 21 returns due to large portions of unilateral responses. Each of the items measuring leisure participation (16 items) and leisure constraints (14

items) would be rated by the respondents on a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Data analysis

IBM SPSS statistics 20 software was used for analysis of the collected data. Importance-Performance Analysis (IPA) would be performed from demographic results of the data. Since respondents may rate the levels of participation, importance, and enjoyment on their perceived standards, calibration of the data would be performed to normalize their responses. The responses of the Liker scale would be converted into fuzzy-sets first where 1 (of Likert scale) = 0.05 (of fuzzy scale); 2 = 0.25; 3 = 0.50; 4 = 0.75; and 5 = 1.00. A respondent who frequently participates in multiple leisure activities may rate participation of a particular leisure activity lower when compared with his or her other leisure activities. The low participation rating of this particular leisure activity may be misleading because the individual's participation level may be higher than those of other respondents who rarely participate in any leisure activity. This calls for the calibration where calibration scores are adjusted accordingly or "stretching" of the interval if an individual's responses have ignored extreme scores (i.e. absence of 1 and 5 on the Likert scale). The stretching is accomplished with conversions of 2 = 0.10; 3 = 0.50; and 4 = 0.90. If a respondent's scores provided a strongly disagree response among several Likert scale items, the calibration would adjust fuzzy values higher (i.e. 1 = 0.10; 2 = 0.33; 3 = 0.67; 4 = 0.90; 5 = 1.00). On the other hand, if a respondent's scores provided a strongly agree response among several Likert scale items, the calibration would adjust fuzzy values lower (i.e. 1 = 0.05; 2 = 0.10; 3 = 0.33; 4 = 0.67; 5 = 1.00).

Configurational analysis is performed to determine causal conditions of leisure constraints. This is accomplished by the fsQCA (fuzzy-set qualitative comparative analysis) software which is readily available at www.fsQCA.com. The key tool of configurational analysis is the truth table. Constructing a truth table involves a two-step analytic procedure which elaborates and formalizes the analytic strategy of comparative research.

Results and Discussions

Importance-performance analysis

Of the 204 valid returns, high consistency was resulted from the reliability test where Cronbach's alpha = .872 for participation of leisure activities, alpha = .869 for the importance level, and alpha = .865 for the enjoyment level. After calibration (12%, n = 24 out of 204 data sets), results of the IPA showed constraints exist among recreational activities of (R3) jogging, (R5) theme parks, (R6) traveling, and (R7) camping (Figure 1). Most of the sedentary leisure activities were found in Quadrant I, with high importance and high participation, including (S1) socializing, (S4) online social media, (S5) watching TV/movies, (S6) computer games, and (S7) music. Leisure activities in Quadrant III, low priority (low importance and low participation) may be ig-

nored. Meanwhile, the perceived level of enjoyment versus participation is similarly shown in Figure 2 where the biggest difference is the replacement of (R3) jogging with (R1) basketball. It is very logical that students view jogging to be an importance leisure activity but not basketball, given its moderately high enjoyment level.

IPA was also performed separately to distinguish the difference between genders. As shown in Figure 3 and Figure 4. Male students viewed (R1) basketball, (R3) jogging, (R4) bicycling, (R5) theme parks, (R6) traveling, and (R7) camping to be important leisure activities with limited participation. Meanwhile, females viewed (R3) jogging, (R5) theme parks, (R6) traveling, (R7) camping, and (S2) reading newspapers/magazines to be important leisure activities with limited participation. Most notably, males viewed (R1) basketball and (R4) bicycling to be important leisure activities while females viewed differently. Conversely, female students viewed (S2) reading newspapers/magazines to be important but their male counterparts didn't.

Another aspect of the differences is the level of participation in recreational leisure and sedentary leisure between genders. In recreational leisure activities, the fuzzy- calibrated mean is .515 by males (n = 103) and .473 by females (n = 101). However, the difference between genders failed to reach significance (p = .088 > .05). In sedentary leisure, the fuzzy-calibrated mean is .649 by males and .634 by females, which is obviously insignificant (p = .471 > .05). The level of participate in recreational leisure activities is less by females than males. The level of participation in sedentary leisure activities is nearly the same between genders.

Gender differential was also performed for the level of enjoyment vs. participation (Figure 5 and Figure 6). While female students only perceived (R5) theme parks, (R6) traveling, (R7) camping to be leisure activities of high enjoyment with low participation, male students perceived more activities of high enjoyment, (R1) basketball, (R2) table pool, (R3) jogging, (R4) bicycling, (R8) water sports, and (S8) poker in addition to those (R5, R6, and R7) identified by females. On the surface, it may seem that male students have more leisure constraints than their female counterparts but the reality is that females enjoyed less leisure activities, which makes it misleading.

Factor analysis

Fourteen attributes of leisure constraints were factor analyzed (Table 1). The top factor of leisure constraints can be attributed to intrapersonal, explained by 21.57% of the total variance with an eigenvalue of 3.020. The second factor (structural) accounts 19.35% of the total variance with an eigenvalue of 2.709. The last factor (interpersonal) explains 16.172 of the total variance with an eigenvalue of 2.264. The Cronbach's alpha across these three factors ranged from .736 to .811 across all items which exceeded the minimum of 1.0. The factor loadings ranged from .508 to .808 across all items which also exceeded the requirement of 0.4 or more. In the process of extracting factors, the Bartlett's test of sphericity

was conducted and found at χ^2 = 969.387, p = 0.000. In addition, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found at 0.784, suggesting appropriateness of the factor analysis.

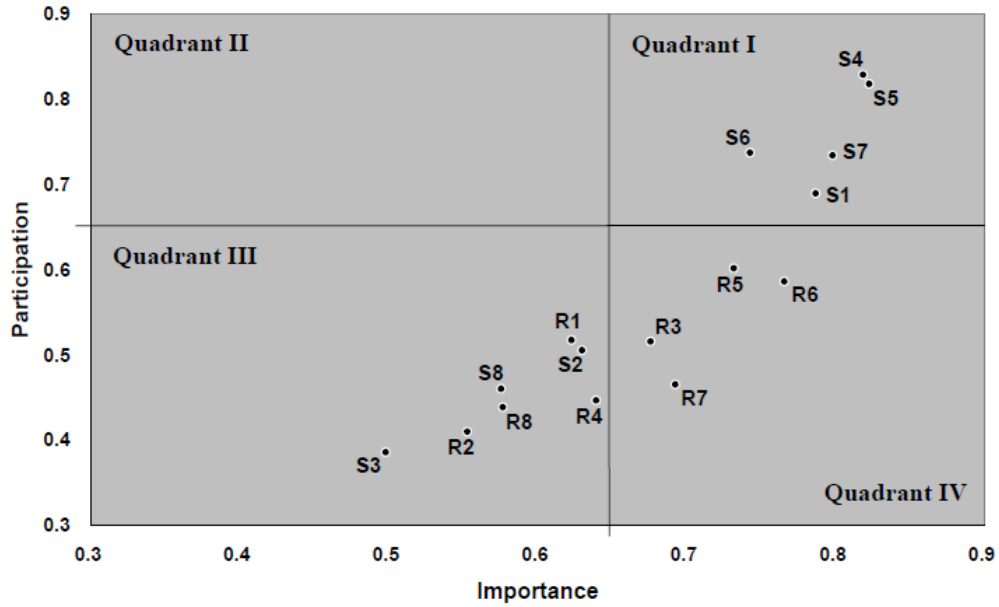

Figure 1. Importance vs. participation by all students (n = 204)

Figure 2. Enjoyment vs. participation by all students (n = 204)

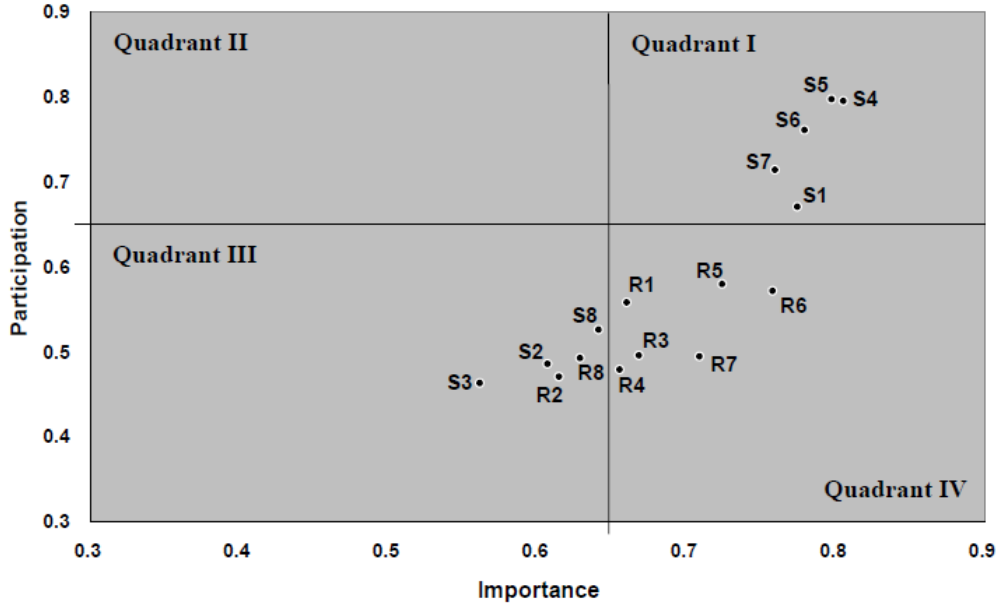

Figure 3. Importance vs. participation by male students (n = 103)

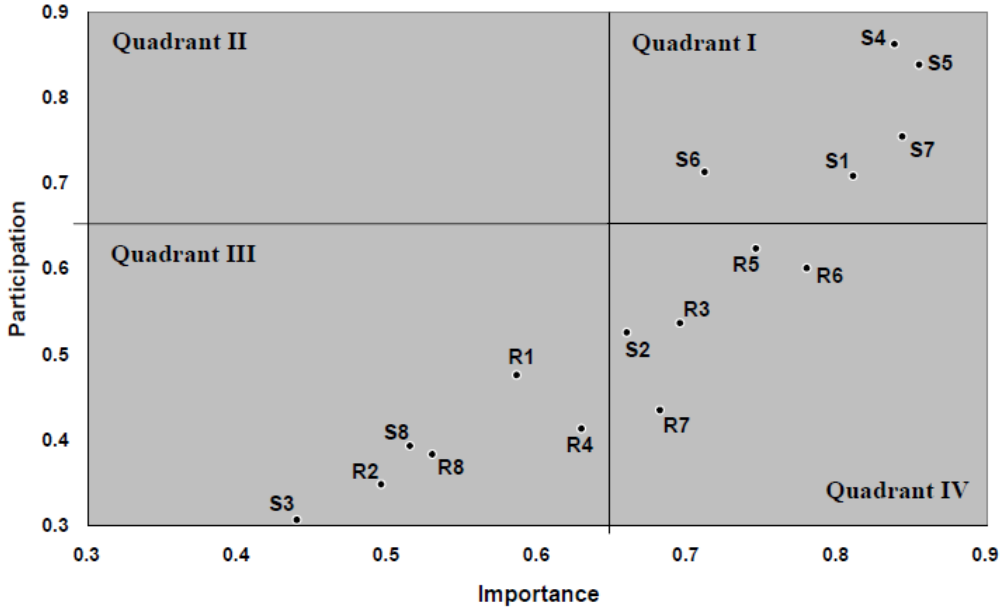

Figure 4. Importance vs. participation by female students (n = 101)

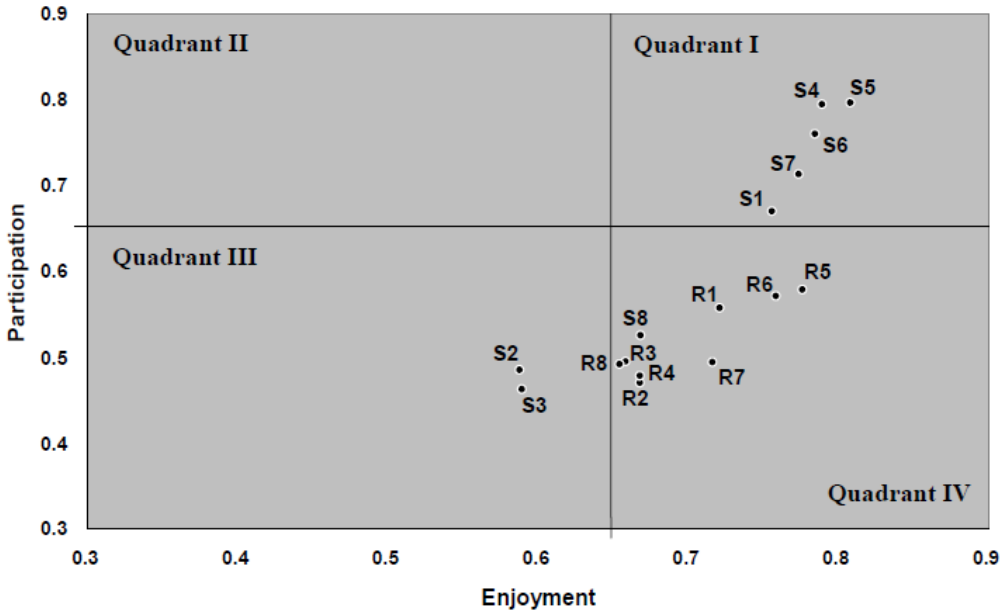

Figure 5. Enjoyment vs. participation by male students (n = 103)

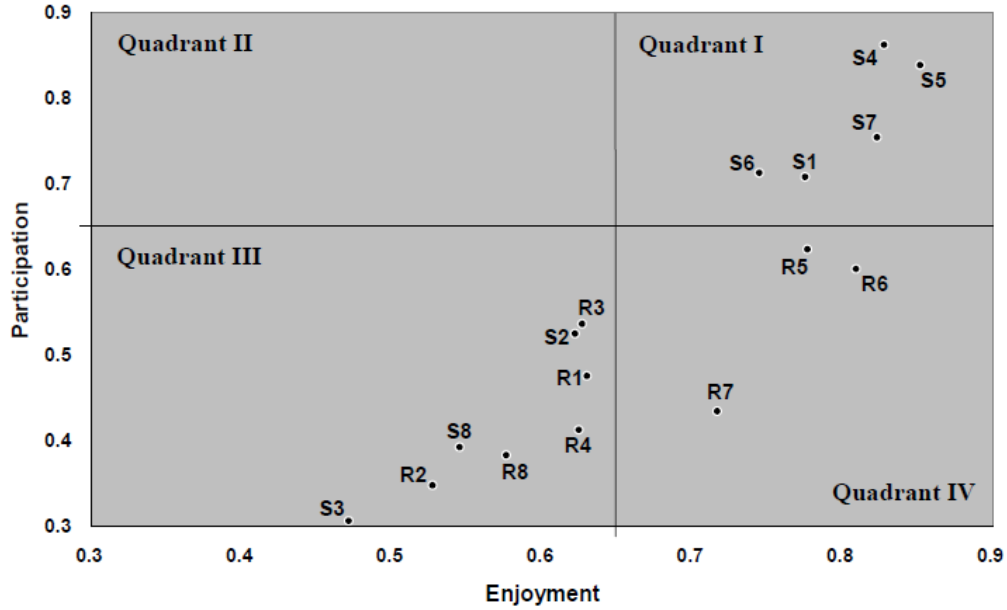

Figure 6. Enjoyment vs. participation by female students (n = 101)

Table 1. Factor analysis of leisure constraints (n = 204)

Factors of leisure constraints (Attributes)	Factor loadings		
	1	2	3
Factor 1: Intrapersonal			
Q4. I don't have the required skills	.765		
Q2. I don't have the energy	.747		
Q5 I don't have the transportation means	.738		
Q3. I don't have the interest	.685		
Q6. I don't have the money	.644		
Factor 2: Structural			
Q13. Weather (climate) factor affects my participation		.763	
Q14. Factor of facility affects my participation		.735	
Q12. Information factor affects my participation		.680	
Q11. Factor of safety affects my participation		.668	
Q1. I don't have the time		.508	
Factor 3: Interpersonal			
Q9. My friends live in inconvenient locations			.808
Q8. My friends don't have time to participate with me			.745
Q7. I don't have many friends			.720
Q10. My friends don't have the transportation means			.699
Eigenvalues	3.020	2.709	2.264
Variance (%)	21.573	19.348	16.172
Cumulative variance (%)	21.573	40.921	57.093
Cronbach's alpha	.811	.778	.736

Configurational analysis

Recall that the factor analysis accounted for 57.093% of the total variance. By fuzzy sets, Causal recipes were identified as sufficient conditions leading to high probabilities of leisure constraints, where the configuration combined for 95.842% of the explanation on leisure constraints (Table 2). The union of (Q1: no time) * (Q3: no interest) * (Q6: no money) * (Q14: no facility) explains the highest coverage (.840032) for non- participation of leisure activity. Similarly, the union of (Q1: no time) * (Q3: no interest) * (Q13: bad weather) * (Q14: no facility) explains the second highest coverage of non-participation (.839935). The union of (Q1: no time) * (Q11: not safe) * (Q13: bad weather) * (Q14: no facility) explains the third highest coverage (.827449). The union of (Q3: no interest) * (Q6: no money) * (Q11: not safe) * (Q13: bad weather) explains the fourth highest coverage (.825724). The union of (Q1: no time) * (Q6: no money) * (Q13: bad weather) * (Q14: no facility) explains the fifth highest coverage (.814963). It is noted that there are 2^{14} = 16,384 possible combinations of explanation in non-participation of leisure activities but only

ticipation of leisure activities but only the top five are shown as an example.

Table 2. Truth table

Complex solution	Coverage	Consistency
Q1 * Q3 * Q6 * Q14	.840032	.708907
Q1 * Q3 * Q13 * Q14	.839935	.711160
Q1 * Q11 * Q13 * Q14	.827449	.717236
Q3 * Q6 * Q11 * Q13	.825724	.719635
Q1 * Q6 * Q13 * Q14	.814963	.710377
solution coverage = .958420		
solution consistency = .670044		

Conclusions

The study has identified the types of activities associated with leisure constraints among college students. Students have constrained participation in (R1) basketball, (R3) jogging, (R5) theme parks, (R6) traveling, and (R7) camping (defined as recreational leisure). Gender differential showed an additional recreational leisure (R4: bicycling) that males perceived as important but limited participation. Females viewed a sedentary leisure activity (S2: reading newspapers/magazines) to be important but limited participation. However, females did not view (R1) basketball and (R4) bicycling to be constrained activities.

The study validated the conventional wisdom that leisure constraints are composed of intrapersonal, interpersonal, and structural. Unlike previous studies, the paper uses a fuzzy approach to evaluate causal recipes. Lack of time and lack of facility are two key contributors of non-participation in leisure activities. Lack of interest, lack of money, and bad weather are other significant contributors of leisure constraints, followed by safety concerns. In general, the structural aspect of leisure constraints slightly outweighs the intrapersonal component. The interpersonal aspect plays lesser role of leisure constraints. Hence, the study showed the fuzzy approach to be a useful tool of evaluating leisure constraints.

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GLOBAL ENVIRONMENT, CORPORATE STRATEGY, LEARNING CULTURE AND HUMAN CAPITAL: A THEORETICAL REVIEW

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Abstract

To win the high global competitive environment, a company depends much on its strategy, learning culture and its human capital. A company has to offer innovative products or services demanded by its customers. Innovative products or services could be created through knowledge management and its learning culture. Therefore, employees should be creative, professional, morally competence and affectively committed to their company. Managers should practice effective leadership styles to achieve the high performance standard. As a part of a competence-based human resource strategy, employees should support the corporate strategy and learning culture to achieve high corporate performance. In this article, it is presented a model demonstrating the congruent relationships among corporate strategy, learning culture, human resource strategy and human capital which have a significant impact on the performance.

Key words: Corporate Culture, Human Capital, Innovation, Moral Competence, Affective Commitment

Introduction

Business Environment

Today's business environment is competitive, and future business will be even more competitive. As a matter of fact, the rapid development of technology makes the world become *boundaryless* and it results in a very competitive global environment. A number of multinational companies which have their branches in many countries, among others are IKEA, McDonald, Kentucky Fried Chicken, P & G, Nestle, Frisian Flag, Medco, Starbuck and Unilever. This fact shows that global competitive environment happens everywhere. Consequently, companies should work smart to win the

competition and sustain. The keyword to succeed is to keep on innovating.

According to Nonaka (1999:14) innovation *can be better understood as a process in which the organization creates and defines problems and then actively develops new knowledge to solve them*. In other words, a company should be innovative and offer new products, system or services with high new value added to its customers. Knowledge has become a direct competitive edge; it is embedded to organizational *human capital*. Companies should pay close attention to its stakeholders' needs and demands. A company should not seal itself off, instead it should adapt to the changing environment continually (Daft, 2013). Managers should have a global mindset to understand the effective way of managing their companies in a tough business global competition. Nowadays, many companies adopt a creative strategy to win the competition; however, the execution of their creative strategy is often not well supported by their corporate culture and human capital. Successful companies should be adept at attracting, retaining and developing employees to be successful. In line with the high dynamic business environment, a company should determine its appropriate vision, mission, strategy and objectives supported by a competence-based human resource strategy.

As human capital processes are essential to the implementation of corporate strategy, a company should be concerned with ensuring employees' commitment, creating professional value, mission and purpose, as well as practicing a learning culture. To face the global competition, the human resource strategy should be proactive, strategic focus and dynamic to support the creative corporate strategy to accomplish the corporate goals.

Theoretical Review

Corporate Strategy and Human Competencies

In a global competitive environment, companies should apply a *blue ocean strategy* which is aimed at creating new market segment. This strategy pursues differentiation and low cost at the same time. Kim & Mauborgne (2005: 4) define *blue ocean as the untapped market space, demand creation, and the opportunity for highly profitable growth.* Nowadays, stakeholders such as customers, employees, societies, and special interest groups SIG's) are very demanding; therefore, a company has to adopt a *learning organization* and to implement a proper corporate strategy to satisfy them. Chandler (1962: 13) defines strategy *as the determination of the basic long-term goals of an enterprise, and the adoption of courses of action and allocation of resources necessary to achieve the goals.* Quinn (1978) argues that strategies change over time, gradually and incrementally; it is aimed at managing the environment to achieve certain goals. Corporate strategy, culture and human resource are intertwined; they should be contingent one another to face the competitive environment. Corporate strategy which plays an essential role in achieving corporate goals should be in line with its culture and human resource strategy.

Miles and Snow (1978) postulate four types of corporate strategy: a)

Prospector refers to companies whose managers continually search for market opportunities. Therefore, a company applying this strategy should focus on creating new products or services through innovating process; then, creating the new products and services. As a consequence, employees should be creative and continuous learning-oriented. b) *Analyzer* refers to a creative strategy; managers observe carefully to what their competitors do. A company applying this strategy imitates ideas, services and products which have been proved to be successful. This strategy focuses on efficiency; therefore, research and development for employees are planned as efficiently as possible. c) *Defender* focuses on a narrow product-market domain; it tends to reduce its operating costs to achieve high productivity. d) *Reactor* refers to a strategy which has inconsistent patterns; therefore it is often not considered as a strategy.

The relationship among the corporate strategy, corporate culture and competence-based human resource strategy is obvious. For instance, prospector or creative strategy requires certain characteristics such as learning oriented, innovative and creative. As a consequence, the human resources should have relevant competencies and characteristics to support those characteristics. Principally, the human resource strategy is reflected by the required crucial competencies, and focused on managing the human resource management activities, such as recruitment and selection, talent management, leadership building and training and development. Based on a theoretical review, in a high competitive environment, a company should adopt prospector strategy which is supported by a learning culture and competent employees.

Learning Culture

Schein (2004:17) defines *corporate culture as a pattern of basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems*. A corporate culture guides employees to do activities and make decisions which lead to the achievement of the organization goals. Companies should adopt a learning culture to anticipate the future environment which is even more dynamic and complex than that of today's environment. Sadri & Lees (2001) argue that a positive corporate culture addressed as learning culture which provides benefits to the company to win the business competition. In other words, learning organization should be adopted to produce new knowledge which is needed to create new products, services and systems. Rashid et al. (2003) prove that corporate culture has a positive impact on corporate performance. Further, Schein (2004) introduces the characteristics of a learning culture : a pro-activity assumptions, commitment to learning to learn, positive assumptions about human nature, the assumption that the environment can be dominated, commitment to truth through pragmatism and inquiry, orientation toward future, commitment to full and open task relevant communication, commitment to diversity, commitment to systemic thinking and commitment

to cultural analysis for understanding and improving the world.

Nonaka & Taeuchi (1995) explain that knowledge conversion should involve both tacit and explicit knowledge. The tacit knowledge which is difficult to articulate is based on personal knowledge such as experiences, values, and beliefs. In contrast, explicit knowledge is easy to articulate and transfer as it is codified and "tangible" (Nonaka & Konno, 1998). The process of knowledge conversion of tacit and explicit knowledge should be encouraged to result in innovativeness. In fact, human capital plays a decisive role in practicing the knowledge management activities. An effective human resource strategy will encourage the knowledge management approach through the human resource management activities such as recruitment and selection, training, maintenance and development. Employees should be empowered to make decisions with regard to their expertise and authority. In addition, employee career path should be planned based on *a strategic competency-mapping model*. With regard to the knowledge conversion, Nonaka and Takeuchi (1995) present a model as follows:

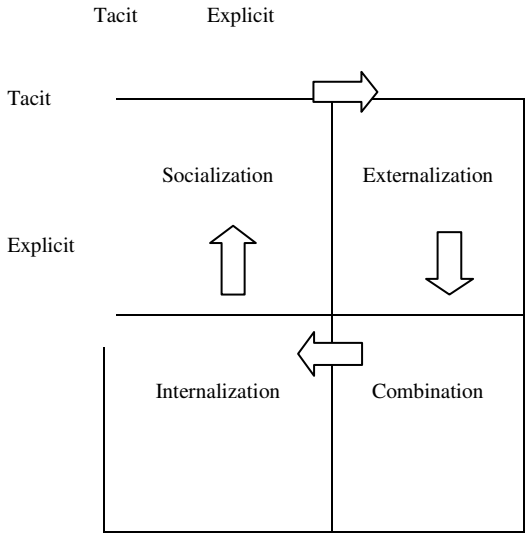

Figure 1**.** Knowledge Conversion (Source : adapated from Nonaka & Takeuchi, 1995)

Socialization refers to the knowledge sharing activities from tacit knowledge to tacit knowledge. Externalization refers to the process of converting tacit into explicit knowledge, for instance an employee who tries to write down his or her knowledge. Combination refers to the dissemination of explicit knowledge among the employees. Internalization refers to a process of converting explicit knowledge into tacit knowledge. Learning by doing is mostly practiced by companies to internalize the explicit knowledge. According to Schulz and Jobe (2001), knowledge management is potential to create competitive edge. Whilst Soo et al. (2002) argue that knowledge acquisition impacts on corporate perform-

ance through problem solving, new knowledge creation and innovations.

Human Resource Strategy

It is obvious that the role of human resource is to support the organizations to achieve high performance. Ulrich (1998) postulates that excellence comes through a focus on learning, quality, teamwork and other strategic-related activities. In fact, companies face many challenges and issues which among others are on globalization, profitability and growth, technological change, human capital and continuous change. As a consequence, a company should employ individuals with high innovation speed, responsiveness, learning capacity, and achievement. In addition, they should have high affective commitment, cultural and moral competence.

According to Ulrich (2000) there are three dimensions of the value chain functioning as the foundation of a strategic human resource role : a) the human resource function, b) the human resource system, and c) employee behaviors referring to strategically focused competencies, motivations and related behaviors. Human resource management today tends to be a strategic focus; in other words, a leader has to be visionary and able to make vision happen. According to Hilltrop (1998), as future leaders may face many challenges; they are required to have the following characteristics:

a) *Self-reliant* refers to initiative, visionary, creativity, risk-taker, self- motivation.
b) *Expert* refers to professional, intellectual curiosity and lifelong learner.
c) *Networked* refers to communication skills, negotiation skills, problem solving skills, project management, and open-minded-ness.
d) *Resilient* refers to stress tolerance, team-work and adaptability.

Schuler (1992) introduces a five-P model explaining the need of congruent relationships among mission, vision, corporate strategy, external and internal characteristics as well as the human resource strategy. His model consists of five P's: a) *Human resource philosophy* refers to a corporate culture guiding the employees to behave in a certain way. For instance, in *a learning culture company,* employees are encouraged to learn continuously and share their knowledge. b) *Human resources policies* refer to an establishment of guidelines for human resource programs and actions. c) *Human resources program* refers to a coordination facilitating change concerning major people-related business issues. d) *Human Resources practices* refers to the effective approaches required to motivate employees. d) *The Human resources processes* refers to the ways of implementing the human resources processes and activities.

The 5-P model explains the interrelations among the activities of the strategic human resource management in line with the strategic business needs. The model suggests that a company should employ individuals with high achievement, initiative and customer service orientation. Schuler (1992) introduces the 5-P Model as simply depicted below:

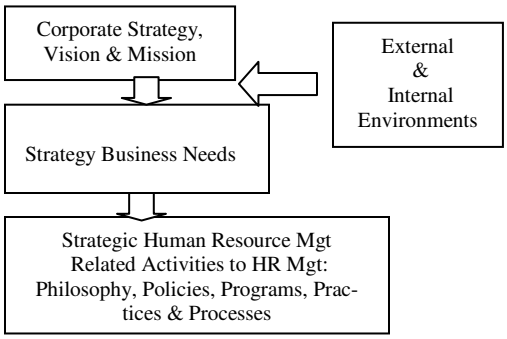

Figure 2. The 5 -P model

The strategic business needs, which are affected by the corporate strategy, mission, vision, external and internal environments, determine the management's overall plan for its survival, growth and adaptability. The internal environment indicates a company's internal condition which includes organizational culture, structure and nature of business; whilst the external environment refers to the external condition of a company such as market trends, competition, and technology. In line with learning organization, Senge (1990) postulates five *disciplines*: *shared vision, system thinking, mastery learning, mental models* and *team learning* aimed at supporting the implementation of knowledge management activities. The knowledge management activities are believed to improve the company productivity, encourage business environment, and increase innovation as well. Knowledge management process will increase the employees' trust, mutual respect, dedication and cohesiveness if it is appropriately done.

Human Capital

Human capital, which is comprised of competence, attitudes, values and intellectual agility, is essential to support a company to achieve its goals. Competencies can simply defined as a combination of knowledge, abilities, experiences, skills, and personal attributes such as values and motivation owned by an individual that contribute to the corporate performance. Spencer & Spencer (1993) introduce six competency dimensions a) Initiative, and information seeking; b) *Helping & Human Service*: interpersonal understanding and customer service orientation; c) *The Impact & Influence*: the impact & influence and organizational awareness; d) *Managerial:* developing others, directiveness, teamwork & cooperation and team leadership; e) *Cognitive:* analytical thinking, conceptual thinking and technical/professional/managerial Expertise; f) *Personal Effectiveness:* self-control, self-confidence, flexibility, organizational commitment and other personal characteristics. Based on theoretical review, human capital used in this study refers to managerial competencies, moral competence and affective commitment; they play a very important role in accomplishing the corporate performance. In addition, *Cultural Intelligence* which is also known as *Cultural Quotient* (CQ) should be considered as globalization in business environment is taking place. According to Livermore (2010), CQ is required to understand diffident customers, manage diverse employees and teams, recruit, select and develop cross-cultural talent and adapt leadership style. In other words, mastering CQ, a leader will be able to run a business more effectively as he or she has the capability to manage the stakeholders' cultural differences in a professional way.

Organization future-oriented vision, mission, corporate culture and strategy should be congruence one another and supported by an appropriate human resource strategy. Corporate culture should enhance employees' creativity and continuous learning; whilst the human resource strategy should provide employees with relevant competencies. Talent management should be well executed and empowerment should also be encouraged to support the human resources to achieve high performance. Spencer and Spencer (1993) argue that an executive as a leader should have essential competencies such as strategic thinking, change leadership, relationship management and a manager as a leader should have the following competencies flexibility, change implementation, entrepreneurial innovation, interpersonal understanding, empowering, team facilitation, portability.

Leadership Style

Good leaders are valuable human capital as they lead the company towards the achievement of the corporate goals by applying effective leadership style. The application of high effective leadership will result in high corporate performance, highly motivated and satisfied subordinates. Ulrich et al. (2009) introduce five rules of leadership which are commonly called as "leadership styles"; they are based on two axes a) *the individual* versus *organizational*. *The individual* dimension refers to the orientation of a leader towards the members of the organization whilst *the organizational dimension* refers to the orientation of a leader towards the organizational goals. b) *near-term operational* versus *long-term strategic.* This axe is concerned about operational versus the strategic issue. Based on the two axes, five rules or five leadership styles (Ulrich, et al., 2008) are created :

Rule 1: shape the future is reflected by the *strategist* style. This style requires a leader to have a future-based vision. A leader must know what the company needs to succeed and how it should be managed to face the future challenges.

Rule 2: *make things happen* is reflected by the *executor* style. This style or dimension requires a leader to execute his or her strategic planning properly. c)

Rule 3: *engage today's talent* is reflected by *talent manager's* dimension. This style indicates that a leader must be able to identify and develop the relevant competencies of his or her subordinates. A leader must attract talented employee-candidates, develop them and make them engaged.

Rule 4: build the next generation is reflected by *human capital developer's* dimension. This style requires a leader to prepare potential talented employees to achieve its long term corporate goals and to sustain them.

Rule 5: *invest in yourself i*s reflected by *personal proficiency.* This style requires a leader to excel in his or her personal competency.

Therefore, he or she should be very competent in managing the company effectively. An effective manager should apply a transformational leadership style and practice the five-rule leadership style effectively to achieve a high corporate performance. He or she should use the leadership style in accordance to the situation. According to Budihardjo (2013) most Indonesian managers tends to practice the *personal proficiency* and *strategist* style Al-

though, they are not ineffective leadership style, they should also practice the other leadership styles based on the required situation. The research also shows that many managers are not good at implementing their strategic plan. They tend to take a long period of time to execute their strategic plan and sometimes they even postpone it.

Moral Competence

The role and function of moral competence which is also called moral *intelligence* (MI) is very important. Nowadays, a company should comply not only with universal regulations but also with universal norms and values. Companies should apply good corporate governance and practice corporate social responsibility. In addition, a company should pay attention to the environmental issues and practice ethical conducts. Having a high moral intelligence, a leader will manage a company with a special attention to the stakeholders. Based on a thorough literature review, it is indicated that moral competence has a positive impact on the corporate performance. Therefore, a future good leaders should have a high moral competence. Kiel & Lennick (2005) argue that companies should practice high *moral competence* (MC) in order to sustain personal and organizational success. Moral intelligence (Lennick & Kiel, 2005: 7) is defined as *a mental capacity to determine how universal principles like those embodied by the golden rule should be applied to our personal values, goals, and actions*. Basically, it has four principles to sustain personal and organizational success: a) *Integrity* focuses on conforming person's behavior to the universal human principles. b) *Responsibility* refers to a *bility* refers to a person's willingness to be responsible for his or her actions, and ensure that his or her actions are in line with the universal human values, norms or principles. c) *Compassion* focuses on a person's willingness to care others by creating compassionate climate and offering assistance. d) *Forgiveness focuses* on a condition of being tolerant for others' mistakes. A person with this characteristic is tolerance, flexible and able to engage with others easily. Based on a research (Budihardjo and Supri-yadi, 2006), many Indonesian managers have moderate to high level of Moral Intelligence. Most of the companies they are working for consider moral competence as one of the requirements of selection process. Moral intelligence (MI), which can be simply defined as people cognitive capability applying the universal human habits, principles, rules, norms and values, becomes very essential in today's business. In fact, human beings are not born moral; instead they were born with what so called *talented moral* or *moral quotient*. Functioning as a mental model, Moral Intelligence enables people to develop their moral values. It will also guide people to behave morally. Not having high MI, a person can probably be a "charismatic" leader but in a negative sense. He or she may use his or her power for a negative purpose.

Affective Commitment.

According to Saks (2006) organizational commitment is an individuals' attitude and attachment towards his or her organization. In fact, organizational commitment is undoubtedly important; employees without strong commitment will probably just work but he or she is not "engaged". As

a consequence, he or she can just move easily to work for other companies. Meyer and Allen (1987) propose three kinds of commitment which can be simply described as follows a). *Affective commitment* is driven by the corporate values, mission, and vision; this kind of commitment is reflected by employees' emotional attachment to the company. b). *Continuance commitment* is driven by a employee's calculative-based consideration whether to remain or to leave the company. c). *Normative commitment* is driven by employees' psychological reasons. Compared with the other two types of commitment, affective commitment is regarded the most essential ones as it is driven by the corporate values and vision. As a matter of fact, many researchers use affective commitment more frequently than the two other types of commitment. According to Budihardjo (2013), affective commitment is proved to have a significant correlation with the corporate effectiveness. Affective commitment is mostly used in many research; it is strongly indicated to have a significant influence on the corporate performance.

Synthesized Theories

Organizational Dimensions Model

To achieve high performance, managers should determine the company's vision, mission, objectives, and apply a *competence-based human resource strategy* which is congruent with its corporate strategy and learning culture. Human capital must also support all the organizational dimensions.

Based on the theoretical review, a tentative model can be presented in Figure 2.

Human capital represented by human competencies, commitment, and leadership style should be in line with the corporate strategy, culture, mission, vision and human resource strategy. To summarize, the ideal model of the organizational dimensions in a very competitive is presented in Table 1.

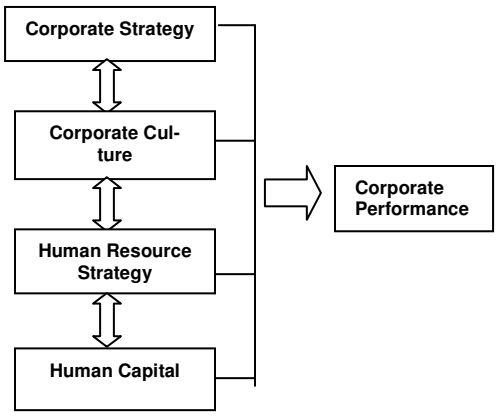

Figure 2. The Organizational Dimensions & Performance

Conclusion

In a high competitive *business* environment, a company should adopt creative corporate strategy and learning culture, as well as employs high competent and affectively committed employees. Learning organization which enhances innovation should be encouraged and its human resource strategy should be ensured whether or not is able to respond effectively to the changes of the stakeholders' demands and needs. It is obvious that human capital plays an essential role in bringing the company into a success. Managers should practice transformational leadership style to face the tough business global competition. Corporate human capital should support the corporate strategy and its activities to achieve

high corporate performance. Employees need to be effective.

Table 1. The Organizational Dimensions

Organizational Dimensions	Future's Requirements
Environment	global competitive
Org. Dimensions	
• Corp. Culture	learning culture
• Cor. Strategy	creative/Prospector
• HR Strategy	highly competence-based
Human Capital	
• Moral Intelligence	high MI
• CQ	extremely high CQ
• Leadership style	transformational & others , esp. the strategist & executor (the five styles)
• Competencies	professional, networking, innovating
• Commitment	high affective commitment

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GAME SOLUTIONS OF NASH NONLINEAR GREY BERNOULLI MODEL USING ITERATED ELIMINATION OF WEAKLY DOMINATED STRATEGY

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Abstract

In this study, Game Theory is introduced to the Grey Forecasting Model to enhance the fore-casting precision. In a game, the normal-form representations include the players (i.e. parameter *n* and *p*), the strategies available to each player (i.e. parameter's possible value), and the payoff (i.e. the average relative percentage error). By iterated elimination of weakly dominated strategy, Nash NGBM weakly dominates traditional GM, optimal *p* GM and NGBM. Besides, this study develops two types of NNGBM. That possibly causes two Nash solutions. Thus, it is necessary to find dominant-strategy equilibrium. Finally, the novel NNGBM is used to forecast America's and China's Gross Domestic Product (GDP) for years 2012-2014. The results may serve as useful information to gov-ernments in the development of their future economic policies.

Key Words: Grey Forecasting Model, Nonlinear Grey Bernoulli model, Game theory, Nash equilibrium, GDP

Introduction

Grey theory has been proposed (Deng, 1989) and developed over thirty years. Grey theory is based on the ordinary differential equation and least square method. It has been widely applied in various academic fields in its initial phase. Owing to some limitation of forecasting precision, researchers work hard to increase the model preci-

sion. One developing trend is to refine the grey forecasting itself by investigating the effect of governing parameters (Wang, Liu, Tang, Cao, & Li, 2014) and refine the traditional model to nonlinear grey model (Chen, 2008; Chen, Chen, & Chen, 2008). The other dev-eloping trend is to combine other soft computing algorithm and other theory in mathematics. Li et al. (2007) used GM (1,1) and Markov chain combined model with an application to predict the number of Chinese international airlines. Bahrami et al. (2014) studied short term electric load forecasting by wavelet transform and grey model improved by PSO (particle swarm optimization) algorithm. Samet and Mojallal (2014) investigated enhancement of electric arc furnace reactive power compensation using Grey-Markov prediction method. Wang (Wang, 2014) combined neural network and GM(1,1) to forecast postgraduates' employment confidence index. Zhou (Zhou, Huang, Yuan, & Tang, 2014) predicted water con-sumption in hospitals based on a modified grey GM(0, 1|sin) model of oscillation sequence. Kumar and Jain (Kumar & Jain, 2009) adopted time series models (Grey-Markov, Grey Model with rolling mechanism and singular spectrum analysis) to forecast energy consumption in India.

No matter which developing trend all achieve satisfactory result and improve forecasting precision. In this study, the nonlinear grey model is the research topic. Since the nonlinear Grey Bernoulli model (NGBM) (Chen, 2008; Chen et al., 2008) was proposed, because of its nonlinear characteristics which could fit the raw data with more flexibility, some researches contribute to develop the related model concerning with NGBM. Zhou et al. (2009) studied parameter optimization of nonlinear grey Bernoulli model using particle swarm optimization. Chen et al. (2010) forecast Taiwan's major stock indices by the Nash nonlinear grey Bernoulli mode. Zhang et al. (2014) proposed an optim-ized Nash nonlinear grey Bernoulli model based on particle swarm optim-ization and its application in prediction for the incidence of Hepatitis B in Xinjiang, China. Through literature survey, the combination of Grey theory and Game theory is rarely found. Li et al. (2014) used Grey Game Model for Energy Conservation Strategies. There is no application of Game theory to Grey forecasting realm based on what we found and this is the motivation why this research conducted.

In this paper, the grey forecasting model is converted into the game form (Fudenberg & Tirole, 1996). The normal-form representation of a game includes the players (i.e. parameter n and p), the strategies available to each player (i.e. parameter's possible value), and cost function (i.e. average residual error). In such a game, GM(1,1), optimal p GM(1,1), NGBM and Nash NGBM can be completely described. For Nash NGBM, iterated elimination of weakly dominated strategy is used to find other Nash solution which is probably different from Chen's Nash solution (Chen et al., 2010). This article also proves Nash NGBM weakly dominates GM(1,1), optimal p GM(1,1) and NGBM and has an excellent performance.

Methodology

(Editors Note: The following sections have been converted to single column format to facilitate easier reading of the complex formulas).

The deriving procedures of NGBM are described below:

Nonlinear Grey Bernoulli Model, NGBM

Step 1: Assume the original sequence is

$$X^{(0)}(1,m)=\left\{x^{(0)}(k_1),...x^{(0)}(k_i),...,x^{(0)}(k_m)\right\},$$

$$m\geq 4 .(1)$$

Step 2: A new sequence $X^{(1)}$ is generated by one time accumulated generation operation (1-AGO),

$$X^{(1)}=\{x^{(1)}(k_i)=\sum_{i=1}^{m}x^{(0)}(k_i)\mid 4\leq m\} \quad (2)$$

Step 4: 1-AGO yields a monotonically increasing sequence similar to the solution curve of the first order linear differential equation. Based on the elementary course in the ordinary differential equation, a differential equation is called the Bernoulli equation. It is nonlinear and has the following form,

$$\frac{d\hat{x}^{(1)}}{dt}+a\hat{x}^{(1)}=b[\hat{x}^{(1)}]^n, \qquad (3)$$

where *n* denotes any real number except 1.

The background value $\hat{x}^{(1)}(t)\cong px^{(1)}(k)+(1-p)x^{(1)}(k+1)=z^{(1)}(k)$, where the production coefficient *p* is in the range of 0-1.

Step5: A discrete form of Eq. (3) is described as:

$$x^{(0)}(k)+a\ z^{(1)}(k)=b\ [z^{(1)}(k)]^n, k=2,3,4,...(4)$$

Using the least square method, the above model parameters a and b become

$$\begin{bmatrix}a\\b\end{bmatrix}=(\mathrm{Z}^T\mathrm{Z})^{-1}\mathrm{Z}^T X \ , \qquad (5)$$

Where Z and X are defined as follows

$$\mathrm{Z}=\begin{bmatrix}-z^{(1)}(2) & [z^{(1)}(2)]^n\\ -z^{(1)}(3) & [z^{(1)}(3)]^n\\ \vdots & \vdots\\ -z^{(1)}(m) & [z^{(1)}(m)]^n\end{bmatrix}, X=\begin{bmatrix}x^{(0)}(2)\\ x^{(0)}(3)\\ \vdots\\ x^{(0)}(m)\end{bmatrix}, (6)$$

Step 6: The particular solution of Eq. (4) is

$$\hat{x}^{(1)}(k+1)=\left[\left(x^{(0)}(1)^{(1-n)}-\frac{b}{a}\right)e^{-a(1-n)k}+\frac{b}{a}\right]^{1/(1-n)},\ n\neq 1,\ k=1,2,3,\ldots\ldots, \qquad (7)$$

Hence, the forecasting value can be estimated by inverse accumulated generated operation (IAGO) which can be calculated by

$\hat{x}^{(0)}(k+1) = \hat{x}^{(1)}(k+1) - \hat{x}^{(1)}(k)$, k=1,2,3…,
(8)

Step 7: Calculate the modelling error.

In the Gray Model, the main criterion for assessing forecasting accuracy is relative percentage error between the fitted and actual values. The relative percentage error (*RPE*) is defined as

$$RPE = \frac{x^{(0)}(k_i) - \hat{x}^{(0)}(k_i)}{x^{(0)}(k_i)} \times 100\% \equiv \varepsilon(n, p \mid X^{(0)}) \quad (9)$$

and the average relative percentage error (*ARPE*) is

$$ARPE = \frac{1}{m-2} \sum_{i=2}^{m} \left| \varepsilon(k_i) \right| \equiv \delta(n, p \mid X^{(0)}) \quad (10)$$

Converting grey forecasting model into the game form

This study converts grey forecasting model into the game form. The normal-form representation of a game specifies: (1) the players in the game, (2) the strategies available to each player, and (3) the payoff received by each player.

In this study, the game structure is:

(1).There are 2 players. $Player = \{N, P\}$.

(2).The set of strategy available to player *N* is $S_N = \left\{ s_n \mid s_n \in R - \{1\} \right\}$ and the set of strategy available to player *P* is $S_P = \left\{ s_p \mid s_p \in [0,1] \right\}$.

(3). Player *N*'s payoff function is $C_N = \delta(n, p \mid X^{(0)})$ and player *P*'s payoff function is $C_P = \delta(n, p \mid X^{(0)})$. Because the payoff function is the average relative percentage error, players *N* and *P* choose their best strategy to minimize the average relative percentage error.

In above game, there are different solutions under various conditions.

Case 1. Traditional GM(1,1)

Suppose that the initial point (*n*, *p*) is (0, 0.5). It is the traditional GM (1, 1).

Case 2. Verhulst GM(,1,1)

Suppose *n*=2, so the set (*n*, *p*) is (2, 0.5). It is Verhulst GM(,1,1) (Wen, 2004).

Case 3. Optimal *p* GM(1,1)

Player *P* moves first and chooses strategy $s_p^* = p_1^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, n = 0)]$. Then, the game ends. This is a case of optimal *p* GM (1,1).

Case 4. Optimal *n* GM(1,1),i.e. NGBM

Player N moves first and chooses strategy $s_n^* = n_1^* = \underset{\{p\}}{Arg\ Min}[\delta(n \mid X^{(0)}, p = 0.5)]$. Then, the game ends. This is a case of NGBM.

Case 5. Nash solution when player N moving first

Suppose that players N and P can move in turn and that player N moves first. The process of obtaining Nash solution is

$$
\begin{aligned}
& n_0^* = \underset{\{n\}}{Arg\ Min}[\delta(n \mid X^{(0)}, p_0 = 0.5 \equiv p_0^*)] \\
& , p_1^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, n_0^*)] \\
& \vdots \\
& , n_i^* = \underset{\{n\}}{Arg\ Min}[\delta(n \mid X^{(0)}, p_i^*)] \\
& , p_{i+1}^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, n_i^*)] \\
& \vdots \\
& , n_n^* = \underset{\{n\}}{Arg\ Min}[\delta(n \mid X^{(0)}, p_n^*)] =, n_{n+1}^* \\
& , p_n^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, n_n^*)] = p_{n+1}^* \\
& Finally, \\
& C(n_n^*, p_n^*) \le C(n_n^*, p_{-n}^*) \\
& C(n_n^*, p_n^*) \le C(n_{-n}^*, p_n^*)
\end{aligned}
\qquad (11)
$$

The strategies (n_n^*, p_n^*) are Nash equilibrium. It uses iterated elimination of weakly dominated strategies. The model is Nash NGBM and is abbreviated as NNGBMn in this study.

When players use iterated elimination of weakly dominated strategies, it is very important to players to realize who move first. Different conditions may cause dissimilar Nash equilibrium. Thus, this investigation proposes case 6.

Case 6. Nash solution when player P moving first

Suppose that players N and P can move in turn and that player P moves first. The process of obtaining Nash solution is

$$\hat{p}_1^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, n = 0 \equiv \hat{n}_0^*)]$$

$$\hat{n}_1^* = \underset{\{n\}}{Arg\ Min}[\delta(n \mid X^{(0)}, \hat{p}_1^*)]$$

$$\vdots$$

$$\hat{p}_i^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, \hat{n}_{i-1}^*)]$$

$$\hat{n}_i^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, \hat{p}_i^*)] \qquad (12)$$

$$\vdots$$

$$, \hat{p}_n^* = \underset{\{p\}}{Arg\ Min}[\delta(p \mid X^{(0)}, \hat{n}_{n-1}^*)] = \hat{p}_{n+1}^*$$

$$, \hat{n}_n^* = \underset{\{n\}}{Arg\ Min}[\delta(n \mid X^{(0)}, \hat{p}_n^*)] = \hat{n}_{n+1}^*$$

Finally,

$$C(\hat{n}_n^*, \hat{p}_n^*) \le C(\hat{n}_n^*, \hat{p}_{-n}^*)$$

$$C(\hat{n}_n^*, \hat{p}_n^*) \le C(\hat{n}_{-n}^*, \hat{p}_n^*)$$

The strategies $(\hat{n}_n^*, \hat{p}_n^*)$ are also Nash equilibrium. This NNGBM is abbreviated as NNGBMp in this study. It also uses iterated elimination of weakly dominated strategies. Multiple Nash solutions are common in game theory. Therefore, the researchers have to rule out unreasonable Nash solution. As a result, this study develops case 7.

Case 7. Reasonable Nash equilibrium

According to case 5 and 6, there are two Nash equilibrium, so a dominated strategy should be eliminated. A reasonable Nash equilibrium is defined as

$$U(\tilde{n}^*, \tilde{p}^*) \equiv Min\left\{C(n_n^*, p_n^*), C(\hat{n}_n^*, \hat{p}_n^*)\right\} \quad (13)$$

Thus, $(\tilde{n}^*, \tilde{p}^*)$ is a reasonable Nash equilibrium. Players *N* and *P* have motivation to deviate from a worse Nash equilibrium to a better one. Because they are better off owing to their deviation. The better Nash solution is call dominant-strategy equilibrium.

Comparisons of forecasting performance for GM series

According to the cases described above, this study proposes the following propositions.

Proposition 1. *The optimal p GM (1, 1) is more precise and effective than GM (1, 1).*

Proof: According to case 6, it is easy to obtain that

$$\hat{\delta}^*(n_0 = 0\ , p_1^*) \le \hat{\delta}^*(n_0 = 0, p_0 = 0.5) \quad (14)$$

Therefore, proposition 1 exists.

Proposition 2. *NGBM is more precise and effective than GM (1, 1).*

Proof: According to case 5, it is easy derive that

$$\hat{\delta}^*(n_1^*, p_0 = 0.5) \le \hat{\delta}^*(n_0 = 0, p_0 = 0.5) \quad (15)$$

Hence, proposition 2 exists.

Proposition 3. *NGBM is more precise and effective than Verhulst GM(1,1).*
Proof: According to case 5, it is easy to get that

$$\hat{\delta}^*(n_1^*, p_0 = 0.5) \le \hat{\delta}^*(n_0 = 2, p_0 = 0.5) \quad (16)$$

Thus, proposition 3 exists.

Proposition 4. *Nash NGBM is more precise and effective than Optimal p GM(1,1).*
Proof: According to case 6, it is easy derive that

$$\hat{\delta}^*(\hat{n}_n^*, \hat{p}_n^*) \le \hat{\delta}^*(n_0^* = 0, p_1^*) \quad (17)$$

Therefore, proposition 4 exists.

Proposition 5. *Nash NGBM is more precise and effective than NGBM (1, 1).*
Proof: According to case 6, it is easy to obtain that

$$\hat{\delta}^*(n_n^*, p_n^*) \le \hat{\delta}^*(n_1^*, p_0^* = 0.5) \quad (18)$$

Thus, proposition 5 exists.

Proposition 6. *The optimal p GM(1,1) and NGBM can't be compared in forecasting accuracy.*
Proof: According to case 6 and 7, it is easy to get that

$$\hat{\delta}^*(n_1^*, p_0 = 0.5) \underset{<}{\overset{\ge}{}} \hat{\delta}^*(n_0^* = 0, p_1^*) \quad (19)$$

Therefore, proposition 6 exists.

Proposition 7. *NNGBMn and NNGBMp can't be compared in forecasting accuracy.*
Proof: According to case 6 and 7, it is easy derive that

$$\hat{\delta}^*(n_n^*, p_n^*) \underset{<}{\overset{\ge}{}} \hat{\delta}^*(\hat{n}_n^* = \hat{p}_n^*) \quad (20)$$

Hence, proposition 7 exists.

Therefore, the above proposition can be summarized as follows.
(1) The optimal *p* GM(1,1) weakly dominates traditional GM(1,1).
(2) NGBM weakly dominates GM(1,1) and Verhulst GM(1,1).
(3) Nash NGBM weakly dominates GM(1,1), Verhulst GM(1,1) and NGBM(1,1).
(4) It all depends for which one has a good performance between optimal p GM(1,1) and NGBM.
(5) There are two Nash equilibrium strategies, (n_n^*, p_n^*) and $(\hat{n}_n^*, \hat{p}_n^*)$. In detail, NNGBMn's Nash solution is (n_n^*, p_n^*), and NNGBMp's Nash solution is $(\hat{n}_n^*, \hat{p}_n^*)$. The proposed NNGBM can't summarize which Nash solution dominates the other one. A case study in following section proves this thesis.

Case Study: G2' GDP Forecasting

In this study, G2's GDP is used to testify the proposed NNGBM. The Group of Two (G2) is a proposed informal special relationship between America and China. They are the two most influential and powerful countries in the world. Thus, to forecast the G2's GDP is very important for policy makers and economists. The data from 2006 to 2011 is used to construct grey model. The forecasting performances are described as follows.

Empirical results of GM series for forecasting America's GDP

The process of obtaining the forecasted values by GM series is described in the following.

(1) Denote the original data series, $X^{(0)}(1,6) = \{133772, 140287, ..., 150940\}$.

(2) Thus, the AGO series of $X^{(1)}(1,6) = \{133772, 274095, ..., 852569\}$.

(3) After constructing the matrices *Z* and *X*, obtain the following objective function.

$$ARPE = \frac{1}{m-1}\sum_{2}^{m}\left(\frac{|x^{(0)}(k_i) - \hat{x}^{(0)}(k_i)|}{x^{(0)}(k_i)} \times 100\%\right)$$
$$= \delta\left[\varepsilon(Z(n,p), X^{(0)})\right]$$
$$= \delta\left[n, p \mid X^{(0)}\right]$$

(4) Sets n=0 and p=0.5. Thus, GM's *ARPE* is 1.4536.

(5) Sets n=0 and p=1 $\left(p \equiv \underset{\{p\}}{Arg}\ \delta\left[p \mid n=0, X^{(0)}\right]\right)$. Thus, optimal p GM's *ARPE* is 1.2948.

(6) Sets n=0.*07* $\left(n \equiv \underset{\{n\}}{Arg}\ \delta\left[n \mid p=0.5, X^{(0)}\right]\right)$.

Thus, NGBM's *ARPE* is 1.0940.

(7) By eq(11), n=-0.08 and p=0.78. Thus, NGBMn's *ARPE* is 1.0669.

(8). By eq(12), n=-0.0. and p=1. Thus, NGBMp's *ARPE* is 1.2178.

By Newtonian method, it is easy to figure out *p* or/and *n*. The above results are showed in Table 1. NGBMn's *ARPE* is the smallest. Thus, it has the highest forecasting accuracy. The results also show that NGBM's *ARPE* is smaller than optimal p GM(1,1). Hence, NGBM is better than optimal p GM(1,1).

Empirical results of GM series for forecasting China's GDP

The process of obtaining the forecasted values by GM(1,1) series is described in the following.

(1) Denote the original data series, $X^{(0)}(1,6) = \{27129.5, 34940.6, ..., 72981.7\}$.

(2) Thus, the AGO series of $X^{(1)}(1,6) = \{27129.5, 62070.1, ..., 289411.6\}$,

(3) After constructing the matrices *Z* and *X*, obtain the objective function $ARPE = \psi\left[n, p \mid X^{(0)}\right]$.

(4) Sets n=0 and p=0.5. Thus, GM's *ARPE* is 2.6384.
(5) Sets n=0 and p=0.44 $\left(p \equiv \underset{\{p\}}{\text{Arg}}\ \delta\left[p \mid n=0, X^{(0)} \right] \right)$. Thus, optimal p GM's *ARPE* is 2.3747.
(6) Sets n=0.10 $\left(n \equiv \underset{\{n\}}{\text{Arg}}\ \delta\left[n \mid p=0.5, X^{(0)} \right] \right)$ and p=0.5. Thus, NGBM's *ARPE* is 2.4802.
(7) By eq(11), n=0.08 and p=0.47. Thus, NGBMn's *ARPE* is 2.3743.
(8) By eq(12), n=0.05. and p=0.44. Thus, NGBMp's *ARPE* is 2.2747.

The above results are showed in Table 2. NNGBMp's *ARPE* is the smallest. Therefore, it has the highest forecasting accuracy. The results also indicate that optimal p GM(1,1) is better than NGBM, which is different from Chen's case study(C.-I. Chen, 2008; C. I. Chen et al., 2008). In short, NGBM(1,1) is not always better than optimal *p* GM(1,1). Notice that the best forecasting model for America is NNGBMn, while the best one for China is NNGBMp.

Conclusion

This study transforms grey forecasting model into a game form which contain player *N* and *P*, strategy set *Sn* and *Sp*, and payoff function *Cn* and *Cp*. This proposed game can completely describe the traditional GM(1,1), optimal *p* GM(1,1), NGBM and NNGBM.

This article proves optimal *p* GM and NGBM weakly dominate GM. The optimal *p* GM and NGBM can't be compared in forecasting accuracy in advance. NNGBM weakly dominates optimal *p* GM(1,1) and NGBM. In addition, this study uses iterated elimination of weakly dominated strategy to find Nash solution for NNGBM. That causes two scenarios. NNGBM is named NNGBMn when the player *N* moves first, and NNGBM is named NGBMp when the player *P* moves first. In such a game, there are two Nash solutions. No one can absolutely dominate the other one. Thus, unreasonable solution should be eliminated. This study uses min function to solve this problem.

Finally, America's and China's (i.e. G2's) GDP are used to test the proposed NNGBM. The yearly modelling data are from 2006 to 2011. The findings indicates that NNGBMn is suitable for forecasting America's GDP,and NNGBMp is suitable for forecasting China's GDP. It tells a truth that no Nash solution can absolutely dominate the other one in NNGBM. This investigation also shows that NGBM doesn't always dominate optimal p GM. The case of forecasting China's GDP proves this statement. The early literatures have to revises their reports. The results also show that G2's GDP are keeping on growing. The research results would provide a valuable reference for policymakers as well as useful information for all investors.

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Table 1. Actual value, forecasted value and forecasting performance by GM series for America's GDP

Year	*Actual*	*GM n=0.00 p=0.50*	*RPE*	*Optimal p GM n=0.00 p=1.00*	*RPE*	*NGBM n=-0.07 p=0.50*	*RPE*	*NNGBMn n=-0.08 p=0.78*	*RPE*	*NNGBMp n=-0.03 P=1.00*	*RPE*
2006（k=1）	133772	133772.00	0	133772.00	0	133772.00	0	133772.00	0	133772.00	0
2007（k=2）	140287	139013.24	0.9079	140204.50	0.0588	140405.90	-0.0847	140375.33	-0.0629	140148.30	0.0988
2008（k=3）	142915	141344.72	1.0987	142565.44	0.2446	140662.88	1.5758	140704.83	1.5464	141926.54	0.6916
2009（k=4）	139390	143715.31	-3.1030	144966.13	-4.0004	142795.64	-2.4432	143176.38	-2.7163	144540.30	-3.6948
2010（k=5）	145265	146125.65	-0.5924	147407.25	-1.4747	145841.83	-0.3970	146698.31	-0.9866	147589.38	-1.6000
2011（k=6）	150940	148576.42	1.5659	149889.48	0.6960	149476.70	0.9694	150906.82	0.0219	150933.95	0.0040
2002（k=7）		151068.30		152413.50		153554.13		155640.49		154509.81	
2013（k=8）		153601.96		154980.03		157998.30		160817.23		158283.14	
2014（k=9）		156178.13		157589.77		162766.74		166392.49		162234.73	
ARPE			1.4536		1.2948		1.0940		1.0669		1.2178

Table 2. Actual value, forecasted value and forecasting performance by GM series for China's GDP

Year	*Actual*	*GM n=0.00 p=0.50*	*RPE*	*Optimal p GM n=0.00 p=0.44*	*RPE*	*NGBM n=0.1 p=0.5*	*RPE*	*NNGBMn n=0.08 p=0.47*	*RPE*	*NNGBMp n=0.05 P=0.44*	*RPE*
2006（k=1）	27129.5	27129.50	0	0.00	0	27129.50	0	27129.50	0	27129.50	0
2007（k=2）	34940.6	35790.80	-2.4332	27129.50	0.0000	34996.12	-0.1589	34929.93	0.0305	34963.06	-0.0643
2008（k=3）	45195.2	42596.47	5.7500	35385.64	-1.2737	42682.58	5.5594	42365.33	6.2614	42060.36	6.9362
2009（k=4）	49904.4	50696.24	-1.5867	42039.49	6.9824	51063.67	-2.3229	50597.57	-1.3890	50111.75	-0.4155
2010（k=5）	59260.2	60336.20	-1.8157	49944.52	-0.0804	60529.50	-2.1419	59989.11	-1.2300	59435.07	-0.2950
2011（k=6）	72981.7	71809.20	1.6065	59335.99	-0.1279	71362.93	2.2180	70820.90	2.9607	70308.73	3.6625
2002（k=7）		85463.81		70493.41	3.4095	83838.19		83376.39		83030.89	
2013（k=8）		101714.86		83748.86		98250.64		97967.50		97939.82	
2014（k=9）		121056.07		99496.84		114931.58		114948.87		115426.95	
ARPE			2.6384		2.3747		2.4802		2.3743		2.2747

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UNDERSTANDING THE EFFECT OF POSITIVE PSYCHOLOGICAL CAPITAL ON HOSPITALITY INTERNS' CREATIVITY FOR ROLE PERFORMANCE

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Abstract

For the hospitality industry interns, it is important to have the service skills, attitude and creativity. Furthermore, employees' creativity is needed for organizations to innovate, survive and profit in competitive environments. The purpose of this study is to reveal how human resource management practice can enhance hospitality interns' creativity and composite structure of positive psychological capital (PPC), which has gained prominence as an important construct behavior research. The obtained data was analyzed by covariance-based structural equation modeling and component-based structural equation modeling. The results indicated that interns' positive psychological capital was composed of confidence, hope, optimism, resilience, and it was significantly potential association with the interns' creativity for role performance.

Key Words: Positive Psychological Capital, Creativity, Role Performance, Hospitality Intern

Introduction

The value created when human capital is aligned with corporate strategy and fully engaged in making the enterprise effective has been researched extensively by Harter, Schmidt, and Hayes (2002). Also, it have a significant posi-

tive impact on performance outcomes, specifically, it focuses on strengths rather than weaknesses, health and vitality rather than illness and pathology. (Luthans et al., 2004). In recent years, internship programs bridge the gap between formal education and practical work experience. Some stated problems reveal that not only hospitality employees need to be taken care of, but much urgency is required concerning student interns who may consider joining the industry. The term "positive psychological capital (PPC)" has been mentioned in various works on economics, investment, and sociology. But fewer studies discussed the relationship with positive psychological capital (PPC) and interns' creativity for role performance.

The following was to examine psychological capital's antecedents and the effect of psychological capital and the interns who majoring in hospitality on their self-creativity ability. It aggregates four antecedents: confidence, hope, optimism, and resilience to assessing positive psychological capital and test the research model with the interns' creativity for role performance in five colleges.

Literature Review and Hypotheses

Positive Psychological Capital

In today's environment, "human capital"—has become a key success factor for sustained organizational performance (Luthans et al., 2004). Positive psychological capital (PPC) resources are often referred to as "more stable than states such as moods or emotions, but not as fixed as personality traits such as conscientiousness or core self-evaluations" (Luthans et al., 2010). Over the last decade an accumulating body of research has suggested that this motivational state is linked to organizational effectiveness and desired work outcomes (Newman et al., 2014 and Youssef and Luthans, 2012).

Also, researcher Seligman (2002) finds that optimistic, self-efficacy (or confidence), hope, optimism, and resilience of the positive organizational behavior consistent could be measurable. Relevant issues have been discussed from positive psychological to extract theoretical and empirical research. Accordingly, Luthans, Avolio, et at. (2006) represent that psychological is a second order factor of those follow factors:

Confidence.

Confidence is a self-efficacy in team interns' abilities, and success is psychological capital in the characterization of the mission of self-confidence to achieve a positive workplace psychology (Luthans et al., 2007); In Psychological Capital Questionnaire (PsyCap questionnaire, PCQ), the score is adapted as the operational definition of confidence (self-efficacy). For example, hospitality interns with the higher confidence scores, express the greater self-efficacy to complete their tasks.

Hope.

Hope is an incentive to think (agency thinking) and the path of thinking in order to achieve the target state of positive motivation by efforts to complete the task in a positive state of mind (Luthans et al., 2007).In this study, the sec-

tion of hope in the questionnaire is an important indicator for psychological capital. As for Adult Hope Scale, the state hopes (state hope) scores is adapted as the operational definition of the hope (Snyder, Lopez, Shorey, Rand & Feldman., 2003). The interns with the higher scores are with more energy by virtue of his will power to complete tasks.

Optimism.

The positive psychologist Tal Ben-Shahar (2009) uses "optimism" to mean willingness to accept failure while remaining confident that success will follow, a positive attitude he contrasts with negative perfectionism. An optimistic intern is one who perceives good things happening to them as internal, stable, and global, also in the interpretation of events characterized by positive psychological (Luthans et al., 2007). This study uses positive psychological capital optimistic part of the questionnaire, and Life Orientation Test (Life Orientation Test) scores of optimism are adapted as the operational definition of optimism (Scheier and Carver., 1985).

Resilience.

Psychological resilience is defined as an individual's ability to properly adapt to stress and adversity. Stress and adversity can come in the shape of family or relationship problems, health problems, or workplace and financial worries, among others (APA, 2014). In positive organizational behavior (POB), it is carefully defined as "the study and application of positively oriented human resource strengths and psychological capacities that can be measured, developed, and effectively managed for performance improvement in today's workplace" (Luthans, 2002)

This study takes the questionnaire about mental toughness part of the capital (Luthans et al., 2007), as well as Self-Resiliency Scale (Ego-Resiliency Scale) score as the toughness of the operational definition (Block and Kremen., 1996). The hospitality interns with higher scores in the section of toughness, indicating their more able to past events, a positive interpretation of the results.

The view that individuals both within and outside employees' immediate work setting are increasingly important contributors to their creative performance (Madjar, 2005; Madjar, Oldham, & Pratt, 2002). Thus, Understanding how interns increase their own creativities for role performance may be as important as understanding who they are or how their context facilitates their efforts. The in-role behavior of the employee refers to the collection of a series of actions of the employee based on his or her role in the organization, and the extra-role behavior of the employee defined as a part of the work or reflected in the official salary system of the organization. (Zhu, Y., 2013).Is the creativity for role performance driven by inner psychological needs or conflicts?

We assume that the PPC dimensions together will identify hospitality interns who believe in their professional skills, are goal oriented and confident with a strong ability to adjust to change and hardships from their workplace. It is expected that PPC will contribute to

identify hospitality interns with a strong focus on work creativity for role performance. Thus, we propose the following hypothesis:

Hypothesis 1： The interns' positive psychological capital is aggregated second order variable of psychological construct.

Hypothesis 2： The interns' positive psychological capital has a positive effect on creativity for role performance.

Research Methodology

Conceptual Framework

From the documents review, the research model summarizes the relationship test in this study. In general, we propose that positive psychological capital (PPC) positives have influences on creativity. This study also tests the second effect of psychological capital aggregated form four positive emotions demeans. Finally and as a positive effect on the dotted line in Figure 1, we will discuss the effects interaction of PPC in predicting hospitality interns' creativity ability.

The research model is shown in Figure 1. The data are collected from one of the Student who majoring in hospitality in Taiwan, which was then used to examine the structural model. Data collection was on college student, pilot research phase and questionnaire survey phase emphasized the importance of positive psychological capital when student are building on self-positive emotion. This study use an online survey system sending a request to 278 student of the interns who majoring in hospitality of five companies in Taiwan and yielding a 79% response rate.

Constructs and Measurements

The scales positive psychological capital and creativity were chosen based on a concern for each constructs' reliability. Psychological capital used a modified version of psychological capital questionnaire (Luthans et al., 2007). Creativity we focused on development of novel and expedient way to problem solving, and provide innovative and useful ideas (Amabile, Conti, Coon, Lazenby,&Herron, 1996; Zhou & George, 2001), and instructed to indicate their degree by Likert-type five point scale of agreement from 1 (strongly disagree) to 5 (strongly agree).

This study is measuring reliability into the conduct test by Cronbach α value, all variables are greater than the α value is almost 0.7, consistent with Nunnally (1978) proposed threshold. Validity is divided into convergent validity and discriminate validity, convergent validity in measuring (Fornell & Larcker ,1981), proposed three Proof (1) All of the standardization item load is greater than 0.5; (2) CR values of large at 0.8; (3) AVE values greater than 0.5. In this study all dimensions are in compliance with three standards, so good Convergent validity. As for discriminate validity, the dimensions of the AVE value is greater than 0.5, our results of the factors significantly dominated are shows in Table 1.

Alternative Model Analysis

The researcher firstly uses the sample model (N1=278) to analyze the psychological capital alternative model. The confirmatory factor analysis index in Psychological capital. The evaluation index of one-factor model did not reach the ideal threshold value. Uncorrected factors model reached the threshold value in these evaluation indexes: RMSEA(<.08)、NNFI(>.9)、CFI(>.9)、PNFI(>.5)、PGFI (>.5); the model is almost perfect in the GFI index and AGFI index (>.9), shows as the Table 2. Hierarchical model reaches the ideal threshold value in all evaluation indexes. From this perspective, one-factor model should be deserted; hierarchical model is the best one; uncorrected factors model is near-perfect. The chi-square difference test ($\Delta \chi 2$) can further analyze the fitness of the uncorrected factors model and the hierarchical model. We then have $\Delta \chi 2=59.25$, $p<.001$. This result indicates the obvious difference of the two models, and hierarchical model is the optimal one. Structural equations modeling (SEM) is particularly test the relevance is suitable and use LISREL 8.88 to tested research model. The positive effect of psychological capital and creativity all are latent variables that need to be anchored in measurable manifest variables in order to be tested for statistical significance.

According to Figure 2, models evaluate the Path coefficient between psychological capital and creativity path coefficient is $\gamma 11 = .99(t=35.37)$ is positive significant. Thus Table 2, the psychological capital Hierarchical model is $\chi 2=649.22$ (df=226); One-factor model is $\chi 2=1661.30$ (df=230), above all become a nested model to tested adjusted chi-square difference test $\triangle = 1012$ ($\triangle$ df=4) is greater than 3.84, nested model shows that positive psychological capital Hierarchical model could be a useful explained of the model, Hypothesis 1 is supported that psychological capital is aggregated four deamination factor Hierarchical model. Hypothesis test the CFA of PPC Hierarchical model, that psychological capital is four deamination positive psychological construct of individual' self-positive emotion by psychological capital.

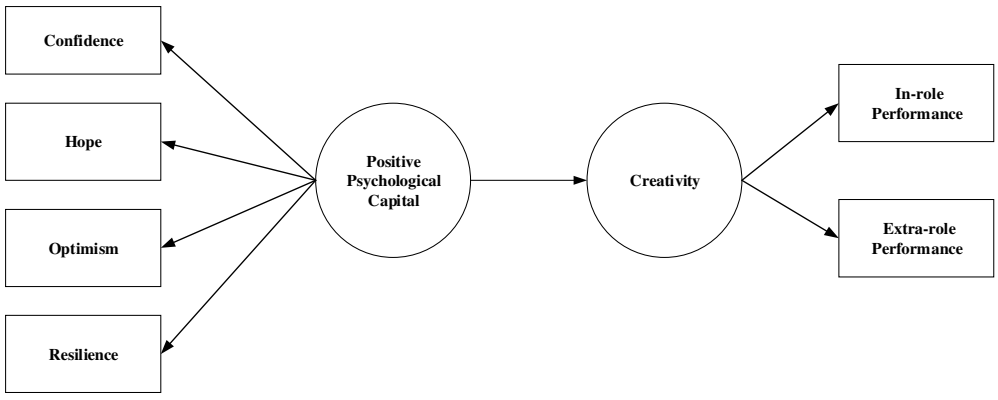

Figure 1. Structural Model

Table 1. Psychometric Properties of Reflective and Formative Constructs

Constructs	Item	Factors		Item	Factors	
		Loadings	ITC		Loading	ITC
Positive Psychological Capital: Confidence *CR=.898, Alpha=.864, AVE=.595*	1	.715	.596	2	.814	.711
	3	.794	.684	4	.766	.648
	5	.769	.654	6	.770	.659
Psychological Capital: Hope *CR=.966, Alpha=.954, AVE=.879*	1	.934	.882	2	.916	.853
	3	.952	.912	4	.948	.905
Psychological Capital: Optimism *CR=.947, Alpha=.926, AVE=.817*	1	.913	.840	2	.914	.844
	3	.904	.826	4	.886	.799
Psychological Capital: Resiliency *CR=.976, Alpha=.971, AVE=.875*	1	.940	.912	2	.911	.873
	3	.919	.883	4	.938	.910
	5	.954	.932	6	.951	.928
In-role Creativity *CR=.914, Alpha=.910, AVE=.727*	1	.903	.840	2	.849	.790
	3	.813	.772	4	.867	.810
Extra-role Creativity *CR=.877, Alpha=.890, AVE=.641*	1	.793	.730	2	.869	.790
	3	.753	.952	4	.807	.750

Table 2. Fit index of Psychological Capital Confirmatory Factor Model (N1=278)

Model	$\chi 2$	p	df	RMSEA	GFI	AGFI	NNFI	CFI
Null model	18522.97		253					
One-factor model	1661.30	.00	230	.089	.85	.81	.94	.94
Hierarchical model	649.22	.00	226	.049	.93	.92	.98	.98

Table 3. Variables correlation matrix

	Mean	S/D	SE	HO	OP	RE	CR-IN	CR-EX
Confidence	5.62	.804	1.000					
Hope	5.57	.831	.939	1.000				
Optimism	5.55	.832	.953	.963	1.000			
Resilience	5.50	.893	.909	.937	.970	1.000		
in-role Creativity	5.47	.929	.878	.903	.956	.981	1.000	
extra-role Creativity	5.52	.892	.918	.947	.958	.990	.972	1.000

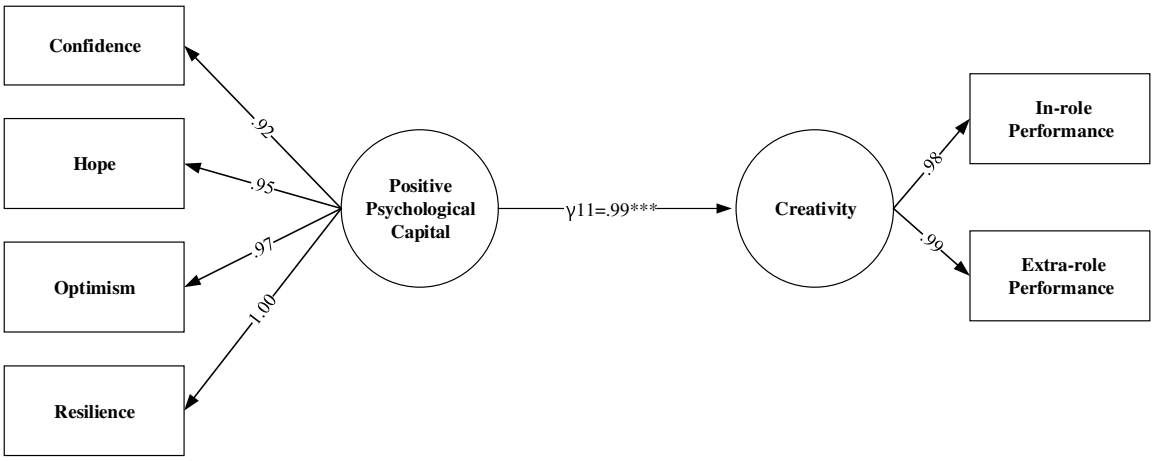

Figure 2. The Direct Effects Model (Stander solution)
(*=p<.05 **=<.01 ***=<.001)

Hypothesis 1 suggested that psychological capital is a four deamination hierarchical model.

Hypothesis 2：Interns 'positive psychological capital has a positive effect on creativity for role performance.

Discussion

This study revealed how and in what ways positive psychological capital (PPC) can contribute to creativity for role performance. We also examined the hierarchical model of psychological capital in the relationship on interns' creativity ability. In line with what has been suggested in previous theoretical work (Avolio & Luthans, 2006), we found that positive psychological capital positively related to their performance of the firms. This relationship was define it will increases interns' creativity ability, this effect is proved by hypothesis 2, the result shows it had direct effect between psychological capital and creativity for both in-role and extra-role performance, thought psychological capital like a leadership climate of the firms. When intern member had powerful positive psychological capital were import more work energy and self- learning intention as building their own idea on work.

Research has focused on psychological capital of team (in-role and extra-role) is more (or less) effective of the firms in promoting interns' positive emotion and increase their own creativity ability. The study proved the direct effect of psychological capital to interns' creativity. Specifically, the result provides fairly strong support for psychological capital direct effect with the relationship between interns' team psychological capital and their performance of creativity for role performance.

Conclusions

This study's sample of hospitality interns in Taiwan for a small number of samples were be limited of this study. An impor-tant implication of these findings on positive creativity is related to

psychological capital as positive emotion. Thus, firms shall focus on building psychological capital environment of leadership climate advantage by supporting the antecedents of intern member's creativity.

The researches on positive psychological capital increases our understanding of the complex relationship between psychological capital and important interns' member in-role and extra-role creativity outcomes. Furthermore, it is suggested that the psychological capital of team workers may need to be extended to capture more fully the effective creativity in facilitating intern member's creativity performance.

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SHARING ROLES AND RESPONSIBILITIES OF PROJECT DELIVERY METHODS IN TAIWAN: A CASE STUDY

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Abstract

This study explains the procurement of construction projects for public and private in as well as to introduce a complicate project delivery system of PCM (Professional Construction Management) which combine pure CM and Design-Build and defined by Government Procurement Act of Taiwan. This project delivery method widely used for large engineering projects and clients who have little experience of construction projects. Then the relationship of the participations was used to illustrate the sharing roles and responsibilities of project delivery methods in Taiwan. The framework of management in execution level is examined completely in case study. Finally, the deficiencies of this system will be discussed in conclusion for the reference to improvement of other systems.

Key Words: delivery method; PCM; procurement; roles and responsibility

Introduction

Motive and Background of the Study

In Taiwan, the recent scale-up of public engineering projects together with the enhanced complexity of their working contents resulted in the division between technological and management services in execution of the project, which in turn, gave rise to the Professional Construction Management (PCM) in Taiwan. The concept of PCM was introduced into Taiwan by the Bechtel Corporation (U.S.A.) early in the 1980s. But its legal foundation was not estab-

lished until the promulgation of Project Bidding Regulation of Taiwan Government in 1987. The Law of Governmental Purchase, which was promulgated by Taiwan Government and came into effect in 1998. The Public Construction Commission promulgated and put into practice the relevant sub-regulations, which was further revised in August, 2000. Thus the PCM-related laws and regulations have come into completeness in Taiwan.

Public engineering projects in Taiwan were often divided into two parts: (1) planning and designing; (2) constructing and superintending. They were not contracted as Turn-Key". Hence, PCM in Taiwan mainly involves examining the planning and designing, or supervising and managing the construction engineering on behalf of the owner. However, a construction organization for public engineering projects usually has its official engineering department to supervise the construction engineering, but has no department for planning and designing. Hence, construction organizations rely heavily on PCM to assist them in the planning and designing stages.

Although the assistance of PCM in the stages of planning and designing was valued by the owners, and had showed good performance, it has only been a short time since PCM was introduced into Taiwan, cases of PCM participation in the planning and designing stages are still few, and lack a complete integration of experience. In addition, the inadequate understanding of authority and responsibility by some owners or related vendors often lead to various executing problems in the stages of PCM planning and designing.

Some studies relating to PCM executing problems had recently been published. Burger & Halpin firstly developed the Project Control System database to tackle the management problems in complicated projects. Their studies listed the major items to be paid attention to in operation of engineering projects, and suggested to control, diagnose and solve related problems through computerized project designing. Handa & Rivers analyzed 28 representative accident-causing problems in large engineering projects, which were statistically categorized into 6 major problematic items, and finally proposed 7 methods to avoid or solve the problems.

Russell & Fayek classified project problems into 10 major items and discussed and listed 4-10 possible causes. A preliminary diagnosis system was established via expert rules and fuzzy logic. Some improvement measures were suggested for problem diagnosing of engineering projects.

Mitropoulos & Howell collected 24 problem cases for a comparative analysis to determine the main reasons leading to the problems, and developed a decision tree analysis program for problem diagnosing and improvement proposals.

This study explains the procurement of construction projects for public and private in Taiwan firstly. And introduce a complicate project delivery system of PCM (Professional Construction Management) which combine pure CM

and Design-Build and defined by Government Procurement Act of Taiwan. This project delivery method widely used for large engineering projects and clients who have little experience of construction projects. Then the relationship of the participations was used to illustrate the sharing roles and responsibilities of project delivery methods in Taiwan. The framework of management in execution level is examined completely in case study. Finally, the deficiencies of this system will be discussed in conclusion for the reference to improvement of other systems.

Moreover, the governmental agencies that are responsible for making policies and systems to the construction industry can be roughly classified into two groups. The first group plays as owners, who perform as the clients for asking engineering professionals to conduct planning, design, and supervision jobs, constructors to construct facilities, or professional construction management (PCM) to act as a technical substitute or surrogate of owners in ascertaining their interests during the project delivery process. The ministries of Transportation and Communication, Economic Affairs, Education belong to this group. Every ministry may have specified necessary technical codes (such as specifications of materials and scale magnitude, composition of materials, or tested methods and criteria) for the construction companies to deliver the facilities they need.

The next group plays as the policy maker, or designer and regulator of the systems for the construction industry. The Public Construction Committee (PCC) of Executive Yuan and the Construction and Planning Agency (CPA), Ministry of Interior fall into this group. PCC is primarily in chare of the regulations of engineering professionals (including professional engineers, professional engineer firms, and engineering consultant companies), Government Procurement Law, and Promotion of Private Participation. The regulations of constructors and architects, and buildings are conducted by CPA.

Budget introduce process of Public Project

On the national budgeting basis, PCC will review all the proposals of public investment of construction facilities, either buildings or civil works, by checking the necessity and budget amount of the required facilities. As shown in Figure 1., basically it is very similar to most of projects. (Note: see all Figures at the end of this article.) Feasibility study is necessary in plan stage, especially economic efficiency is enough to project is going or not going. The fundamental design and detail design should have complete information to revise the preliminary budget of plan stage, and to set up the contract budget.

One another important job in design stage is to get the construction permit by regulation. The major issue in construction stage is to make sure every activity in site is fully the requirement of contract document. Finally, the supervisor should assist the client to inspect and survey the project is acceptable, for client can complete the project.

Basically, in public procurement, there are three ways to issue the bid.

1) Open tendering procedures: the procedures under which a public notice is given to invite all interested suppliers to submit their tenders.
2) Selective tendering procedures: the procedures under which a public notice is given to invite all interested suppliers to submit their qualification documents for pre-qualification evaluation basing upon specific qualification requirements and, after such evaluation, the qualified suppliers are invited to tender.
3) Limited tendering procedures: the procedures under which, where no public notice is given, two or more suppliers are invited to compete or only one supplier is invited for tendering. And, there is little different to select the contractor in Public Procurement and Private Procurement.

The principles of awarding contract in Public Procurement are as below.
1) The Lowest Bid with government estimate: the lowest tender within the government estimate.
2) The Lowest Bid without government estimate:
the lowest tender within the budget amount.
3) The most advantageous tender: may or may not consider tendering price when evaluating, tenders are allowed to submit tenders for construction work, property, and services with different qualities.
4) Multiple award: awarded to different renderers by different items or different quantities. The lowest bid is the major type of awarding contract.

Normally there is only one type of awarding contract in Private Procurement. The tendering procedure is invitation bid in generally, and principle of awarding contract is the most advantageous tender for client.

Sharing roles and responsibility in PCM

The major construction companies in Taiwan include: architect firm, professional engineer (PE) firm, engineering consultant company, construction company (contractor), PCM firm, and developer company, as listed in Figure 2. An architect firm shall have at least one registered architect. Several architects can jointly run an associate architect firm. If necessary, an architect firm can hire in-house professional engineers for conducting specified technical works such as structural engineering works. Otherwise, the structural engineering works have to subcontract to other PE firm or engineering consultant company. PE firm shall have at least one registered professional engineer, while engineering consultant company shall have many registered professional engineers with different professional expertise so that the engineering consultant company can provide services that are matched with the expertise areas of the professional engineers. PCM firm shall hire engineering professionals who have same qualifications as that required for architects or registered professional engineers.

Construction company (contractor) shall have at least one registered professional engineer in the areas of civil engineering, structural engineering, hydraulic engineering, survey engineering, geotechnical engineering, environmental engineering, or architect.

In order to operate its business, a constructor company has to hire registered professional engineer who has practical experiences of more than 2 years. At construction sites, constructor companies must hire a chief site manager, who has related engineering background and taken a training course designed by CPA, is responsible for all the activities. Quality control engineer is also required at the construction sites to make sure the desired quality is fulfilled. The registered professional engineer of a constructor company is primarily responsible for the issues of technical and safety at the sites. All the professional engineers at the sites must follow the process requested by government, conduct tests on materials specified in construction codes, and fill out necessary documents for recording construction details. The main professional service is interface management, including the interfaces of cost, schedule, quality, etc. The main technical services may have building, civil work, mechanic, electric, pluming, elevator, lighting, security, landscape, Eco. Certification, etc.

For example the quality management in PCM delivery method is implementation of 3-level quality control systems aims at upgrading the public construction quality. Effective quality control system should be established for motivating, remedying, preventing the defects of the construction company's (contractor's) quality control. Three levels of public project quality control systems are established to enhance public construction quality control. The content of the establishment are all parties respectively as the authority, the client supervision party, PCM, architect inspection and JV team (design architect, construction company, and MEP construction company). Their construction quality controls are as shown in the Figure 3. The construction quality of public projects must be independently completed and guaranteed by the JV team, i.e., the JV team itself must be capable of processing the quality control system through self inspection, quality assurance, quality directing and quality audit. The target of contractual construction quality shall be completed under such a system.

For confirming the execution result of the construction quality management, the construction authority should apply construction quality evaluation through a very objective manner. The construction quality's degree of good or bad should be determined according to the appropriate quality evaluation standards. The result of the evaluation can be applied as basis for evaluating the authority and it also can be used as reference for improving the contractor's quality control operation and selection of excellent bidder. Moreover, by convincing the client (or supervisory party) and contractor's substantial practice of quality control, it is intended to achieve the target of upgrading construction quality. Project inspection operation should be established with "Construction Evaluation Team's Operation Regulations". The regulations were established in accordance with the Government's Procurement Laws Clause 70, Sub-clause 4 and "Project construction evaluation team" shall be stipulated according the laws. In their evaluation, the said team should process in compliance with the construction quality control system announced by the Public Con-

struction Commission, Executive Yuan, relevant laws & regulations and the requirement of the contract conditions. Further, by referring to the construction evaluation operation reference standards in their evaluation on the items such as construction quality and progress etc. The major evaluating items to be performed by the Evaluation Team are as follows:

1) Quality directing mechanism of the authority, the record of the reviewed supervision plan, construction progress management measures, handling of construction defect and the defect improvement tracing.

2) Supervision organization of the supervisory party, the review procedure of construction plan & quality plan, the evaluation procedures and standards of material/equipment random inspection and construction evaluation, quality audit, document record management system etc from the supervision plan content and executed condition; the executed condition of defect remedy tracing and construction progress supervision etc.

3) Contractor's quality control organization, construction outlines, quality control standard, material & construction inspection procedure, self inspection checklist, control of unqualified product or work, remedy & prevention measures, internal quality audit, document record management system etc. in the quality plan content and execution condition; the execution condition of construction progress management, catch up plan, safety/hygiene & environmental protection measures etc.

4) Construction planning & designing, ecological environmental protection, material & equipment, significant defects of drawings & specifications, necessity of design change, whether the architect, contractor's professional engineer and quality control personnel perform their obligations in compliance with relevant laws & regulations and contractual requirement etc.

Case study

As shown in Figure 4, the case study is a complexion building with 11 blocks of public project. The site area has 77,667 M2, and the budget is 5.7 billion NTD. The JV (joint venture) team should complete geotechnical, structure (RC), finish for exterior wall and interior partition, basic mechanical/ electrical/ plumbing, and facilities of site landscape. The schedule, shown as Figure 5, from land acquirement, realize project requirement, boring investigation for earth condition, basic design for construction permit, detail design for coordination with electric/ fire/ communication/ water/ sewage system , approval for issue the contract to commence the project, inspection for project completion, and to handover is 1170 calendar days. The main project participators, shown as Figure 6, are client, PCM, supervisor and contractor (JV team). As shown in Figure 2, this delivery method has very complicate relationship for all participations. But the major roles in the framework of management are PCM and supervisor. Because the PCM involve in the project on very early stage. And settle the management system for project which will be executed through the project.

The framework of management is also developed by this management system. The supervisor plays as the role of inspection architect, whose rights and obligation are stipulated by Building Code and Architect Law, but not by Government Procurement Law. The conflicts of these regulation systems also make the defects of sharing roles and responsibilities of this delivery system. The framework of management and these two major roles will be discussed in detail to illustrate this delivery method. And, the deficiencies will be discussed in conclusions.

The main responsibility of PCM

The main responsibilities of PCM in case study, shown as Figure 7, are to get the charter from client, to settle the management system for project, to assist the client selecting contractor, to manage the construction of contractor, and to coordinate the building handover. From the view of time series, PCM should settle management system for project to review design drawings, specification & budget, inspection plan of supervisor, approval flow of material & equipment, etc. And coordinate with client to make the decision whether issue the contract or not. In contract stage, PCM should review the proposals from contractors, and decide which contractor is proper to client, then coordinate with client to sign the contract. A lot of activities which are supervision, approval, execution, review will be processed concurrently to reach the objectives of project. Which objectives are concerning with cost, schedule, quality, and safety. The most important responsibility of PCM in construction stage is to coordinate designer and contractor to produce the completion drawings, then to get the usage permit. Finally, in handover stage, PCM should coordinate other participations to handover the project and complete records for client.

The main responsibilities of inspection architect

The main responsibilities of supervisor in case study as shown in Figure 8.
1) Providing inspection plan and bid document to explain quality assurance and information to estimation for contractors. And client can issue the bid and sign the contract in order to commence construction project and inspect construction activity.
2) Setting up the regular meetings which explain the details of project in order to build mechanism of project control through Q&A of specification and drawings, and coordination of interfaces among the contractors or subcontractors. In the same time, reviewing the construction method, construction plan, quality management plan, etc.
3) Structuring the document review system with other project participations on the principles of review then inspection, efficient and effective.
4) Making the conscience with client, PCM, user, contractor and inspector to realize the work standards for contractor, subcontractors, suppliers, specialists. And expedite the materials and equipment can be inspected then used in the job site.
5) Drawing out the major working items to discuss the construction method for the details of construction processes & checkpoints, quantified management for

quality control and tracing & control base on concurrent management.
6) Inspecting the deficiency of activities and recoding on construction & inspection reports to require improvement.
7) Collecting the record document and rechecking the site condition to assist the client survey the real quantity of working items then asking client to sign the payment.
8) Constructing the working flow of change order to deal with conflicts between client and contractor rationally, completely and effectively. And making effort to tell the clear story of whole project for every party, in order to make the completion inspection smoothly.
9) Assisting the client to accept the project according to the specification and drawing, and handover to settle the account and make sure this project can be operated immediately.

The framework of management

The framework of management for construction, shown as Figure 9, basically is for quality assurance, quality control, surveying, and payment. The processes consist with review then inspect, inspect then use, construction inspect, and revise for every activity, material, equipment etc. used in site.

1) The main purposes of review then inspect are to make sure of the qualification of contractors, subcontractors, suppliers, etc., and review the construction drawings & plans. The tools may have review list, activities & QA process & list, weekly examination and monthly control. The frequency will be depended on the schedule of production and inspection of materials or equipment. Normally, the proposals or samples should be submitted two months before construction in site.

2) The main purpose of inspect then use is to realize the construction team, including contractors, subcontractors, suppliers and specialists. The tools may examine the ability of production, supply, construction method, etc. to build up the standards of inspection. The frequency will be different in working items, including civil works, architecture works, MEP works etc.

3) The main purpose of construction inspection is to do quality assurance of supervisor and contractor. The tools may have quantified management using spread sheets with quantity and weight division of working items, inspection mode whether complete or sampling, management mode from mobile to trust.

4) The main purposes of revise are to stipulate the time of improvement and to prevent the repeat deficiency. The tools may have control improvement from payment, engineer in chart for improvement, household control in finish stage and record deficiency & difference in handover for guarantee.

Conclusion

As described before, the PCM project delivery method is widely used large engineering projects and clients who have little experience of construction projects. But the complicate and huge relationship of project participations and conflicts of professional law and Government Procurement Act make the confusion and ambiguous of sharing roles and responsibilities in this project delivery method. And this paper may mark some conclusions as below.

1) The combination of pure CM and Design-Build defined by Government Procurement Act of Taiwan.

2) The providing the three levels management, especially for quality management to large engineering projects and clients who have little experience of construction projects.

3) But, extending the management process of project and increasing the interfaces of roles/ responsibilities of project participations.

4) PCM may positively take over the role of inspection & supervision, but on the contrary, PCM may reluctant to take the responsibilities because the role conflicts with architects.

5) PCM may only response the views of client, and neglect reasonable processes, professional judgments, dispute treatment, etc.

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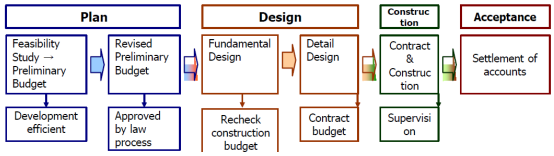

Figure 1. Budget introduce process of Public project

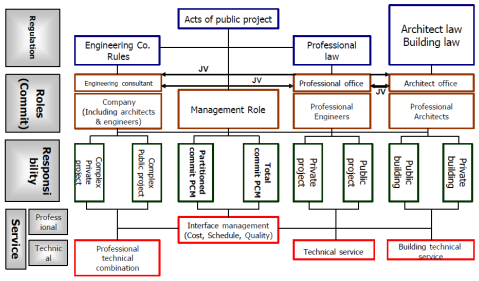

Figure 2. Sharing roles and responsibility in PCM

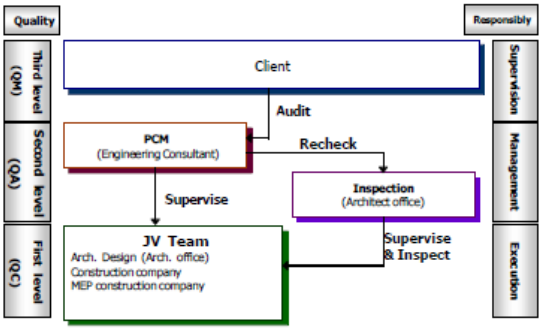

Figure 3. Quality management in PCM

Figure 4. Introduction of case study

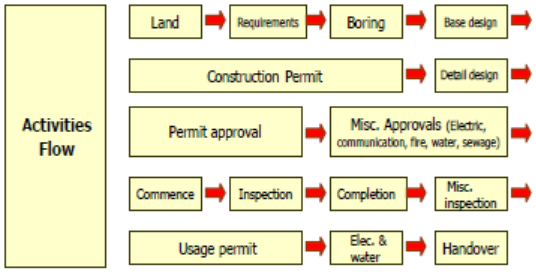

Figure 5. The main activities of case study

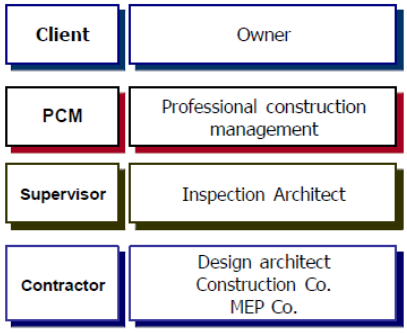

Figure 6. The main project participations of case study

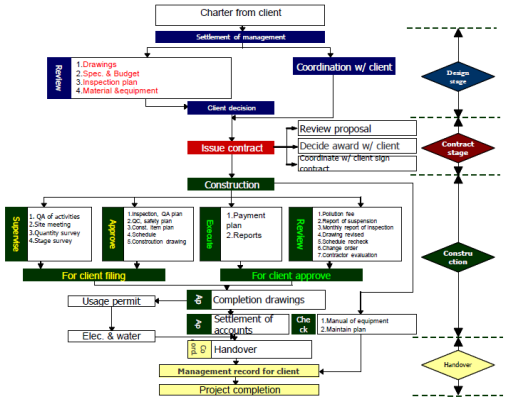

Figure 7. The main responsibilities of PCM

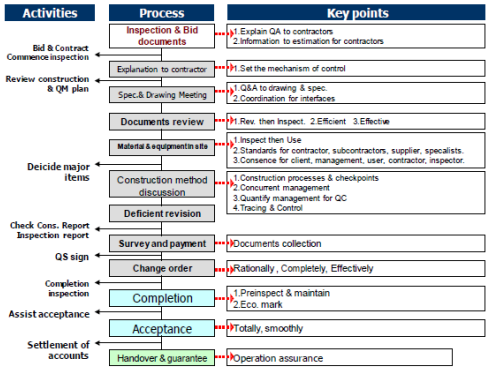

Figure 8. The main responsibilities of inspection architect

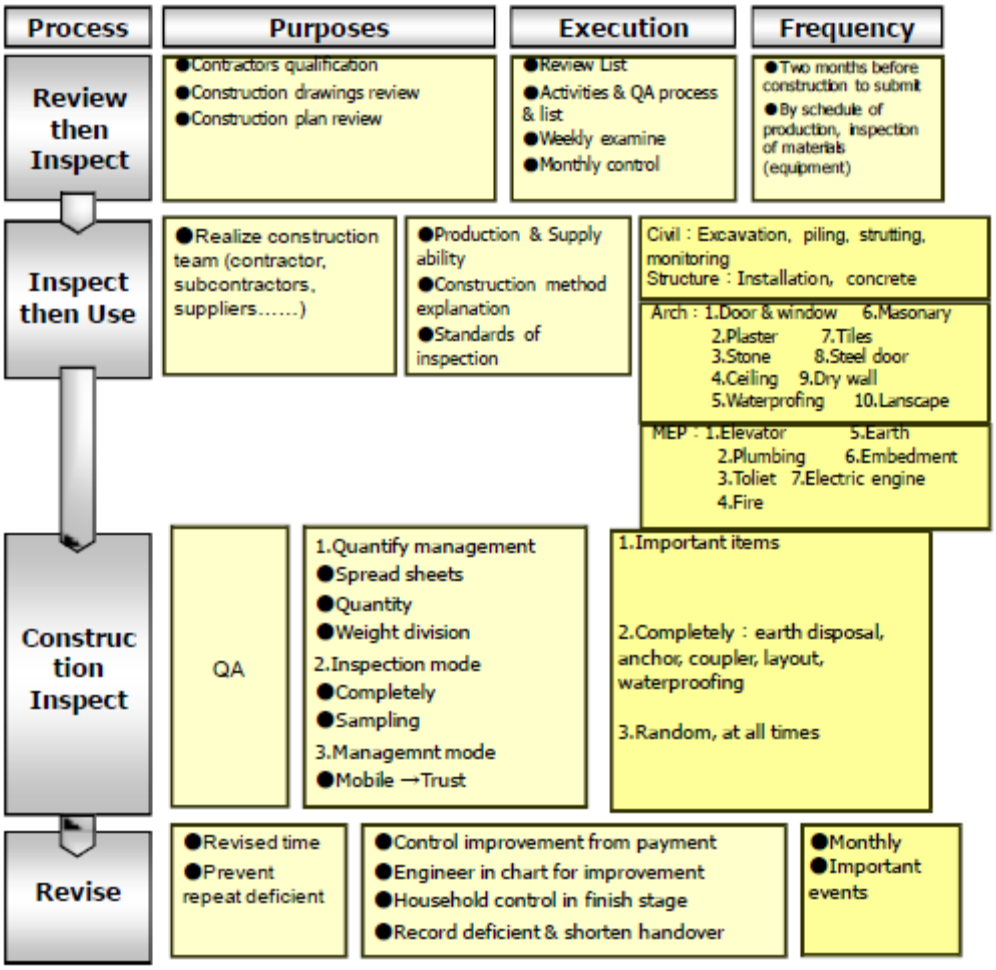

Figure 9. The framework of management for construction

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AN ANALYSIS OF TELECOMMUNICATION VENDOR COMPANY BANKRUPTCY POTENCY BASED ON THE PROBLEMATIC FINANCIAL RATIO WITH ALTMAN, SPRINGATE AND ZMIJEWSKI METHODS

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Abstract

The capability of a company to survive in business is highly related with its own performance. In order to preserve company's life cycle, management team must be able to maintain, even improve its performance. A company that cannot compete to maintain its performance eventually will get kicked out from its industrial environment and will suffer from financial distress. If a company cannot escape from that condition, it will encounter a bankruptcy threat. Bankruptcy is a form of company's failure in carrying out its performance to achieve profit. Bankruptcy occurs when debt value is over its asset market value. The purpose of this research is to find out Nokia Corp financial condition in 2010-2014, whether this company has some serious problem or still in a good condition. Besides, this research would like to know which financial ratio is troublesome that can causes the company trapped in financial distress zone or even creates bankruptcy potential. The methods that used to predict company's bankruptcy in this research are Altman Method, Springate Method and Zmijewski Method.This research shows that using Altman Method, Nokia is in financial distress zone for four years, starting from 2011-2014 while Nokia is in the grey/ ignorance zone in 2010. Using Springate Method, Nokia is in a distress zone for three consecutive years starting from 2011-2013, while Nokia is in a safe zone in 2010 and 2014. In the opposite, using Zmijewski Method, Nokia is in the distress zone only in 2012, while in the other four year period, it is in a safe zone.

Key Word : Bankruptcy, Altman Z-Score, Springate Score, Zmijewski Score

Introduction

The goal of the firm should be maximization of shareholder wealth. This goal can be achieved by maximizing its value. For a go public company, maximizing company's value means it has to maximizing its stock price in stock exchange (Titman, Keown & Martin; 2011: 9). Every financial decision will be reflected in it. This goal not only beneficial to the shareholders, but also beneficial to the stakeholders.

A go public company will utilize the existence of capital market as a media to get resources with offering its shares or notes. Before investing their funds, investors will analyze company's financial condition. Those funds must be utilized productively by the company so that the shareholders will get maximum benefit. A company's share price will rise if its financial condition is getting better. In the opposite, a bad dividend and investment policies will make investors react negatively so that the share price will fall.

Nokia is one of the most well-known telecommunication company in the world. As a go public company, Nokia must maintain its financial condition so that it will give profit to the shareholders. According to International Data Corporation, there are five groups of companies that employ at least 57.7% world telecommunication market in 2012. This condition maybe different if it is seen from market structure in each product category. With a more detailed analysis, there might be one or more company that occupy some particular market, for example for a smartphone product. Table 1 describe five biggest vendors that occupy the market in 2010-2012.

In three consecutive years started from 2010, Nokia suffers from loss. The biggest loss occurs in 2012, the loss amount is 3,789 UERm. One of the reason is because the shrinkage of product sales (see Graphic 1) that makes Nokia has to sell its asset to pay its debt. In November 2011, all of Nokia's asset is being confiscated by tax autonomy because Nokia has tax debt about US$ 10 million *(Source: bloomberg.com)*. In facing competition with the other telecommunication companies, Nokia has launched new products under collaboration with Microsoft in October 2011. But it does not help the current condition of Nokia. In the end of 2011, Nokia announced to sell its subsidiary named Vertu in UK that used to produce luxury cellular phone.

A high decrease of profit in a company is a sign of financial distress. Gitman (2006:785) stated that " A firm may fail because its return are negative or low". Financial distress occurs because of a company could not achieve profit. But as commonly know, a company's goal is to create profit, sales, maximize share price, and increase shareholder's welfare (Brigham and Houston, 2012: 7).

Based on the data that has been mentioned before, the writer wants to know whether Nokia will be able to survive in the future with doing bankruptcy analysis. Writter also want to know

which financial ratio that contributed to the bankruptcy of a company. This research is titled An Analysis of Telecommunication Vendor Company Bankruptcy Potency Based on The Problematic Financial Ratio With Altman, Springate and Zmijewski Methods (Study In Nokia Corporation).

The Purpose of The Research

The purposes of this research are :

- To find out the financial condition of Nokia in 2010-2014, whether Nokia suffers from serious financial problem or not with Altman Method.
- To find out which is the problematic financial ratio that causes Nokia trapped in distress zone in 2010-2014.
- To find out the financial condition of Nokia in 2010-2014, whether Nokia suffers from serious financial problem or not with Springate Method.
- To find out the financial condition of Nokia in 2010-2014, whether Nokia suffers from serious financial problem or not with Zmijewski Method.

Literature Review

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- Sanobar Anjum (2012), Business Bankruptcy Prediction Methods: A Significant Study of The Altman's Z-Score Method. The results showed that there are majorly five different types of bankruptcy prediction method. Multiple discriminant analysis is the crux of this research paper. Altman's Method is discussed in detail describing the changes occurring to the equation so as to reach a perfect prediction method.
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Times. The results showed that further exploration of Altman's and alternative formula is necessary to refine this potentially useful tool in order to develope a predictive collection of tools useful in predicting not only bankruptcy, but financial distress in a variety of firms in a variety of contexts.

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Data Analysis

Altman Z-Score

Analysis Z Score was founded by Edward I Altman in 1968. This analysis can be used to predict company's life cycle with combining several financial ratios and he gives different weighting for each ratios.

After selecting 22 financial ratios, it was founded that five ratios can be used in combination to separate a bankrupt and non-bankrupt company. Altman makes Z-Score, a ratio method that use Multiple Discriminant Analysis. This method emphasizes profitability as the most influential ratio to bankruptcy.

Z-Score for a go public manufacturing company by Altman (2006:242-243) is explained as below :

$$Z = 1.2\ X_1 + 1.4\ X_2 + 3.3\ X_3 + 0.6\ X_4 + 1.0\ X_5$$

where :

$$X_1 = \frac{\text{Working Capital}}{\text{Total Assets}}$$

$$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$

$$X_3 = \frac{\text{Earning Before Interest and Tax}}{\text{Total Assets}}$$

$$X_4 = \frac{\text{Market Value of Equity}}{\text{Book Value of Total Debts}}$$

$$X_5 = \frac{\text{Sales}}{\text{Total Assets}}$$

Calculation using Z-Score henceforth is compared with this below indicator to valued company's life.

Discrimination Zone	Indicator
Z > 2.99	Safe Zone
1.81 < Z < 2.99	Grey Zone/Zone of Ignorance
Z < 1.81	Distress Zone

The Proportion of Each Financial Ratios

To determine each financial ratios proportion, below's formula is used :

$$\text{X1 proportion till safe X5} = \frac{(\text{X1 till X5}) \times \text{coefficient for cutoff 2,99 value}}{1{,}2 + 1{,}4 + 3{,}3 + 0{,}6 + 1{,}0}$$

$$X1 \text{ proportion till distress } X5 = \frac{(X1 \text{ till } X5) \times \text{coefficient for cutoff 1,81 value}}{1{,}2 + 1{,}4 + 3{,}3 + 0{,}6 + 1{,}0}$$

To determine which one is the troubled financial ratio, we have to compare each ratios with the average score of each ratios, and also we have to compare each ratios with the safe and distress proportion level.

Rank Value Analysis

To find out how the conditions of each financial ratio used rank value. Financial ratio category are not problematic, a little bit problematic, problematic, and very problematic. The higher score is 4 for not problematic financial ratio and the lowest score is 1 for very problematic financial ratio.

The research time period is five years. The highest score is 5 x 4 = 20. The lowest score is 5 x 1 = 5. The smallest percentage value is = 5/20 = 25.00 % and the highest percentage value is 20/20 = 100.00 %. Percentage score interval is = (100.00 % - 25.00 %) : 4 = 18.75 %

Springate Score

As the development of Altman Z-Score, this method was founded by Gordon L.V. Springate in 1978. Springate Score is a method to predict company's life that combined several financial ratios with giving different weighting between them (Rudianto; 2013:262).

To determine which ratios that can predict bankruptcy, Springate uses Multiple Discriminant Analysis to choose four ratios that can differentiate exactly between a bankruptcy signal and the non-bankruptcy signal from the total of 19 financial ratios available. This method emphasizes profitability as the most influential ratio to bankruptcy.

Springate Score to various companies is mentioned as below :

$$Z = 1.03\ X_1 + 3.07\ X_2 + 0.66\ X_3 + 0.40\ X_4$$

where:

$$X_1 = \frac{\text{Working Capital}}{\text{Total Assets}}$$

$$X_2 = \frac{\text{Earning Before Interest and Tax}}{\text{Total Assets}}$$

$$X_3 = \frac{\text{EBT}}{\text{Current Liability}}$$

$$X_4 = \frac{\text{Sales}}{\text{Total Assets}}$$

Calculation using Springate henceforth is compared with this below indicator to valued company's life.

Discrimination Zone	Indicator
Z > 0.862	Safe Zone
Z <0.862	Distress Zone

Zmijewski Score

Mark Zmijewski is also did research to predict company's life. From his research in 1984, Zmijewski created

formula that can be used to predict bankruptcy potency for a company thats called Zmijewski Score.

According to Rudianto (2013:264), Zmijewski uses ratio analysis that measure performance, leverage, and company's liquidity. This method emphasizes to debt as the most influential component to bankruptcy.

Zmijewski Score calculation is stated below :

$$Z = -4.3 - 4.5\,X_1 + 5.7\,X_2 - 0.004\,X_3$$

where:

$$X_1 = \frac{\text{Net Profit}}{\text{Total Assets}}$$

$$X_2 = \frac{\text{Total Liabilities}}{\text{Total Assets}}$$

$$X_3 = \frac{\text{Current Assets}}{\text{Current Liability}}$$

The criteria used in this method is that the bigger the score result, the bigger the bankruptcy potential for a company. In other words, if the Zmijewski score is positive, then the company has a potential to suffer bankruptcy and vice versa.

Discrimination Zone	Indicator
$Z < 0$	Bankrupt
$Z > 0$	Non-bankrupt

The Result of The Research And Discussion

Altman Z-Score

Z-Score calculation in Nokia Corporation for 2010 – 2014 period is listed inTable 2. Based on the that table, it can be seen that the Nokia's Z-Score in 2011 is suffer from a significant shrinkage, from 2.67 in the grey zone to 0.34 in the bankruptcy zone.

This shrinkage is caused by the decrease of Nokia's market share to be 29% in Q1 2011, where Apple took the lead of the market share. From the revenue point of view, this amount is the lowest since 1990. In Q2 2011, there is 16.5% growth of the world's cellphone sales, while Nokia only enjoy a 15.7% growth. Nokia came in the third after Samsung (19.1%) and Apple (19%) for the market share. In the same quarter in 2010, Nokia's market share is 32.9% (Source: IDC dan Strategy Analytics, January 24, 2013).

In 2014, Nokia's Z-Score experiences a significant increase compare with its previous years. This is caused by the increase of the highest profit occurred in 2010-2014 period. In 2013, Nokia suffer loss about EURm 739, but in 2014, Nokia is able to achieve net profit of EURm 3,476.

Problematic Financial Ratio with Altman Method

In the next step, the proportion of each bankruptcy and non-bankruptcy ratios is determined. It is listed in the Table 3.

This paper will explain about each of the financial ratios.

- Working Capital to Total Assets (X_1). Financial ratio category for 2010 - 2014 period is listed in Table 4. With the range scoring, the total score is 40.00%. Using linier continuum analysis, Working Capital to Total Assets Ratio can be categorized as very problematic. It means, Nokia's working capital to fund its operational activities is less than the total asset
- Retained Earning to Total Assets Ratio (X_2). Financial ratio category for 2010 - 2014 period is listed in Table 5. With the range scoring, the total score is 40.00%. Using linier continum analysis, Retained Earning to Total Assets Ratio can be categorized as very problematic. It means, Nokia's retained earning for reinvestment is less than the total asset.
- Earning Before Interest and Tax to Total Assets (X_3). Financial ratio category for 2010 - 2014 period is listed in Table 6. With the range scoring, the total score is 40.00%. Using linier continum analysis, Earning Before Interest and Tax to Total Assets Ratio can be categoryzed as very problematic. It means, Nokia cannot achieve enough earning before interest and tax, since the value is less than the total asset.
- Market Value of Equity to Total Debt (X_4). Financial ratio category for 2010 - 2014 period is listed in Table 7. With the range scoring, the total score is 70.00%. Using linier continuum analysis, Market Value of Equity to Total Debt Ratio can be categorized as a little bit problematic. It means, Nokia is successfully increase its market value but not its shareholder's wealth.
- Sales to Total Assets (X_5). Financial ratio category for 2010 - 2014 period is listed in Table 8. With the range scoring, the total score is 60.00%. Using linier continuum analysis, Sales to Total Assets Ratio can be categorized as problematic. It means, Nokia still failed to utilize its asset to increase its sales volume.

Springate Score

Springate-Score calculation in Nokia Corporation for 2010 - 2014 period is listed in Table 9.

Using Springate Method, it can be seen that in 2011 – 2013, Nokia is trapped in distress zone because Nokia suffers from financial loss during those periods. As the opposite, Nokia is in the safe zone because of the significant increase in net profit compared to the previous year (82.47%) in 2014. The net profit achieved in 2014 is EURm 3,476. Like has been mentioned before, this method is emphasize more on profitability as the most influential component to the bankruptcy.

Zmijewski Score

Zmijewski Score calculation in Nokia Corporation for 2010 - 2014 period is listed in Table 10.

Based on that table, it can be seen that Nokia is trapped in the distress zone only in 2012. It is caused by the debt owned by Nokia in 2012 is at the biggest among years prior and anterior, while

the asset owned is smaller compared to the previous years. Like has been mentioned before, this method is emphasize more on debt as the most influential component to the bankruptcy.

The Comparison of Altman, Springate and Zmijewski Bankruptcy Method

Based on the calculations, Table 11 is listed the comparison of Nokia financial condition using three bankruptcy methods.

Conclusions

- Altman and Springate
  Both gave same recommendation for the bankruptcy potency, which is 60%, for the year 2011, 2012, and 2013, where the company is in the distress zone.
- Altman and Zmijewski
  Only 20% gave same recommendaion for the bankruptcy potency, the company is in the distress zone in 2012.
- Springate and Zmijewski
  Both gave same recommendation for the bankruptcy potency, which is 60%, for 2010 and 2014, the company is in the safe zone, while in 2012 the company is in the distress zone.
- Only in 2012 all methods gave same recommendation for the bankruptcy potency, where the company is in the distress zone.
- For the year 2014, using Springate and Zmijewski Method, Nokia is in the safe zone, while Altman indicates that Nokia is in the distress zone with Z-Score 2.63 point, it is just slightly below the standard of safe zone, which is 2.99 point.
- Working Capital to Total Assets Ratio, Retained Earning to Total Assets Ratio and Earning Before Interest and Tax to Total Assets Ratio categoryzed as very problematic financial ratio.
- Sales to Total Assets Ratio categorized as problematic financial ratio, while the Market Value of Equity to Total Debt Ratio is categorized as a little bit problematic financial ratio.

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Table 1. Five Biggest Global Cellular Phone Producers in 2010-2012

No	Vendor	Shipping 2012 (Million)	Market Share 2012	Shipping 2011 (Million)	Market Share 2011	Yearly Growth	Shipping 2010 (Million)	Market Share 2010	Yearly Growth
	Samsung	406.0	23.4%	330.9	19.3%	22.7 %	280.2	20.1%	18.1%
	Nokia	335.6	19.3%	416.9	24.3%	-19.5 %	453.0	32.6%	-8.0%
	Apple	135.9	7.8%	93.1	5.4%	46.0 %	47.5	3.4%	96.0%
	ZTE	65.0	3.7%	69.5	4.1%	-6.5%	50.5	3.6%	37.6%
	LG	55.9	3.2%	88.1	5.1%	-36.5 %	116.7	8.4%	-24.5%
	Lainnya	737.5	42.6%	716.8	41.8%	2.9%	443.6	31.9%	61.6%
	Total	1,735.9	100%	1,715.3	100%	1.2% %	1,391.5	100%	23.3%

Table 2. Z-Score in 2010-2014

Year	1.2 X_1	1.4X_2	3.3X_3	0.6X_4	1.0X_5	Z-Score	Potential
2010	0.29	0.38	0.17	0.75	1.08	2.67	Ignorance Zone
2011	0.27	0.30	-1.03	0.37	0.43	0.34	Distress Zone
2012	0.28	0.19	-0.35	0.32	0.51	0.95	Distress Zone
2013	0.21	0.14	-0.04	0.95	0.50	1.76	Distress Zone
2014	0.37	-0.31	0.82	1.15	0.60	2.63	Distress Zone

Table 3. Bankrupt and Non-Bankrupt Proportion Limit

Ratio	**Non-Bankrupt Proportion**	**Bankrupt Proportion**	**Average Ratio**
X1	0.48	0.29	0.24
X2	0.56	0.34	0.19
X3	1.32	0.80	-0.03
X4	0.24	0.15	1.18
X5	0.40	0.24	0.62

Table 4. Working Capital to Total Asset Ratio Analysis in 2010-2014

Year	**X_1**	**X_{1M}**	**Proportion X_S**	**Proportion X_D**	**Analysis**	**Financial Ratio Category**
2010	0.25	0.24	0.48	0.29	$X_1 > X_{1M}$ $X_1 < X_D$	Problematic
2011	0.22	0.24	0.48	0.29	$X_1 < X_{1M}$ $X_1 < X_D$	Very problematic
2012	0.23	0.24	0.48	0.29	$X_1 < X_{1M}$ $X_1 < X_D$	Very problematic
2013	0.17	0.24	0.48	0.29	$X_1 < X_{1M}$ $X_1 < X_D$	Very problematic
2014	0.31	0.24	0.48	0.29	$X_1 > X_{1M}$ $X_D < X_1 < X_S$	A little bit problematic

Table 5. Retained Earning to Total Assets Ratio Analysis in 2010-2014

Year	**X_2**	**X_{2M}**	**Proportion X_S**	**Proportion X_D**	**Analysis**	**Financial Ratio Category**
2010	0.27	0.19	0.56	0.34	$X_2 > X_{2M}$ $X_2 < X_D$	Problematic
2011	0.22	0.19	0.56	0.34	$X_2 > X_{2M}$ $X_2 < X_D$	Problematic
2012	0.13	0.19	0.56	0.34	$X_2 < X_{2M}$ $X_2 < X_D$	Very problematic
2013	0.10	0.19	0.56	0.34	$X_2 < X_{2M}$ $X_2 < X_D$	Very problematic
2014	0.22	0.19	0.56	0.34	$X_2 > X_{2M}$ $X_2 < X_D$	Problematic

Table 6. Earning Before Interest and Tax to Total Assets Ratio Analysis in 2010-2014

Year	**X_3**	**X_{3M}**	**Proportion X_S**	**Proportion X_D**	**Analysis**	**Financial Ratio Category**
2010	0.05	-0.03	1.32	0.80	$X_3 > X_{3M}$ $X_3 < X_D$	Problematic
2011	-0.31	-0.03	1.32	0.80	$X_3 < X_{3M}$ $X_3 < X_D$	Very problematic
2012	-0.11	-0.03	1.32	0.80	$X_3 < X_{3M}$ $X_3 < X_D$	Very problematic
2013	-0.01	-0.03	1.32	0.80	$X_3 > X_{3M}$ $X_3 < X_D$	Problematic
2014	0.25	-0.03	1.32	0.80	$X_3 > X_{3M}$ $X_3 < X_D$	Problematic

Table 7. Market Value of Equity to Total Debt Ratio Analysis in 2010-2014

Year	**X_4**	**X_{4M}**	**Proportion X_S**	**Proportion X_D**	**Analysis**	**Financial Ratio Category**
2010	1.25	1.18	0.24	0.15	$X_4 > X_{4M}$ $X_4 > X_S$	Not Problematic
2011	0.62	1.18	0.24	0.15	$X_4 < X_{4M}$ $X_4 > X_S$	Problematic
2012	0.54	1.18	0.24	0.15	$X_4 < X_{4M}$ $X_4 > X_S$	Problematic
2013	1.58	1.18	0.24	0.15	$X_4 > X_{4M}$ $X_4 > X_S$	Not Problematic
2014	0.91	1.18	0.24	0.15	$X_4 < X_{4M}$ $X_4 > X_S$	Problematic

Table 8. Sales to Total Assets Ratio Analysis in 2010-2014

Year	**X_5**	**X_{5M}**	**Proportion X_S**	**Proportion X_D**	**Analysis**	**Financial Ratio Category**
2010	1.08	0.62	0.40	0.24	$X_5 > X_{5M}$ $X_5 > X_S$	Not Problematic
2011	0.43	0.62	0.40	0.24	$X_5 < X_{5M}$ $X_5 > X_S$	Problematic
2012	0.51	0.62	0.40	0.24	$X_5 < X_{5M}$ $X_5 > X_S$	Problematic
2013	0.50	0.62	0.40	0.24	$X_5 < X_{5M}$ $X_5 > X_S$	Problematic
2014	0.60	0.62	0.40	0.24	$X_5 < X_{5M}$ $X_5 > X_S$	Problematic

Table 9. Springate-Score in 2010-2014

Year	**1.03X_1**	**3.07X_2**	**0.66X_3**	**0.4X_4**	**Springate Score**	**Potency**
2010	0.25	0.16	0.07	0.43	0.91	Safe
2011	0.23	-0.96	-0.05	0.17	-0.61	Distress
2012	0.24	-0.33	-0.17	0.21	-0.05	Distress
2013	0.18	-0.04	-0.04	0.20	0.30	Distress
2014	0.31	0.76	0.44	0.24	1.75	Safe

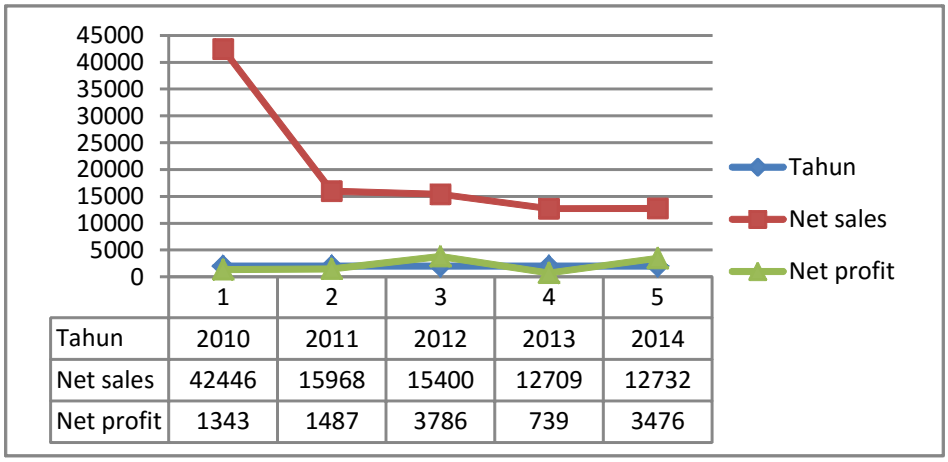
Table 10. Zmijewski Score in 2010-2014

Year	**-4.3**	**-4.5X_1**	**5.7X_2**	**-0.004X_3**	**Zmijewski Score**	**Potency**
2010	-4.3	-0.15	3.34	-0.01	-1.12	Safe
2011	-4.3	0.18	3.51	-0.01	-0.62	Safe
2012	-4.3	0.57	3.94	-0.01	0.20	Distress
2013	-4.3	0.13	2.96	-0.01	-1.22	Safe
2014	-4.3	-0.74	3.35	-0.01	-1.70	Safe

Table 11. Bankruptcy Method

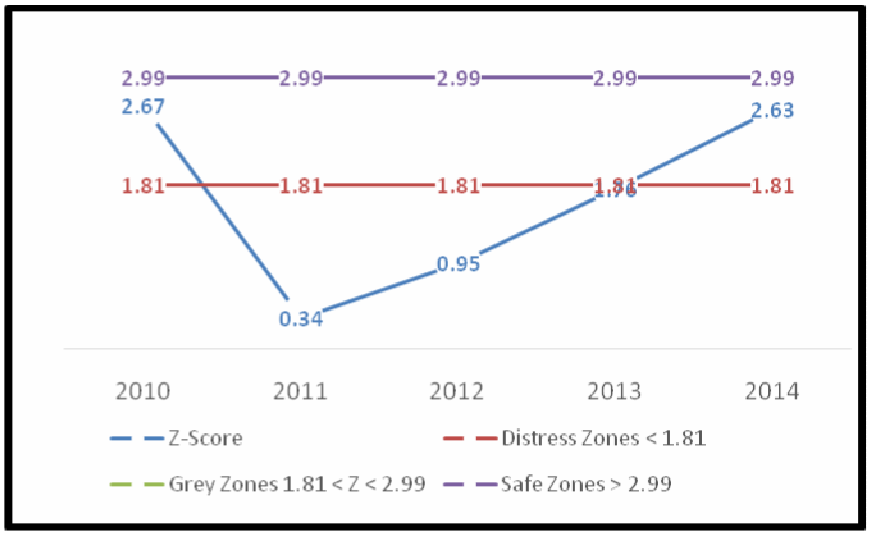
Year	**Altman**	**Springate**	**Zmijewski**
2010	Gray	Safe	Safe
2011	Distress	Distress	Safe
2012	Distress	Distress	Distress
2013	Distress	Distress	Safe
2014	Distress	Safe	Safe

Graphic 1. Net Sales & Net Profit

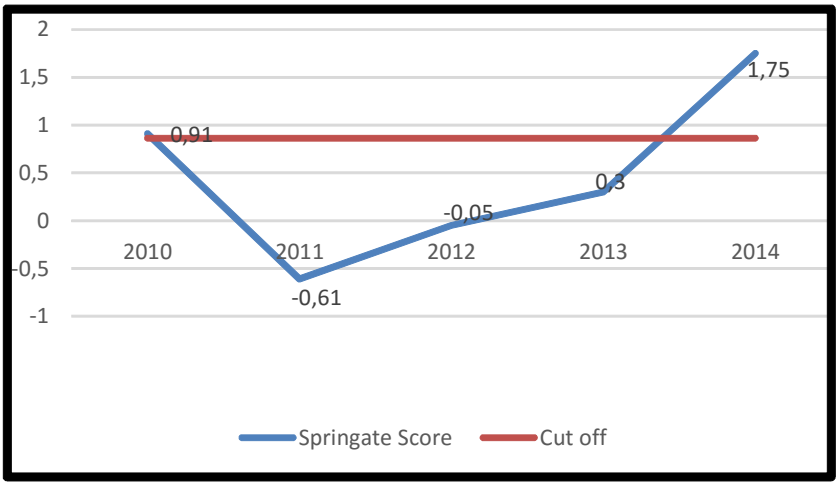


Tahun	2010	2011	2012	2013	2014
Net sales	42446	15968	15400	12709	12732
Net profit	1343	1487	3786	739	3476

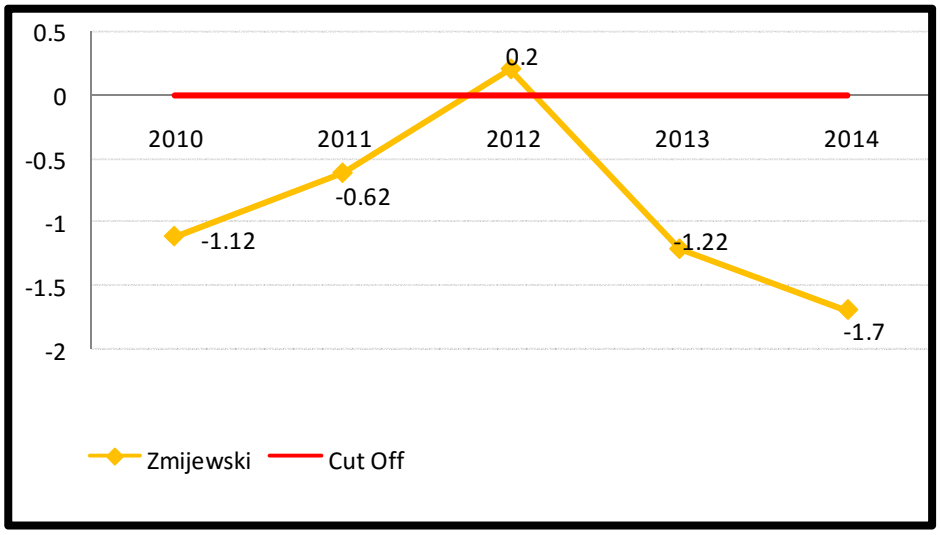
Graphic 2. Z-Score



Graphic 3. Springate Score



Graphic 4. Zmijewski Score



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LEADERSHIP STYLES IN BUDGETING PARTICIPATION TO SUPPORT MANAGERIAL PERFORMANCE

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Abstract

This research aims to find the model of leadership styles in the implementation of budgeting participation to support managerial performances in star hotels in Palu. The research was conducted by a field research and used survey method for data collection. The population of the research were employees that involve in budgeting and hotel manager. The result showed that budgeting participation, directive, participative and supportive styles of leading have positive influence on managerial performance. Achievement-oriented leader is influential toward managerial performances.

Keywords: Leadership styles, budgeting participation, and managerial performance.

Introduction

The growth of hotels in Indonesia has shown positive trends each year. As reported globally, companies engaged in the global hospitality business and research record new growth projections in Indonesia until the first quarter / 2013 reached 24.2% with a total of 30 942 rooms. In its official statement, Vice President of Digital Media & Communication STR Global, Jeff Higley, said that the total planned development of new hotels in the Asia Pacific region reached 1,788 hotels (quoted in the online portal bisnis.com). The rapid growth of hotels in Indonesia each year has made a more competitive market for hotel business in Indonesia.

Hotel companies are not only required to survive in the future global economy but are also expected to maximize profits with the available resources. Not only financial management skills, but the managers are expected to do short-term profit plans. Short-term planning can be realized by planning the budget each year. Budget is an essential tool for planning and controlling the effective short-term within the organization (Anthony & Govindarajan, 2005: 73). Budget is not only as a financial planning tool, but also as a means of control, coordination, communication, performance evaluation, and motivation (Hansen & Mowen 2001: 383).

The success in managaing an organization or company is supported by some factors such as leadership and the support of staffs in working to achieve the purposes of the organization. A leader needs to know what is expected from him in order to understand his roles and demanded competence. Participation in the preparation of the budget is a managerial approach which is generally considered to improve managerial performance. Individuals who participated in the preparation of the budget will be more responsible for their job compared to individuals who were not involved in the preparation of the budget. The success of managers in preparing the budget of company also becomes a barometer in assessing the performance of managers.

The focuses of many researchers are mostly on problems regarding budgeting such as leadership styles especially in behavioural accounting domain. Fieldler (1978) and Candra (1978) in Sumarno (2005) found that the right leadership styles will have positive impacts on budgeting encouragement or in other words, the effectiveness of budgeting participation will be influenced by leading styles. Himawan (2010) and Ika (2010) found positive and significant results between leadership style and budgeting participation.

Literature Review

Leadership styles

Veithzal Rival (2008: 2) revealed the leadership is "the process of influence in determining organizational goals, motivating followers to achieve the objective behaviour, influence to improve the group and its culture". Furthermore Veithzal Rival (2008: 3) stated that:

"Leadership is also said to be a process of directing and influencing the activity of the activity that has to

do with the work of the members of the group, which contained three important implications in this regard; (1) leadership that involves others either subordinates or followers' (2) leadership involves the distribution of power between the leader and the group members in a balanced manner, because the group members are not without power, (3) the ability to use different forms of power to influence his behaviour through various means ".

Veithzal Rival (2008:3) argued style of leadership is " a set of leadership traits used to influence subordinates in order to achieve organizational goals or can also be said that the style of leadership is a pattern of behaviour and preferred strategy and is often applied by a leader ". The same opinion was delivered Miftah Thoha (2007: 49) saying that "leadership style is the norm of behaviour used by someone when the person is trying to influence the behaviour of others as he sees".

The Path-Goal Theory of Leadership revealed four leadership styles; *directive, supportive, participative, and achievement-oriented leadership* (House and Mitchell, 1974). The house's path-goal theory expressed by Miftah Thoha (2007: 42) inserted four different types or styles of leadership are described as follows:

(1) Directive leadership, this model of leadership is similar to autocratic style of leadership from Lippit and White. The employees know exactly what they are expected to do and understand what they are asked to do from the heads. In this model there is no participation from employees;

(2) Supportive leadership, this model of leadership is when the leader have willingness to explain himself, friendly, approachable, and have a genuine humanitarian concern for his subordinates or employees;

(3) Participative leadership; in this style of leadership, the leader tried to ask and use the suggestions from subordinates or employees, but the decision remains on him

(4) Achievement-oriented leadership; in this style, the leader sets series of goals that challenge its employees to participate. The leader also gives confidence to them to be able to do their job right and achieve its main objectives.

Leadership styles and manager performance

Miftah Thoha (2007:49) found that the if the leader in particular organization needs to develop and motivate the staff to increase the organization's productivity, then the leader needs to figure out his way of leading. House *and* Evans in Miftah Thoha (2007:42) described the *path-goal* theory in modern development about the influence of leader's behaviour toward motivation, satisfaction and the work execution of the employees.

Budgeting participation

Munandar (2001:1) argued that "budget is a systematically arranged plan which covers all activities of the com-

pany expressed in monetary units and is valid for a period of time (period) certain to come". Horngren, et.al. (2003: 6) revealed that "budget is the quantitative expression of the proposed plan of action by management and is an aid to coordinating what needs to be done to implement that plan," while Supriyono (2001: 340) states that "the budget is a detailed plan formally expressed in a quantitative measure, usually in the money, to demonstrate the acquisition and use of the resources of an organization within a specified period, usually one year ". Anthony, Dearden M Bodford (2000: 499) argued that "budget is both a planning tool and control tool". The opinion explained that the budget has two important roles within an organization; on the one hand, the budget serves as a tool for planning (planning) and on the other side of the budget serves as a tool for short-term control (control) for an organization. Lubis (2010: 173) stated that "participation is a decision-making process shared by two or more parts, where the decision will have an impact in the future against those who make it, in other words the worker or lower-level managers have a voice in the management process", Kenis (1979) argued that “budgeting participation is process of manager involvement in arranging budget for the company” while (Brownell, 1982) argued that "budgeting participation is a process by which individuals are involved in it and have an influence on the preparation of the budget target performance which then will be evaluated and are likely to be rewarded for the achievement of their budget targets".

Budgeting Participation and Manager Performance

Ernawaty (2012) revealed that the involvement (participation) of various parties in budgeting process along with participatory budgeting are expected to increase managerial performance. The objectives or goals that are set collectively will maximize the performance of employees as they will be responsible to achieve what they have arranged and agreed upon (Milani, 1975). This argument implies that the seriousness in achieving goals organization by the subordinates will increase the effectiveness of the organization, as it reduces or even eliminates the potential of onflict between individual goals and organizational goals

Population and Sample

Population is a group of people, events or things that have certain characteristics (Indriantoro, 2002: 115) while Sugiyono (2008: 117) defined the region's population is a generalization which consists of object / subject that has certain qualities and characteristics defined by the researchers to learn and then drawn conclusions from. The population in this research are all five-star hotel in Palu city. The sampling is based on the approach of (Slovin in Umar 1999: 67).

Types and Data Collection

The data used in this study are primary data. Primary data is a source of research data obtained directly from the original source. Primary data used in this study was obtained from the results of

questionnaires distributed to samples that have been determined (employees and hotel managers).

Results and Discussion

Reliability and Validity Analysis

The results of reliability test using SPSS software showed Cronbach's Alpha value is high. Each variable was obtained value of Cronbach's Alpha for participation budget of $\alpha = 0.923$, the leadership style of $\alpha = 0.925$, managerial performance at $\alpha = 0.893$. A construct or a variable is said to be reliable if the value of Cronbach Alpha> 0.60 (Nunally, 1960). Under these conditions, the instrument on the research to be conducted can be considered reliable or consistent to measure the construct research.

Validity test used to measure whether or not a legitimate or valid questionnaires. Validity relates to the accuracy of measuring devices to do its job objective. Validity touch with reality (actually). Validity is also related to the purpose of measurement. A questionnaire is said to be valid if the questions on the questionnaire were able to reveal something that will be measured by the questionnaire. (Ghozali, 2009: 49). Invalid measuring tool will provide measurement results deviate from the goal. This measurement deviation called by mistake (error) or varian.To test whether each indicator is valid or invalid can be seen on the output display Cron-bach Alpha Correlated column Item-Total Correlation. From the data pro-cessing is known that all items have questions Correleted Item-Total Correlation bigger than r table. The questions considered valid if the value of r count which is the value of Corrected item-total correlation> of r table. Based on the results if the data for all variables obtained value Corrected Correlation -Total item> of r tables, so it can be concluded that all the items in the questionnaire is a valid question.

Reliability test is meant to measure the stability and consistency of the respondents answered the items in question are the dimensions of an instrument arranged in the form of questionnaires. Tests on research conducted using the instrument reliability test methods Cronbac's Alpha.Batasan Cronbac's Alpha reliability score Score <0.50 lower reliability category, a score of 0.50 to 0.60 and a sufficient reliability category scores above 0.70 to a high reliability category. (Jogiyanto, 2008: 52), but Cronbachs Alpha Score> 0.60 was considered quite reliable (Ghozali, 2006: 48).

Regression Analysis

Classical Assumption Test

Multi-collinearity is the situation there is a correlation between the independent variables with each other. One way to detect multikolenearitas is using the Pearson test. As a criterion, if the correlation between the two variables exceeds 0.8 then there multikolenearitas (Gujarati, 2006; 63). Multikolinearitas test results showed that kerelasi between the two independent variables do not exist in excess of 0,8. From table correlation (Pearson correlation) can demonstrate the value of the Budget Participation Managerial Performance of (0.623), directive leadership style with Manage-

rial Performance of (0.659), Style Managerial Leadership Sportif with the performance of (0.739), Participative Leadership Style with Managerial Performance of (0.740) and Leadership Style Achievement Orien-tation with Managerial Performance of (0.704), the value of these variables is under 0.8, or less than 0 , 8 so that it can be said not occur multicollinearity between variables. Based on the results if the data we can see the scatterplot that shows not happen heteroskedastisitas. The residual normality is to look at normal probability plots comparing the cumulative distribution by a normal distribution. Based on the results if the data we can see normal probability plots to meet the assumptions of normality.

Multiple regression test results presented that the value of R square is equal to 0.555, this means that the regression equation for budgetary participation, leadership style describes the managerial performance of 55.5%, while the remaining 45.5% is explained by other variables which are not included in this research model.

F test aims to show whether all the independent variables included in the model have influence together against the independent variable. From the results of multiple regression showed singnifikansi level of 0.000 (significant) meaningful participation and leadership style variables jointly affect managerial performance.

The t-test is to test the significant level of influence of independent variables on the dependent variable individually. If t is smaller than t table then Ho is accepted, whereas if t is greater than t table then Ho is rejected (Ha accepted). The basic assumption is needed in this case is the significance level (α) of 5%.

a. Testing Hypothesis 1

The first hypothesis states that the positive effect of budget participation on managerial performance. The test results using multiple regression showed that budget participation has a positive relationship with a significance level of 0.000. Results of multiple regression analysis showed that budget participation has a positive relationship with a significance level of 0.000 (which means significant), the direction of this positive relationship means that the effect of budget participation on managerial performance, which means better participation, the budget will increase managerial performance.

b. Testing Hypothesis 2

The second hypothesis states that the directive leadership style positive effect on managerial performance. The test results using multiple regression showed that the directive leadership style has a positive relationship with a significance level of 0.017 which means significant implies that the leadership provides direction to employees will improve managerial performance.

c. Testing Hypothesis 3.

The third hypothesis states that the supportive leadership style positive effect on managerial performance. The test results using multiple regression showed that the supportive lead-

ership style has a positive relationship with a significant level of 0.0018, which means a significant and implies that leaders are supportive, friendly and shows concern for employees will increase managerial performance.

d. Testing Hypothesis 4.

The fourth hypothesis states that the participative leadership style positive effect on managerial performance. The test results using multiple regression showed that participative leadership has a positive relationship with a significant level of 0.015, which means a significant and implies that leaders engage, communicate and consult and listen to the suggestions of subordinates will improve managerial performance.

e. Testing Hypothesis 5.

The fifth hypothesis states that the achievement-oriented leadership style positive effect on managerial performance. The test results using multiple regression showed that the achievement-oriented leadership has a positive relationship with a significant level of 0.026, which means a signif-icant and implies that leaders set a series of challenging goals and expects subordinates to perform semaksimalnya will improve managerial performance.

f. Hypothesis testing. 6

The sixth hypothesis which states that the supportive leadership style moderate the relationship between budgetary participation and managerial performance. Test results show that the supportive leadership style strengthen the relationship between budgetary participation and managerial performance. Supportive leadership style in the form of friendly and shows concern for the needs of employees moderating and strengthen relationship between budgetary participation and managerial performance.

g. Hypothesis Testing 7

The seventh hypothesis states that the leadership style pertisipatif moderate the relationship between budgetary participation and managerial performance. Test results show that the participative leadership style that involves, communicate and consult and listen to the suggestions of subordinates moderate and strengthening the relationship between budgetary participation and managerial performance.

h. Testing Hypothesis 8

The eight hypothesis states that achievement orientation leadership style moderate the relationship between budgetary participation and managerial performance. The test results showed that the leaders set a series of challenging goals and expects subordinates to perform as much as possible to strengthen and moderate the relationship between budgetary participation and managerial performance.

Conclusion

Budgeting participation has positive influence on managerial performance. This shows the more participation involving on budgeting process, the more managerial performances would likely to increase.

Directive style of leadership has positive impact to managerial performances. The more leaders give directions to the employees, the more managerial performances increase. Supportive style of leadership also showed positive result on managerial performances. The friendlier and the more considerate the managers are to the employees, the better performance they have. Participative style of leadership also gives positive results on managerial performances as the more participation the managers give to the budgeting process, the better performance of the managers. Achievement-oriented leaders also have better managerial performance.

Leadership styles that are applied in the budgeting process should use the bottom up method where the budgeting process involves staffs from each unit concerned.

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USING *TAM* TO INVESTIGATE CONSUMER ACCEPTANCE OF HYDROPONIC VEGETABLES GROWN USING LED LIGHT

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Abstract

With many cases revealing illegal food adulteration and fraud as well as the resulting apprehensiveness from the general public, food safety has become an important topic of the food industry. Many have expressed their desires to revise the entire food production process. The aim of this paper is to investigate the means of developing and employing energy efficient LED as a source of artificial lighting and high performance hydroponic engineering in agriculture to tackle the issue of global food shortage. LED could be employed to reduce energy consumption while improving food safety. The second part of this study shall investigate how LED and hydroponic technologies are employed and accepted in this market to clarify certain misunderstanding. The final part of this study would be a new model designed to investigate market mechanics and consumer behaviors. The expected outcome of this study would be to discuss and determine market acceptance for the new generation of growing technologies, and propose effective means of promoting effective energy saving and environmentally friendly technologies in every household to improve food safety and production speed, and to solve the food crisis.

Keywords: LED, TAM, energy saving, zero pollution, hydroponic vegetables

Background, motive, and objectives of the research

Environment protection bureaus had recently collected samples from water bodies receiving discharged wastewater from Advanced Semiconductor Engineering (ASE) production facilities. The pH values and suspended solids (SS) parameters were found to have violated the limits specified in the *Water Pollution Control Act*. Other issues include nickel contents that exceeded the limit by three times, which were on par with that of strong acids. Nickel was already declared by the Environmental Protection Administration (EPA) as a health hazard that could injure the liver and kidneys. Chairperson Huang Tsung-Chi of the Rural Economics Society of Taiwan expressed that land exposed to heavy metal contamination would not be usable for 20 years. Every soil layer must undergo extensive remediation and decontamination so that heavy metal contaminants may be adsorbed and converted into other compounds.

Current agricultural production practices would also be extremely reliant on petrochemical products. One of the solutions for improving agricultural productivity would be to search for farm products with higher productivity, quality, and economic value while upholding the principles of energy saving and resource conservation. The choice of fuel and fuel application technology employed would affect agricultural productivity. Actions must also be carried out to meet energy saving and carbon reduction agricultural policies released by the Council of Agriculture, Executive Yuan (2010). In addition to improving and raising traditional energy use efficiency, agricultural production must actively develop or promote suitable energy reduction measures to find other alternative sources of energy. Many improvements, such as changes to energy saving operation modes or supplementary equipment, could be deployed for agricultural machinery used in Taiwan. Lu Fu-Ming (2011) mentioned that modern agricultural development must achieve the objectives of balancing productivity, lifestyles, and ecological development while meeting the goals for energy saving and carbon reduction. The next phase of development for agricultural machinery would be directed accordingly. With the depletion of crude oil and rising oil prices, agricultural developments had been focused on energy efficient production technologies by improving fossil fuel energy use efficiency as well as investigating the possibility of utilizing alternative energy sources. Tsai Chih-Jung and Wu Yu-Heng (2011) also described the inevitable trend of reducing energy consumption in response to global efforts in reducing carbon emissions and alleviating global warming.

With global warming affecting agricultural production, various countries around the world have formulated a number of responsive measures and initiated research for potential solutions. Taiwan also carried out similar research, which provided substantial outcomes. The Taiwanese government also enforced a number of policies to tackle relevant issues. In 2010, to improve, promote, and implement energy saving

and carbon reduction policies, the Council of Agriculture, Executive Yuan convened a *Policy Conference for Agricultural Adaptations in Response to Climate Change* which reviewed past energy saving and carbon reduction policies while formulating new policies for the future. Carbon reduction effects could be achieved if agricultural production could reduce energy consumption. The most applicable of greenhouse gas (GHG) reduction and energy saving technologies should be those that could be employed to most growers. These technologies must be capable of maximizing agricultural productivity and returns without further increasing energy use.

The main purpose of this study would be to integrate major developments GHG reduction and energy saving technologies and systems, and to discuss representative case studies where such technologies were employed. In addition to providing references for the infrastructure, technology, policies, and measures for GHG reduction and energy saving, this study also introduced potential opportunities for in-depth research and developments that could be conducted in Taiwan. The purposes of this study would be to investigate whether hydroponic vegetables grown using LED lighting could be used to alleviate food shortage, the degree of acceptance for such vegetables and how it would relate to the background of the consumer, the degree of acceptance for the quality of such vegetables, and finally the willingness of purchasing such vegetables under the context of food safety.

Literature review

Technology Acceptance Model (TAM)

David (1985) referenced the Theory of Reasoned Action (TRA) proposed by Ajzen and Fishbein (1980) to construct a behavior model for describing the degree of acceptance of information technology (IT). The Technology Acceptance Model (TAM), which was raised in 1989, was mainly used to describe and predict user acceptance of IT. The theoretical model of TAM was developed using two important *beliefs* for evaluating technology acceptance, namely *perceived usefulness* (PU) and *trust*. PU measures the beliefs held by an individual that using the system could bring about improved work performance. Hence, any system with a high PU rating would be regarded by its users as having positive performance. Trust, on the other hand, measures a user's sense of dependability for the system. This would affect PU, attitude for use, and willingness to initiate usage. These two beliefs would determine how an individual accepts technology. This acceptance would then determine actual practice and use of the technology.

TAM was initially used to describe and predict individual acceptance for IT using the two key variables of PU and trust to determine an individual's willingness to use and employ such technologies. TAM was later widely employed in fields that related to IT developments, with an increasing number of studies demonstrating the applicability of TAM (Adams et al., 1992; Chen et al., 2002; Chin & Todd, 1995; Legris et al., 2003; Lin & Lu, 2000; Mathieson &

Chin, 2001; Moon & Kim, 2001; Taylor & Todd, 1995; Venkatesh & Davis, 2000). The simple concepts offered by TAM in describing people's acceptance of technology meets the principles of parsimony for any theoretical model. This means that TAM would be the perfect theoretical basis for other studies investigating the acceptance of other types of technologies.

Hydroponic vegetables grown using LED and the benefits of hydroponics

The concept of LED plant factory was first proposed by Japan. Plant factories would employ automated environmental controls that adjust temperature, humidity, lighting, carbon dioxide concentration, pH, and nutrients required for plant growth, protecting the growing system from the influences of the external climate or environments. Simply put, plant factories combine technology and environmental controls with indoor farming techniques so that farmers would no longer be dependent on the changing climate to determine the size of their harvests. Plant production could therefore become a repeatable and predictable factory-based process, achieving improved production volume and quality accordingly. Studies carried out by Rensselaer Polytechnic Institute (RPI) predict that LED illumination could reduce power bills by US$ 1.8 trillion, save 1 billion barrels of crude oil for generating electricity in power plants, and cut carbon dioxide emissions by 10 billion tons for the next 10 years. Some scholars even believe that employing artificial and controllable illumination to *encourage* plant growth could achieve better plant development, productivity, quality, disease resistance, and reduced contamination. This technology would be extremely important in supporting the development of modern farming.

Taiwan's LED industry enjoys a high degree of specialization and benefits from other supporting industries. Official business policies for developing Made in Taiwan (MiT) brands and ensuring food policy as well as growing opportunities for the agricultural lighting industry also provide the perfect industrial structure to fuel the competitiveness of Taiwan's agricultural LED lighting industry.

Li Hsiao-Min (2012) pointed out that various governments in the world have taken measures to promote agricultural LEDs. Actual demonstration showed that LED light sources could fully replace natural illumination and other forms of artificial lighting. Lighting wavelengths could also be adjusted according to the plant's physiological development stage, reducing the growth cycle time of the plants while increasing productivity, minimize losses due to diseases, and enhancing crop quality. Wang Chan-Mei (2013) also described that customer value under the context of food safety, when considered together with new operational models and novel markets created with agricultural LED lighting and new high-value crops, could be used to improve total profitability of these innovative products.

Studies on the benefits and factors affecting LED hydroponics

Studies carried out by Chou Jung-Yuan (2013) revealed photosynthetic bacteria as the most efficient hydrogen gas producer of any biological system. Hence, carbon dioxide could be used as a source of carbon with carefully designed bioreactors for growing such bacteria under optimal conditions. Such bioreactors would be provided with solid-state LED lighting featuring long lifespans, high electricity to light conversion ratio, good energy efficiency, zero UV rays, and excellent durability. Such systems would employ biological and physical properties to optimize the conditions for growing these beneficial bacteria while preserving natural ecology and improving upon the issues caused by global warming.

Traditionally, most photosynthetic bacteria were grown using incandescent or natural lighting. Incandescent lighting, however, consumes too much electricity if used for long-term illumination, while natural lighting from the sun is easily affected by climatic conditions. These two lighting methods would be less than ideal when compared to LED lighting. LEDs are solid-state devices that have the advantages of long lifespan, good energy conversion efficiency that offers energy savings, zero UV, excellent durability, small sizes, great flexibility for designs and applications, and could be rapidly switched on and off as required, providing a continuous source of lighting needed to create a stable growing condition. The use of LED could help reduce production costs while fulfilling the global trends of energy saving and carbon reduction. LED can also be seen as a source of light for the new century. White LED is currently considered the most efficient and environmentally friendly source of light in the market.

Purchasing intent

Morwitz and Schmittlein (1992) believe that purchasing intent should be considered as a well-developed topic in consumer research. Fishbein and Ajzen (1975) also demonstrated that purchasing intent could suitably reflect subjective inclination of the consumer with respect to the target item and a key indicator for forecasting consumer behavior. Morwitz and Schmittlein (1992) also believed that the indicator of purchasing intent could also be used by sales personnel as a key variable for predicting customer purchasing behaviors.

Fishbein and Ajzen (1975) defined behavioral intent as a subjective belief held by an individual with respect to the chances of carrying out certain behaviors. Zeithaml (1988) believes that consumer purchasing intent would be affected by the consumer's perceived value, objective value, intrinsic and extrinsic properties, and perceived quality. Zeithaml, Berry and Parasuraman (1996) studied the computer manufacturing and retail industry and believed that consumer behavior and intents could be used as indicators for determining consumer loyalty to the brand or their decision to switch to another brand. Consumer intent is divided into 2 categories, namely *unfavorable* and *favorable*. When the customer displays unfavorable behavioral intents towards a target business, the customer would reduce their spending or leave the business altogether. The

target business would thus need to spend additional costs in attracting new customers. On the other hand, businesses could strengthen relationships with customers with favorable behavioral intents to bring about continuous benefits and improve spending potential.

These outcomes showed that studies carried out by Zeithaml et al. (1996) assumed behavioral intent as a determining indicator for *customer loyalty*.

Folkes, on the other hand, believes that consumer re-purchasing would be a result of a cause-and-effect relationship (1988). Re-purchasing would occur if a customer experienced satisfaction or other benefits after procuring a product or service. Dodds, Monroe, and Grewal (1991) defined purchasing intent as the chance, probability, and intent of a customer to purchase a product. Hellier, Geursen, Carr and Rickard (2003), on the other hand, believes that purchasing intent would be based upon a current or impending event, and include the decision or opinion in repurchasing a specified product from the same business. Spears and Singh (2004) defined purchasing intent as an individual's conscious planning or efforts in procuring a specific product from a specific brand.

Research structure and assumptions

This study was based upon the TAM described by Lin Hsin-Chih, Tang Kai-Wen, and Lai Hsin-Chih (2010). Relevant research assumptions made in previous research were used to formulate a research framework divided into the 3 major sections of external variables, internal variables, and usage behavior. The first part of this study investigated the external variables (including quality of the LED hydroponic vegetable growing system).

The second part reviewed the internal variables (including perceived usefulness (PU) and trust) and how these variables relate to behavioral variables after purchasing LED hydroponic vegetables (including intent of use and actual behavior). The following lists the 6 hypotheses established using the TAM and framework formulated by this study.

H1: The quality of LED hydroponic vegetables would affect the consumer's PU of the said vegetables.

H2: The quality of LED hydroponic vegetables would affect the consumer's trust for the said vegetables.

H3: The consumer's trust for LED hydroponic vegetables would affect the consumer's PU of the said vegetables.

H4: The consumer's trust for LED hydroponic vegetables would affect the consumer's attitude for using the said vegetables.

H5: The consumer's PU for LED hydroponic vegetables would affect the consumer's attitude for using the said vegetables.

H6: The consumer's attitude for using LED hydroponic vegetables would affect actual usage and behaviors for the purchase of the said vegetables.

Definitions for various research aspects and variables used in this study are provided in Table 1.

Questionnaire design and investigation

This study employed a questionnaire to evaluate the intents for growing LED hydroponic vegetables while referencing studies conducted by other scholars (Davis, 1989; Han vander Heijden, 2002; Wang Cheng-Li, 2008) to provide the questionnaire with the perspectives for personal sensory experience and requirements. Through evaluating positive perspectives and customer feedback after using LED hydroponic vegetables, a TAM satisfaction evaluation form was developed to include the five aspects of vegetable quality, PU, trust, usage attitude, and intent of use. This study suitably adjusted the TAM indicators of perceived ease of use and usage behavior intent into trust and usage intent respectively. Intermediate variables would be similar to the PU used in TAM, and investigate whether the purchaser subjectively perceive LED hydroponic vegetables to be capable of improving production efficiency. Hence, these intermediate variables were integrated to create the aspect of PU for the purpose of this study. Additionally, self-performance under the aspect of expectations could be similar to the aspect of trust in the revised TAM. Both refer to the level of acceptance of LED hydroponic vegetables when using the said vegetables. Therefore, this study integrated trust and PU in both aspects and compiled relevant literature to evaluate actual intent of using LED hydroponic vegetables with respect to the four aspects of quality, PU, trust, and usage attitude scored along a 5-point Likert scale.

This study targeted housewives in Taichung City (using actual questionnaire surveys). The surveys were conducted across a one-month period from March 1, 2016 to April 1, 2016.

Basic description of the sample

310 questionnaires were distributed and recovered for this study, of which 306 were considered effective for a recovery rate of 98.7%. Effective surveys were analyzed using SPSS data processing software. The 29-item survey also exhibited a Cronbach's alpha value of 0.942. The distribution of sample information collected is found inTable 2.

Most consumers were 21 to 30 years old, college educated, work for private businesses, and live in northern Taiwan.

Table 1. References For The Research Aspects, Definitions Of Operational Models And Research Assumptions

Source	Aspect	General Definition	Reference
Questionnaire /Actual use Status of LED hydroponic vegetables	Quality of hydroponic vegetables	Various quality evaluations for growing LED hydroponic vegetables, including: less impact from agricultural chemical contamination of water and soil as well as ease of quality monitoring.	
	Perceived usefulness (PU)	LED hydroponic vegetables provide an effective solution to overcome vegetable shortages in the market, improve productivity, and reduce production costs, making it perfect for meeting sales requirements of many growers. LED hydroponics could also provide stable production less affected by natural disasters and pests, achieving the objectives of improved productivity, efficiency, quality, disease, and reduction of public hazards.	Davis, 1989 Igbaria et al.,1997 Morris & Dillon, 1997 Chen et al., 2002 O'cass & Fenech, 2003 Van der Heijden et al., 2003 Ngai et al., 2007
	Trust	Consumer's degree of faith and acceptance after understanding the quality of LED hydroponic vegetables.	
	Usage attitude	When compared to conventional hydroponics, this system could reduce resource waste and reduce growing surface area to achieve increased unit area productivity. Other benefits include improved food safety and decreased uncertainty.	
Questionnaire /open-ended question	Actual behavior	TAM is used as the basis to generate assumptions on the relationships between various aspects as well as influencing behaviors that may take place for those using LED hydroponic vegetables in order to predict future user intent for the said vegetables.	Davis, 1989 Venkatesh et al.,2000 Chen et al., 2002 Van der Heijden et al., 2003 Legris et al., 2003 Juan et al., 2006

Table 2. Distribution of Sample Information Collected

Variable name		Quantity	Percentage (%)
Gender	Male	126	41.2
	Female	180	58.8
Area of residence	Northern Taiwan	279	91.2
	Central Taiwan	9	30.5
	Southern Taiwan	18	5.9
Age	Below 20 years old	18	5.9
	21 to 30 years old	117	38.2
	31 to 40 years old	72	23.5
	41 to 50 years old	99	32.4
Educational background	Bachelor's	162	52.9
	College	54	17.6.
	Senior (vocational) high	45	14.7
	Junior high (and less)	2	2.1

Variable name	Quantity	Percent-age (%)
Professional home-maker	45	14.7
Students	57	11.2
Retired	27	8.8
Full-time employee	36	11.6
Military, civil servant, teacher	27	8.8
Self-employed	18	5.9
Others	9	2.9
Business owner	126	41.2

Table 3. The Path Analysis Coefficients For Quality, PU, Trust, Attitude, And Intent

	Constant	Beta	R^2	t	Sig.
Quality → PU	.353	0.851	0.725	3.055	0.002**
Quality → Trust	1.618	0.801	0.640	15.139	0.000**
Trust → PU	0.9	0.649	0.480	16.811	0.000**
Trust → Attitude	0.021	0.338	0.519	6.13	0.000**
PU → Attitude	0.021	0.445	0.519	8.071	0.000**
Attitude → Intent	2.731	0.588	0.344	12.674	0.000**

**p<.00

Analysis revealed that acceptance for LED hydroponic vegetables was possible- regression procedure was employed to review the explanatory power of each independent variable upon the dependent variables.Table 3. shows the path analysis coefficients for quality, PU, trust, attitude, and intent, providing a summary of all constants between each variable and explained variance of the revised independent variables.

This study found significant relationships between PU and trust and usage attitude for LED hydroponic vegetables. Hence, both PU and trust would significantly affect the resulting usage attitude for LED hydroponic vegetables. This study also revealed that for the relationships between the three aspects of PU, trust, and attitudes for LED hydroponic vegetables, the higher the levels of PU and trust, the better the attitude. Both PU and trust would positively influence attitude that would also positively influence attitude. The positive relationships between these three aspects were significant. This means that higher PU and trust amongst the consumer would result in a stronger attitude for using LED hydroponic vegetables.

Conclusion and Recommendations

After providing consumers with information of the LED hydroponic vegetables during the course of this study, the consumers appreciated LED hydroponic vegetables as great products. However, most consumers demonstrated poor understanding of these vegetables and could not accept the higher prices charged. Further promotion and awareness should be encouraged to educate consumers on the advantages of LED hydroponic vegetables over their conventionally grown counterparts. Popular green industries and concerns of food safety should also highlighted and combined in marketing programs. Successful marketing would propel LED hydroponic vegetables as a leading industry no longer restricted to northern Taiwan. The scope of this study targeted shops selling LED hydroponic vegetables and distributed surveys to consumers in the Eastern District of Taipei, with most respondents exhibiting poor understanding of LED hydroponic vegetables. Since this study was mostly focused upon northern Taiwan, the scope of subsequent research should be expanded to ensure better comprehensiveness of the research results. Questionnaire surveys were em-

ployed to investigate attitudes towards LED hydroponic vegetables and how attitudes were related to the consumer's PU and trust of the products, but did not successfully reflect the true intentions of the consumers. To verify the results of this study, subsequent research should be encouraged to perform qualitative interviews to achieve deeper understanding and revise the questionnaire surveys accordingly to better assess consumer experiences and perspectives.

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