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Competency-based Agribusiness Entrepreneurship Education at the University of the Philippines Los Baños (UPLB): A Conceptual Framework Design

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ABSTRACT

Purpose – The Department of Agribusiness Management and Entrepreneurship (DAME) at the College of Economics and Management (CEM), University of the Philippines Los Baños (UPLB), launched an Agribusiness Entrepreneurship specialization for an undergraduate course in 2018. The purpose of this study was to develop a competency-based framework design of the Agribusiness Entrepreneurship specialization to achieve mindset transformations by enhancing the entrepreneurial competency of students.

Design/Methodology/Approach – A desktop synthesis of recommendations on entrepreneurship education applicable to the case of UPLB was generated based on analyses of entrepreneurial needs, best practices and lessons learned from extant literature. A conceptual framework design for a competency-based Agribusiness Entrepreneurship curriculum was developed to address a recommendation.

Findings – This paper included a conceptual design for an education framework for Agribusiness Entrepreneurship specialization with progression of goals through four learning phases: inspire and create awareness; generate ideas and design; turn ideas into business; and grow and sustain. Each goal was linked with a set of personal entrepreneurial competencies (PECs) achieved through objectives, content, pedagogies, and stakeholders' engagement with evaluation measures. The conceptual impact of the framework on ten personal entrepreneurial competencies (PECs) was mapped out phase-wise to demonstrate a comprehensive non-cognitive skills development plan throughout the learner's four-year journey.

Research Implications – The competency-based framework design of the Agribusiness Entrepreneurship specialization is among the first comprehensive proposals on entrepreneurial education focusing on agriculture in national higher education institutions. The design is now ready for implementation with the first batch of UPLB students. Baseline measurement with periodical assessments of student PEC scores needs to be conducted for individualized mentorship guidance and validation of transformational effects of the learning track among those pursuing the new program compared with another. The model framework on designing competency-based education could be used as a reference process or development tool for any university curriculum. Finally, mainstreaming of entrepreneurship at the university level could be achieved by designing and implementing programs to address the other proposed recommendations for enhanced entrepreneurship education in universities.

Keywords: agribusiness entrepreneurship education, competency-based curriculum design, personal entrepreneurial competencies

JEL Classifications: I21, I23, L26, O30

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I. Introduction

The agribusiness industry is undergoing a period of considerable change across numerous fronts. The ability to innovate in dynamic environments and volatile conditions is key to resilience and sustainable business growth in a constantly evolving global economy. The changes and dynamic trends play across the agribusiness value chain and will continue to shape how food is grown, raised and produced (Walter & Herther, 2017). The growing importance of agribusiness in the Philippine economy has fueled growth and has spurred the demand for building capacities to start up agribusiness ventures or manage agribusiness companies. The entry of the younger generation into the agribusiness sector promises to bring dynamism and a new breed of agribusiness entrepreneurs for nation building. Growth drivers of the Philippine agribusiness sector, specifically micro, small, and medium enterprises (MSMEs), can be developed and promoted through agribusiness entrepreneurship.

The need to modernize the agribusiness sector by attracting the youth has led to the emerging area of entrepreneurship education. Entrepreneurship is a mindset anchored on key non-cognitive skills such as innovation, creativity, critical thinking, complex problem solving and risk taking. Entrepreneurship education can drive the economy by empowering citizens with strong entrepreneurial mindsets, knowledge and skills. Breaking the boundaries of traditional career proclivity for knowledge and practical skills towards employability, entrepreneurship education motivates students with the entrepreneurial mindsets to create innovation for societal development, establish business ventures, become employers, generate jobs and directly contribute to socioeconomic development (Thanh, Nguyen, Nguyen, Nguyen, & Chong, 2019).

Through the years, agribusiness as a concept and a field of study has evolved from solely business to the management of the agribusiness companies' network of supply chains. At the University of the Philippines Los Baños (UPLB), the BS Agribusiness Management and Entrepreneurship (BS ABME) program was launched in 2018 to strengthen the business management of agriculture and to build the capacity of agribusiness entrepreneurs and professionals in support of national growth. The idea was to blend knowledge of scientific agriculture with business management and entrepreneurial skills.

The BS ABME program is a four-year undergraduate course that offers a combination of technical and agricultural courses, management and business courses, and general courses, which provide students with opportunities for lifelong learning. The program presents students a choice of specialization: Agribusiness Entrepreneurship or Agribusiness Management, preparing them to become agribusiness entrepreneurs or managers of agribusiness institutions, respectively.

This study aimed to develop a competency-based design of the newly launched Agribusiness Entrepreneurship specialization to achieve mindset transformations based on analyses of entrepreneurial needs, best practices and lessons learned from literature. A desktop synthesis of program recommendations on entrepreneurship education at the college and university levels was conducted. Recommendations were adapted to the case of the University of the Philippines Los Baños (UPLB).

II. Review of Literature

1. Entrepreneurship Education and Curriculum Design

Entrepreneurship education has expanded globally. Sirelkhatim and Gang (2015) in their review of 129 global articles on entrepreneurship education and entrepreneurship learning provided a detailed map of common and best practices on curriculum design, content and teaching methods at the tertiary level. The study results showed that theoretical courses aim to increase entrepreneurial awareness while practical-oriented courses focus on producing graduates ready to start a business. Similarly, in Southeast Asia, the outcomes of entrepreneurship education were visible in developing the potential of students as entrepreneurs through the students' development of entrepreneurial attitude, intention and motivation, entre-

preneurial skills and knowledge, entrepreneurial competency and ability to start a business (Othman & Othman, 2019). In Europe, entrepreneurship education in schools aims to raise consensus among stakeholders and establish a bridge between the worlds of education and work (Gold & Rodriguez, 2018). Ndou, Secundo, Schiuma and Passiante (2018) identified the following five main dimensions as key characteristics of the structure and organization of entrepreneurship education: target audience, learning objectives, entrepreneurship content, learning pedagogies and stakeholders' engagement. University programs for entrepreneurship should, however, consider the wider entrepreneurial ecosystem beyond the classroom. The activities outside the classroom or extracurricular activities are mainly related to: the design and launch of business, such as incubation initiatives, technology transfer, incubator/science parks; the development of business and entrepreneurship, such as business consulting start-up and spin-off entrepreneurs-in-residence, venture capital funds, coaching start-ups; the exchange of knowledge mainly in forums, workshops, summer schools, student conferences, student clubs; and business simulations and competitions, venture camps, boot camps, and business plan competitions (Wilson, 2008).

The goals of entrepreneurship education are not always the same for every program. Some aim to help students create actual start-ups, while others primarily gear toward the development of core skills associated with being an entrepreneur (Gold & Rodriguez, 2018). There is a tendency to structure the learning initiatives according to a phase-based process and progression model that goes from recognizing or creating an opportunity for value creation; converting this opportunity into a workable concept; and capitalizing on the concept in a growing organization. As such, the entrepreneurship education programs aimed at developing an entrepreneurial mindset and enhancing personal entrepreneurial competencies could be structured according to the specific needs of the students, their prior knowledge and competencies acquired so far, aligning the learning pedagogy and stakeholders' involvement as the students go through the various phases of their learning (Ndou et al., 2018).

2. Entrepreneurial Mindset and Competencies

In 2017, Naumann conducted a synthetic literature review identifying a list of attributes and associated qualities of the entrepreneurial mindset. The review differentiated between core attributes, which are easier to recognize through exhibited behavior, and meta-cognitive attributes, which are hidden and require a higher level of self-awareness. Within the competency literature, there are close links with other disciplines such as leadership and management competencies. There is a direct link that exists between competencies, value creation and the firm's strategy and growth. Research (Naumann, 2017) suggests that entrepreneurs need both entrepreneurial and managerial competencies, and that the latter is particularly important as the business grows and to support successful business growth. It is therefore possible that competencies in the context of leadership and entrepreneurship, while as individual concepts might be much less easy to measure than managerial competencies, can still be recognized and offer a valuable framework for reflection and development (Mitchelmore & Rowley, 2010). Priyanto (2012) noted that the most important entrepreneurial educational material is mindset change, the skills of running and developing business and business-readiness skills. Hood and Young (1993) described these skills and character as follows: communication, leadership, management, human relations, negotiation, analytical thinking, decision making, goal setting, business plan preparation, self-motivation, risk taking, moral standards, competitiveness, aggressiveness, persistence, responsibility, self-confidence, emotional independence, adaptability, and others.

A personal entrepreneurial competencies (PEC) model developed at Harvard University and further refined through the United Nations Conference on Trade and Development (UNTCAD) Empretec Program has grouped the ten PECs into the following clusters: (1) Achievement: opportunity-seeking, risk-taking, persistence, commitment to work contract and demand for efficiency and quality; (2) Planning: information seeking, goal setting and systematic planning and monitoring; and (3) Power: self-confidence and persuasion and networking. The Empretec Program noted that the above com-

petencies are common to all successful entrepreneurs, from one country to another and from one business to another (UNCTAD, 2009).

Several studies noted that entrepreneurship education has a positive impact on entrepreneurial mindset and personal entrepreneurial competencies. The Network for Teaching Entrepreneurship (NFTE) developed an assessment of the impact of entrepreneurship education on the entrepreneurial mindset for school-aged youth. Classroom and experiential entrepreneurial education helped students develop their entrepreneurial mindset leading to other changes in attitudes and behavior including intentions to start their own business or view entrepreneurship as a possible career choice (Gold & Rodriguez, 2018). Moberg, Vestergaard, Jorgensen, Markussen and Hakverdyan (2013) noted that there is a need to connect policy development to address the requirements and competencies of the students by focusing on the entrepreneurship education provided by the universities and other institutions. Moreover, entrepreneurship education could support the entrepreneurial journey of the students by providing a dynamic pathway for entrepreneurial mindset creation and building entrepreneurship competencies through various curricular and extra-curricular learning initiatives within the entrepreneurial ecosystem (Ndou et al., 2018).

3. Entrepreneurship Education in the Philippines

In the Philippines, entrepreneurship as a formal degree program was initiated by the Commission on Higher Education (CHED) in 2005 (Velasco, 2013). Shortcomings in entrepreneurship education in the Philippine formal education system include the lack of academe and industry support for growing and sustaining nascent entrepreneurial undertakings, and the lack of creative and innovative mindset development, which is a prerequisite condition for high growth, high potential start-ups (Velasco, 2013). A study on entrepreneurial competencies among business students in a Philippine academy recommends universities to serve as a breeding ground of future entrepreneurs by allocating funding to business-related activities that foster group problem-solving (Cruz, 2018). Mainstreaming entrepreneurship education was among the conclusions of a study on enterprise development from students in Vietnam and Philippine universities (Thanh et al., 2019). Entrepreneurial education was found to be the key positive determinant of entrepreneurial intent of students. The research report therefore recommended integrating entrepreneurship content in the university education system with a focus on building innovation and creativity. It was posited that entrepreneurship courses should not be reserved mainly for business students but should transcend into non-business disciplines like engineering, science, math, arts and humanities, where business and product ideas emerge given the right environment. The authors also recommended tapping the government to further promote enterprise development. Finally, Gatchalian (2010) highlighted that entrepreneurship education at the tertiary level is best achieved through a well-designed curriculum, effective teaching model grounded on personalized and experience-based learning, and strong institutional support.

4. The Need for Competency-based Agribusiness Entrepreneurship Education in UPLB

As late as 2015, no higher education institution in the Philippines offered an entrepreneurship course specializing in agriculture (Santiago & Roxas, 2015). Therefore, the new agribusiness entrepreneurship specialization in UPLB is setting a national standard. It is critical that this education specialization is designed to generate competencies that empower students for entrepreneurial careers toward national economic growth.

The call for an enhanced design of the Agribusiness Entrepreneurship specialization is a response to below studies that uncovered gaps in skillsets of UPLB agribusiness management students as well as those in other local academic institutions. In general, the gaps stressed a stronger need for non-cognitive skills over technical or knowledge-based skills, prompting for a competency-based education design as presented below.

The study of Cabardo and Madamba (2017) revealed the following non-cognitive skills to be the most sought-after among UPLB agribusiness management graduates: communication, interpersonal/ social/ networking, analytical/critical thinking,

marketing, leadership, management experience, and strategic planning. Authors suggested the following improvements in the UPLB agribusiness management curriculum to provide graduates with a better preparatory education: experiencing on-the-job internship/ apprenticeship program, fostering an entrepreneurial mind-set and hands-on training, and specializing in a degree major specific to a business function. Leading the way to fill these gaps is a competency-based design of the UPLB Agribusiness Entrepreneurship track with the primary aim of transforming the learner's affective or socioemotioal skills and mindset.

A study measuring personal entrepreneurial competencies (PECs) of UPLB BS Agribusiness Management students revealed lower scores compared with that of BS Entrepreneurship students in De La Salle University (DLSU) in Metro Manila, Philippines (Espiritu, Depositario, Manipol, Tan, & Baticados, 2015). The lowest average PEC score among UPLB students was on Persuasion and Networking, which in contrast, garnered significantly much higher scores among DLSU students. With a view that the entrepreneurship curriculum of DLSU was a major contributing factor, authors suggested to design an entrepreneurship program in UPLB that exploits experiential learning, simulating realworld entrepreneurship including business plan competitions and mentoring relationships. Validating that proposal, a study by Reyes and Manipol (2015) demonstrated that UPLB students perceived business pitching competitions as the most effective teaching methodology for increasing entrepreneurial awareness.

In 2016, Alusen measured PEC scores among business administration students of the Lyceum of the Philippines University (LPU - Laguna). Similar to findings with UPLB agribusiness management students (Espiritu et al., 2015), the LPU students rated weak on the PEC of Persuasion and Networking. To address this gap, it was suggested that the learning design give students more opportunities for out-of-campus activities, including conferences and trade-show events, as well as action learning, internship, and simulations.

Moreover, a study among business students in another Philippine academic institution recommended designing curricula and activities that better predispose students toward entrepreneurship by working within innovative spaces outside the classroom and encouraging entrepreneurial success in a variety of settings (Cruz, 2018). From the same study, other recommend-ed methods for enhanced entrepreneurial education included creating networks of peers and mentors to help students start their own enterprises; enabling student immersion experiences in small, medium and large enterprises; organizing conferences that promote idea pitches and participants' collaboration; and demonstration of support for young and emerging entrepreneurs. The development of the UPLB Agribusiness Entrepreneurship specialization should adopt these learnings as strategies for a successful program design.

III. Methodology

Literature describing tertiary level entrepreneurship programs, particularly those referring to UPLB, were reviewed for the purpose of extracting entrepreneurial needs and gaps, best practices and recommendations on enhancing entrepreneurship education in UPLB. Course descriptions of current subjects offered under the UPLB Agribusiness Entrepreneurship specialization were analyzed and integrated into a competency-based design framework with a four-phase learning journey of progressive goals. The UNCTAD set of ten Personal Entrepreneurial Competencies (PECs) was adopted as learning outcomes in the specialized track design because the PEC instrument of measure has become a common standard in Philippine studies investigating the effects of entrepreneurial education. A conceptual impact of the specialized track design on each PEC was mapped out in every learning phase for future empirical validation of the transformational effect of entrepreneurship education.

IV. Results and Discussion

1. Adopting Approaches to Better Agribusiness Entrepreneurship Education at UPLB

Analyses of empirical studies for enhancing entrepreneurship education reveals adaptability

of a number of proposals to the context of UPLB. Literature reviews on global entrepreneurship education programs in the last ten years revealed some lessons learned and best practices for achieving mindset and competency trans-formations among students in terms of approaches, pedagogical strategies, stakeholders' engagement, and development policies, among others. Specifically, the gaps stressed a stronger need for non-cognitive skills over technical or knowledge-based skills, prompting for a competency-based education design. Table 1 synthesizes the best practice recommendations that are likely applicable to the development and design of the UPLB Agribusiness Entrepreneurship specialization for uptake by the College of Economics and Management or by UPLB at the university level

2. Design of the BS ABME Agribusiness Entrepreneurship Specialization

The proposed design of the BS ABME Agribusiness Entrepreneurship specialization applies an adaptation of the framework proposed by Ndou et al. (2018) for developing entrepreneurial mindset in student entrepreneurs. Adapting the four education pillars (learning objectives, entrepreneurial content, learning pedagogy and stakeholders' engagement) presented by Ndou et al. (2018), this paper created a conceptual framework design (Fig. 1) with the added elements of evaluation measures, innovative pedagogical strategies and personal entrepreneurial competencies (PECs) as learning outcomes. The innovative pedagogical strategies address the gaps identified earlier along with recommendations for a holistic entrepreneurship education approach, extracurricular, collaboration and linkage activities beyond the classroom setting. With these strategies, the framework targets achievement of all ten PECs as learning outcomes throughout the four-year student journey. Evaluation measures presented are learner-centered feedback mechanisms confirming the achievement of the objectives.

In general, the conceptual framework design shows the progression of goals through four years of the student's journey:

Goal 1: Inspire and Create Awareness.
Be inspired to become agribusiness entrepreneurs and be aware of agribusiness entrepreneurship.

Goal 2: Generate Ideas and Design.
Address real-life problems and provide solutions through business ideation and creation

Goal 3: Turn Idea into Business.
Turn an idea into an actual business through the creation of a business plan.

Goal 4: Grow and Sustain.
Grow and sustain the business through actual implementation

3. Competency Mapping

The total conceptual relationship of the ten PECs with learning phases is illustrated as a matrix in Table 2. The matrix demonstrates that as the learner progresses through the entrepreneurship education journey, the competencies acquired are expected to increase in number and intensity.

The Agribusiness Entrepreneurship specialization was designed to create transformational impact on all ten PECs at different degrees across the phases of learning. Since these 10 PECs have been identified as common to all successful entrepreneurs (UNCTAD, 2009), designing an entrepreneurship education with the 10 PECs as learning outcomes increases the chance for graduates to become successful agribusiness entrepreneurs or well-equipped agribusiness managers. The earlier identified gaps in non-cognitive skills of UPLB agribusiness graduates, such as communication skills, persuasion, interpersonal/social/networking skills and analytical thinking (Cabardo & Madamba, 2017; Espiritu et al. 2015; Reyes & Manipol, 2015), are altogether addressed by the 10 PECs, given appropriate strategies to achieve the expected learning outcomes. For example, the strategy of business pitching competitions is a powerful way to hone student communication skills towards improved PECs on opportunity seeking, persistence, risk-taking, goal-setting, persuasion and networking, and self-confidence. Interpersonal /social/ networking skills, on the other hand, closely relate to the following PECs: opportunity seeking, commitment to work contract, information seeking, and persuasion and networking. Analytical thinking is linked to the following PECs as learning out-

Table 1. Best Practice Recommendations Applicable to the Development and Design of the UPLB Agribusiness Entrepreneurship Specialization

References	Findings-based Recommendations	Best Practice Recommendations for UPLB
Alusen (2016), Cabardo and Madamba (2017), Espiritu et al., (2015), Ndou et al. (2018), Othman and Othman (2019), Sirelkhatim and Gang (2015), Velasco (2013)	• Simulate real-world entrepreneurship • Entrepreneurial and noncognitive skills • Education framework for entrepreneurship	Competency-based entreprene-urship education
Alusen (2016), Cabardo and Madamba (2017), Espiritu et al. (2015), Ndou et al. (2018), Othman and Othman (2019), Reyes and Manipol (2015), Sirelkhatim and Gang (2015)	• Pedagogical strategies: e.g. pitch, mentorship, networking, action learning	Learning pedagogies for entre-preneurial competency
Alusen (2016), Ndou et al. (2018), Othman and Othman (2019), Reyes and Manipol (2015), Sirelkhatim and Gang (2015)	• Networks • Out-of-campus engagement: conferences and trade shows • Internship	Stakeholders engagement for entrepreneurial competency
Cruz (2018), Gold and Rodriguez (2018), Ndou et al. (2018), Othman and Othman (2019), Sirelkhatim and Gang (2015), Velasco (2013)	• Academe-industry partnership • Capacity building for entrepreneurship at university level	Policy on business incubation in universities to complement entrep-reneurship education
Ndou et al. (2018), Othman and Oth-man (2019), Sirelkhatim and Gang (2015), Thanh et al., (2019), Velasco (2013)	• High-growth, high-potential business start-ups, enterprise devel-opment	Policy on entrepreneurship edu-cation for national growth
Ndou et al., (2018), Othman and Oth-man (2019), Sirelkhatim and Gang (2015), Thanh et al., (2019)	• University-wide and multidisciplinary innovation and entrepreneurship education	Policy on innovation and entre-preneurship competency in gener-al university education
Gatchalian (2010), Ndou et al. (2018), Othman and Othman (2019), Sirelkhatim and Gang (2015), Velasco (2013)	• Effective teaching/ mentorship model grounded on experiential learning • Strong institutional support	Professional entrepreneurship teaching competency program

Fig. 1. Conceptual Framework Design of Agribusiness Entrepreneurship for BS ABME Students in UPLB

Goal	Learning Objectives	Entrepreneurial Content	Learning Pedagogy	Stakeholders' Engagement
Year 1 Inspire and Create Awareness	Understand, create awareness, stimulate and sensitize, inspire, analyze, discuss/reflect, and acquire knowledge of agribusiness, agribusiness management and entrepreneurship	Foundations of Entrepreneurship Agribusiness as a concept, a sector and a field of study Introduction to Agribusiness Management and Entrepreneurship Concepts, values and skills critical to entrepreneurship Entrepreneurial Finance Financial and investment analysis for start-ups and growing enterprises	Lectures, seminars, individual and group exercises, case studies, reflections, discussions, entrepreneurs' talk	Introduction to entrepreneurship ecosystem: inviting entrepreneurs to class talk and interviews, and judge student competitions
	Evaluation measure: quizzes, class participation, group presentation		Innovative strategies: developing an agribusiness concept, business concept pitching competition	
	Learning Outcomes: ENHANCED PERSONAL ENTREPRENEURIAL COMPETENCIES (PECS) in risk-taking, goal setting, information seeking			
Year 2 Generate Ideas and Design	Conceptualize, develop a business idea; explain the business ideation principles and idea generation techniques; develop a business concept and product prototype based on identified needs and opportunities.	Product Ideation and Creation Principles, tools and techniques in product/ service/ business development Design thinking, business model canvas, business pitch Agribusiness Systems and Modalities Integrative arrangements and modalities that relate to operations, problems, opportunities and decisions of agribusiness firms and major commodity systems	Lectures, seminars, workshops, case studies, problem-based learning, learning by doing/ exercises, role play, discussions and case studies, business start-up pitch	Networking; customer interviews; visits to agribusinesses, entrepreneurs, incubators
	Evaluation measure: group work on simple business plan, product/ service prototype and pitch		Innovative strategies: maker space facilities, start-up meet up events	
	Learning Outcomes: ENHANCED PERSONAL ENTREPRENEURIAL COMPETENCIES (PECS) in opportunity seeking, persistence			
Year 3 Turn Ideas into Business	Understand, discuss and formulate integrated business strategies for the different components of the business plan	Business Planning Business plan preparation and business model formulation for agribusiness products and/or services	Action-based entrepreneurial project learning, practical mentored sessions, business investor pitching	Networking; customer interviews; visits to businesses, entrepreneurs, and stakeholders involved in creating new ventures
	Evaluation measure: detailed business plan and investors pitch		Innovative strategies: investor presentations	
	Learning Outcomes: ENHANCED PERSONAL ENTREPRENEURIAL COMPETENCIES (PECS) in systematic planning and monitoring, persuasion and networking, self-confidence			
Year 4 Grow and Sustain	Apply and demonstrate business tools and techniques in establishing and managing agribusiness enterprises; document actual workplace experience/ exposure in agribusiness management and entrepreneurship; and demonstrate career readiness skills as managers or entrepreneurs.	Starting and Managing Agribusiness Enterprises Principles and practice of establishing and managing agribusiness enterprises Special Problem Agribusiness entrepreneurship journey documentation Internship Immersion in an agribusiness enterprise and/or apprenticeship with agribusiness entrepreneur	Conferences, workshops, mentorship, experiential learning with internship and actual workplace practice as an entrepreneur	Entrepreneurship ecosystem: program alumni, business mentors, investors
	Evaluation measure: 360-degree feedback on internship and business implementation; registration of a business venture		Innovative strategies: entrepreneurship journal; internship with agribusiness entrepreneurs; agribusiness launching	
	Learning Outcomes: ENHANCED PERSONAL ENTREPRENEURIAL COMPETENCIES (PECS) in commitment to work contract, persistence, systematic planning and monitoring			

comes: opportunity seeking, risk-taking, demand for quality and efficiency, goal-setting, information seeking, and systematic planning and monitoring.

4. Learning Pedagogy and Content of the Agribusiness Entrepreneurship Specialization

Pedagogical activities and initiatives outlined in the design of the Agribusiness Entrepreneurship specialization comprise a combination of classroom and experiential learning enriched with innovative strategies organized in progression. The aim is to impart entrepreneurship education according to specific needs, prior knowledge and the state of entrepreneurial mindset and competencies among students. This structure recognizes the advancing entrepreneurial mindset of students throughout their education journey, from creating an opportunity for value creation, converting this opportunity into a workable concept, and to capitalizing on the concept for a profitable business venture. Expanding the model framework of the agribusiness entrepreneurship education track, evaluation measures have been integrated into the design to verify students' achievement of learning objectives.

Innovative pedagogical strategies beyond classroom learning at each year level are presented in Fig. 1 and discussed in detail in the next section.

Distinctive to the four-pillar framework of entre-

Table 2. Conceptual Impact of the Agribusiness Entrepreneurship Track on Personal Entrepreneurial Competencies (PECs) as Outcomes throughout the Learning Journey

Personal Entrepreneurial Competency (PEC)	Learning Phase			
	Goal 1: Inspire and Create Awareness	Goal 2: Generate Idea and Design	Goal 3: Turn Ideas into Business	Goal 4: Grow and Sustain
Achievement				
Opportunity Seeking	+ +	+ + +	+ + +	+ +
Persistence	+	+ + +	+ + +	+ + +
Commitment to Work Contract	+	+	+	+ + +
Demand for Quality and Efficiency	+	+	+	+ + +
Risk-Taking	+ + +	+ + +	+ + +	+ + +
Planning				
Goal Setting	+ + +	+ + +	+ + +	+ + +
Information Seeking	+ + +	+ + +	+ + +	+ +
Systematic Planning and Monitoring	+	+ +	+ + +	+ + +
Power				
Persuasion and Networking	+	+ +	+ + +	+ + +
Self-Confidence	+ +	+ +	+ + +	+ + +

Note: + low impact, + + moderate impact, + + + high impact.

preneurship education is the element of stakeholders' engagement. While other education programs may treat that as part of extracurricular activities, entrepreneurship education regards external stakeholders and networks critical to achieving enhanced competencies as learning outcomes brought by the Agribusiness Entrepreneurship specialization. The desired competencies for entrepreneurship are almost impossible to develop without an immersion in real-world business with specialists and mentors who have valuable experiences beyond conceptual frameworks and theories.

The Agribusiness Entrepreneurship specialization offers a combination of nine technical, agribusiness, management and business courses that provide students with opportunities for lifelong learning. These are in addition to general education, legislated, foundation, core and elective courses prescribed for BS ABME students for a well-rounded education. Upon completion of the Agribusiness Entrepreneurship Program, students are expected to experience personal transformation in entrepreneurial mindset, knowledge and competencies, leading them to become agribusiness entrepreneurs or equipped with skills to succeed in their chosen careers.

5. Innovative Strategies beyond Classroom Learning

To provide a holistic entrepreneurship education approach, extra-curricular, collaboration and linkage activities complement the courses offered. The activities include participation in business pitching and business plan competitions; university fairs (e.g., February Fair) and bazaars; seminars, field trips, meet ups with entrepreneurs, financiers and other stake-holders; and linkages and collaboration with university initiatives.

In UPLB, relevant business incubation initiatives to date include the UPLB Agribusiness Center for Entrepreneurship (ACE) and UPLB Startup Innovation and Business Opportunity Linkage Incubation Laboratory (SIBOL). The UPLB ACE was established to catalyze the development of agribusiness in the countryside. It aims to spearhead entrepreneurship in the agribusiness sector for accelerated economic development. The UPLB ACE is the planned hub for agribusiness entrepreneurship and technopreneurship in UPLB. It intends to provide support to the following target beneficiaries: farming communities, UPLB community (faculty, researchers, students), industry associations, local government units and other agribusiness stakeholders. On the other hand, UPLB SIBOL seeks to build the entrepreneurship ecosystem in UPLB through academe-government-industry partnership. UPLB ACE and UPLB SIBOL provide a platform for direct mentorship, linkage with potential investors and other entrepreneurs, and entry to the marketplace. The Agribusiness Entrepreneurship program must make the most of such platforms to enable and empower students by forging strong linkages with business incubator networks and immersing them in real-world business experiences (Department of Agribusiness Management and Entrepreneurship, 2018).

V. Conclusions and Recommendations

This study developed the Agribusiness Entrepreneurship specialization conceptual framework design for an undergraduate course at the University of the Philippines Los Baños (UPLB), with the aim of creating mindset and entrepreneurial competency transformations among students. The design featured a progression of goals through four learning phases: inspire and create awareness; generate ideas and design; turn ideas into business; and grow and sustain. Each goal was linked with a set of personal entrepreneurial competencies (PECs) achieved through objectives, content, pedagogies, stakeholders' engagement and evaluation. The conceptual impact of the specialized design on ten PECs was charted phase wise to demonstrate a comprehensive non-cognitive skills development plan throughout the learner's four-year journey.

A desktop review of entrepreneurial competency needs, key lessons learned and best practices in enhancing entrepreneurship education generated a set of college and university levels of recommendations applicable to UPLB. This paper focused on addressing a key recommendation by developing a conceptual framework design for competency-based Agribusiness Entrepreneurship specialization, which is now ready for implementation with the first batch of BS ABME students. Baseline measurement with

periodical assessments of student PEC scores needs to be conducted for individualized mentorship guidance and validation of transformational effects of the learning track among those pursuing the new program compared with another.

The developed conceptual model (Fig. 1) is among the first designs of entrepreneurship education focusing solely on agribusiness for national higher education institutions in the Philippines. This paper contributes to entrepreneurship education literature on curriculum design frameworks with a more comprehensive approach integrating competency-based learning outcomes and evaluation measures. Previous design frameworks have not demonstrated a clear relationship between learning objectives and PEC as outcomes, nor have they included evaluation measures directly linked with learning objectives. This paper also contributes to literature on curriculum design development and processes that synthesized best practices into holistic recommendations for entrepreneurship education at the university setting addressing academe, industry and government linkages or networks. The conceptual framework could also serve as a general reference tool for enhancing higher education curricula in other disciplines or universities.

As in any conceptual model, the proposed Agribusiness Entrepreneurship specialization framework design needs testing for further refinement by validating through tracer studies across the four-year journey of the students. While each university setting may be unique, an approach such as this may lend clarity in the development of any curriculum design framework and its process.

Table 3. Synthesis of Research-based Recommendations for Enhancing Entrepreneurship Education at UPLB

College of Economics and Management (CEM), UPLB
• Competency-based design of Agribusiness Entrepreneurship specialization
• Enhancement of existing introductory entrepreneurship course with innovation module options catering to various fields of disciplines: arts, social sciences, humanities, sciences, engineering, math, IT and more; collaboratively delivered by the Department of Agribusiness Management and Entrepreneurship (DAME) with technical experts and external network support
• Development of an undergraduate foundation course on Agribusiness Technopreneurship and Technology Management
• Baseline and periodical tracing of student entrepreneurial competency scores for: a) individualized mentorship and guidance b) validation of newly redesigned courses and agribusiness learning tracks
University of the Philippines Los Baños (UPLB)
• Mainstreaming of innovation principles and processes in all undergraduate curriculum by: (a) reviewing systematically all innovation and entrepreneurship-related courses offered by different colleges; and (b) integrating into a common interdisciplinary foundation course offering, collaboratively developed with the leadership of the UPLB Department of Agribusiness Management and Entrepreneurship (DAME) at the College of Economics and Management.
• Professional entrepreneurship teaching competency program for university educators
• Establishment of a university-wide inter/transdisciplinary school of entrepreneurship and innovation with strategic partnership networks

Sources: Alusen (2016), Cabardo and Madamba (2017), Cruz (2018), Espiritu et al. (2015), Gatchalian (2010), Gold and Rodriguez (2018), Ndou et al. (2018), Othman and Othman (2019), Reyes and Manipol (2015), Sirelkhatim and Gang(2015), Thanh et al. (2019), Velasco (2013).

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Analysis of the International Competitiveness and Influencing Factors of China's Service Trade

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ABSTRACT

Purpose – In world trade, the development of the service trade has been extremely rapid, and its development is even faster than that of the goods trade. In order to have a more comprehensive and accurate understanding of the development status of China's service trade, the article mainly analyzes the status quo of China's service trade. By analyzing the status quo of China's service trade's international competitiveness, it finds problems in the development of China's service trade, and proposes ideas to improve China's service trade with measures of international competitiveness.

Design/Methodology/Approach – The article first analyzes the status quo of China's service trade development from a macro perspective, and then analyzes the level of China's service trade international competitiveness from three aspects: international market share, trade competitive advantage index, and explicit comparative advantage index. At the same time, based on Porter's "Diamond Model", the article selects production factors, demand factors, support from related industries, and government factors as auxiliary factors for research on China's service trade. Taking the trade competitiveness index as the dependent variable, the amount of employment in the tertiary industry, per capita GDP, the export value of the goods trade, foreign direct investment, and scientific and technological expenditures are used as independent variables to establish a model. This model is used to conduct quantitative analysis.

Findings – The article found that the overall competitiveness of China's service trade is relatively weak, with serious deficits and uneven structural development. Through quantitative analysis, it is understood that the international competitiveness of China's service trade is negatively correlated with the amount of employment in the tertiary industry and GDP per capita, and is positively correlated with foreign direct investment, China's trade exports, and science and technology expenditures.

Research Implications – Affected by the pandemic, the structure of the global service trade has undergone great changes, bringing new opportunities to the development of the global service trade. By analyzing the status quo and problems of the international competitiveness of China's service trade, relevant suggestions are put forward to better promote the development of China's service trade and improve the international competitiveness of China's service trade.

Keywords: development status, influencing factors, international competitiveness, service trade
JEL Classifications: O13, Q41, Q48

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I. Introduction

With the continuous acceleration and deepening of the process of world economic integration, the service trade has developed rapidly as an emerging economic form. Although it started late, today, with the continuous advancement of information technology and the deepening of the globalization of trade, the service trade is playing an increasingly important role, and has become an important part of world trade. Service industries occupy an increasingly important position in the world economy.

In 1982, China's total trade in services was only 4.5 billion US dollars. As China continues to open up to the outside world, the service trade has also continued to develop. In the 21st century, the Chinese government's emphasis on the service trade has greatly increased, which has further improved the opening up of China's service trade. In 2017, China's total trade in services has greatly improved, reaching 690.5 billion US dollars, second only to the United States, ranking second globally. In 35 years, the scale of China's service trade has increased 152 times over. At present, the output value of the service industry in the world's major developed countries accounts for more than half of GDP, of which the United States accounts for as much as 70%, but the proportion of developing countries is much lower than that of developed countries. In 2017, from the perspective of the proportion of trade volume in GDP, China's service trade accounted for only 5.4% of GDP. This data reflects that although China's service trade has developed rapidly and achieved certain results, compared with other developed countries, the proportion of the service trade in GDP is still small, the level of development is still low, and there are still many problems and challenges.

II. Literature Review

Compared with domestic research, foreign scholars began to study the service trade earlier, and their research in this area is also more mature and comprehensive. Most foreign scholars mainly started from the perspective of country, industry interaction, and service industry sector. These three perspectives are common for research.

▪ Country Perspective: Lall (1986) studied whether comparative advantage can be used in the service trade. By comparing the maritime and technical service levels between China and other countries, Lall concluded that comparative advantage can be used to analyze the service trade. Langhammer (1989) focused his research on the service trade relationship between developed and developing countries, and conducted empirical research on data from four different countries. After the 21st century, Western scholars conducted research on the source of service trade competitiveness and how to improve the international competitiveness of the service trade. Ahn and Lee (2007) conducted a comparative analysis on the service trade-related data of China, South Korea, and Japan, and concluded that it is necessary to continuously strengthen the trade in order to improve the international competitiveness of a region or country's service trade. At the same time, we must further expand the openness of the region.

▪ Industrial Interaction Perspective: Most of the research conducted by foreign scholars is around the relationship between manufacturing and service industries. OECD countries are the main research objects selected by Western scholars when conducting research. Francois and Woerz (2007) conducted a study on OECD countries and found that the degree of openness of the service industry will be affected by the export of manufacturing goods, and there is a positive correlation between the two. The exports of the goods trade will drive the export of service trade products. Therefore, the improvement of the international competitiveness of knowledge and technology-intensive service products can be achieved through service outsourcing.

▪ Service Industry Sub-Sector Perspective: Because different countries have different factor endowments, and compared with foreign Western scholars, each service trade sub-sector is the research object, and the international competitiveness of different service trade sectors has been studied. Bhagwati (1986) pointed out that because some developed countries have comparative advantages in technology, these countries have comparative advantages in technology-intensive service sectors.

This is due to lower prices due to comparative advantage. On the contrary, developing countries have more cheap labor. Therefore, in these countries, labor-intensive service industries have relatively strong advantages in international competition. Windrum and Tomlinson (1999) found that the modern service trade, especially those service trade products that have a higher demand for knowledge, technology, and capital, present a higher level of international competitiveness.

Compared with the research of foreign scholars, domestic scholars started relatively late in the research of service industry competitiveness. Most domestic scholars conducted research from the following two perspectives.

The first is to compare the development status of the service trade between China and other countries to analyze the comparative advantages and disadvantages of China's service trade. Cheng (2000) compared the service trade between China and the United States, and found that the number of employees in a country's service industry will have a positive impact on the country's service export revenue, and an increase in the former will drive an increase in the latter. Ding and Xu (2000) selected China and India as comparison objects to study the aspects of China's service trade competitiveness that need to be improved.

The second perspective is to study the level of competition in China's service trade. Scholars have selected different competitiveness measurement indicators and performed calculations and analyses. Cheng and Yang (2006) studied the changes in the structure of China's service trade exports, and found that the sector with absolute advantage in China's service trade export is still the resource-intensive and labor-intensive service sector. Wang (2010) analyzed China's service trade net export indicators, service market share indicators, service trade competitiveness index, and service trade demonstrated advantage index based on import and export data, and believed that China's service trade export structure is still labor-intensive. The industry is dominated, and competitiveness is relatively weak. Other scholars focused on how to improve the international competitiveness of China's service trade. Yin (2007) made suggestions on how to promote China's service trade from the perspectives of industrial structure, technological innovation, and the openness of the service market. He believed that optimizing the industrial structure, continuously improving technological innovation capabilities, opening the service market, and improving labor factors for the quality of Chinese goods were the key to promoting the international competitiveness of China's service trade. Zhou (2013) analyzed the characteristics of the service trade between China and South Korea, compared the advantages and disadvantages of the two countries' service trade, and concluded that China should pay attention to the training of service trade talents in the process of developing international trade. The introduction of a competition mechanism to improve the investment environment was suggested. She also proposed that while actively developing superior industries, China must constantly improve the competitiveness of inferior industries, and open the service trade market in an orderly manner on the basis of increased supervision.

The development of the international service trade is relatively inadequate compared to the well-developed goods trade, which has a history of several hundred years, and there is a large gap in the research of the service trade at home and abroad. Compared with domestic scholars, foreign scholars began to study the service trade very early, and obtained relatively mature development through empirical analysis from different angles. At the same time, this puts forward conclusions with more reference values, which is of great significance to the development of service trade.

Most scholars in China's academic circles focus on overall competitiveness in research on the service trade. They analyzed the international competitiveness of the country's service trade by calculating different measurement indicators and using these results. The problem is that Chinese academia has not formed a unified system for the selection of measurement indicators. Therefore, there are often some differences in the conclusions drawn by different scholars using different measurement indicators. In terms of empirical research, Chinese scholars have not reached a consensus on the key influencing factors of the service trade, so the different dependent and independent variables selected also affect the empirical results, which are correct and effective for the author's policy recommendations. Gender has a negative impact.

III. Calculation of the International Competitiveness of China's Service Trade

1. The Development Status of China's Service Trade

After joining the World Trade Organization, China's opening to the outside world and the degree of trade with other countries has been continuously increased. In such a general environment, China's service trade has been further developed, and the volume of imports and exports has continued to increase. Although, in 2009, the financial crisis affected the development of China's trade in services, resulting in a slight decline, from 2000 to 2017, China's total service trade has shown an upward trend as a whole. 70.7 billion U.S. dollars increased to 690 billion U.S. dollars in 2017, a cumulative increase of nearly 10 times, and the total trade volume ranks second in the world. The influence shown by China's service trade is also expanding worldwide. Under an economic background of the increasing importance of the service trade, China's service trade has huge development potential and has become an important force affecting China's economy.

There are still many problems in China's service trade under the conditions of rapid development and expanding scale. Among these problems, the imbalance of service trade export structure is very serious and cannot be ignored. There is a serious deficit in China's service trade. Since 2007, there has been a significant gap in China's service trade. There was a service trade deficit in 2009, and the deficit has been expanding year by year. In 2009, the deficit was only -15.5 billion U.S. dollars, but by 2017, China's service trade deficit had reached -238 billion U.S. dollars. It can be seen that the import and export development of China's service trade is extremely uneven. It can be seen that the development of China's service trade exports lags far behind imports. From the perspective of export structure, the traditional service trade is still an important contributor to China's service trade export. The traditional service trade still occupies an important position in exports, but the proportion of China's traditional and modern service trade sectors is constantly changing, and the structure is developing in the direction of continuous optimization. The proportion of exports of electronics, computers, and information services has increased year by year, and the proportion of other business services has also continued to increase, rising to 28.44% in 2017.

2. Calculation of the International Competitiveness of China's Service Trade

2.1. International Market Share

The international market share can reflect the international competitiveness of a country in a certain industry or product. If the value becomes larger, it can reflect the improvement of the country's international competitiveness and international competition for such products or industries. The international market share is reflected by the proportion of exports in the world's exports. When this indicator is used to analyze trade in services, the specific formula is as follows:

International market share = total service trade export / world service trade export total From 2000 to 2017, the international competition share of China's service trade showed an overall upward trend from 2.06% in 2000 to 4.28% in 2017. From 2000 to 2010, the international market share of China's service trade continued to increase at a relatively high rate. After 2010, this data has declined to a certain extent, but on the whole, the international market share of China's service trade is relatively stable, and the competitiveness of China's service trade has shown a trend of continuous improvement.

2.2. Trade Competitive Advantage Index

The trade competitive advantage index, the TC index, can well reflect whether a country's industry or product has a competitive advantage in the international market.

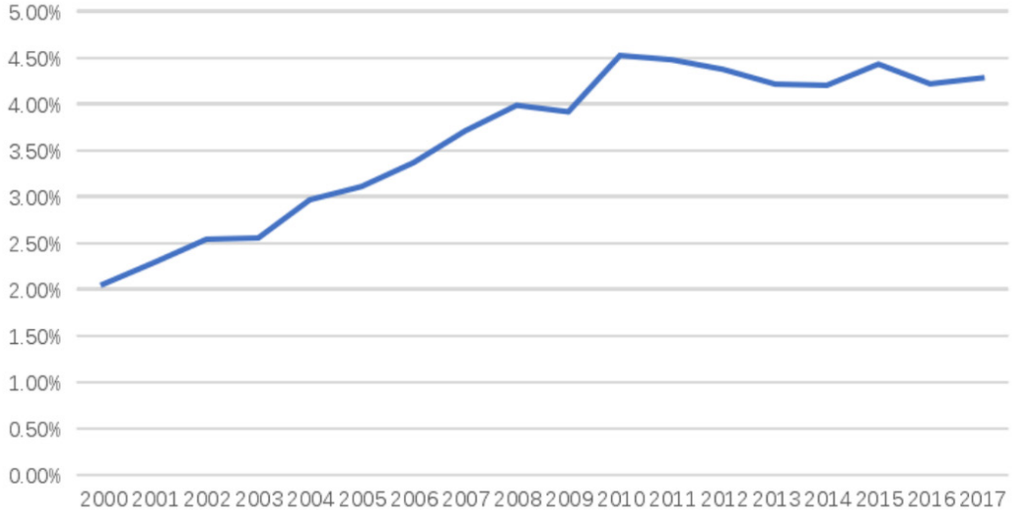
TC index = (Xij-Mij)/(Xij+Mij)

X is the export value, M is the import value, i represents the country, and j represents the j product or industry. The TC index ranges from -1 to 1. When the value of TC is greater than 0, it means

that j products have higher production efficiency than the world level in country i; that is, they have a certain competitiveness. On the contrary, when the value is less than 0, the situation is reversed; that is, the product does not have a competitive advantage in the country and the production efficiency is lower than the world level.

It can be seen from the graph of China's service trade competitive advantage index that the TC index of China's service trade has been negative from 2000 to 2004, but both are higher than -0.05, indicating that China's service trade had a relatively low deficit at that time. From 2005 to 2008, China's service trade competitive advantage index showed integrity, but fluctuated around 0, indicating that China's service trade had a relatively low surplus during this period. It can be seen that before 2009, the import and export status of China's service trade was relatively balanced. Since 2009, the competitive advantage index of China's service trade has been negative and has continued to decline. By 2017, the competitive advantage index of China's trade in services had reached -0.35. This shows that after 2009, China's trade in services has been in a state of deficit for an extended time, and the deficit has been increasing, while the TC index of the service trade in developed countries is generally positive. This shows that in international competition, China's service trade does not have a strong competitive advantage, but is in a relatively disadvantaged competitive position.

Fig. 1. 2000-2017: China's International Market Share



Source: Compiled from "China Statistical Yearbook" and relevant World Bank databases

2.3. Revealed Comparative Advantage Index

The Revealed Comparative Advantage Index, also known as the RCA Index, is the most commonly used measure of whether a product has a comparative advantage in one country over anoter.

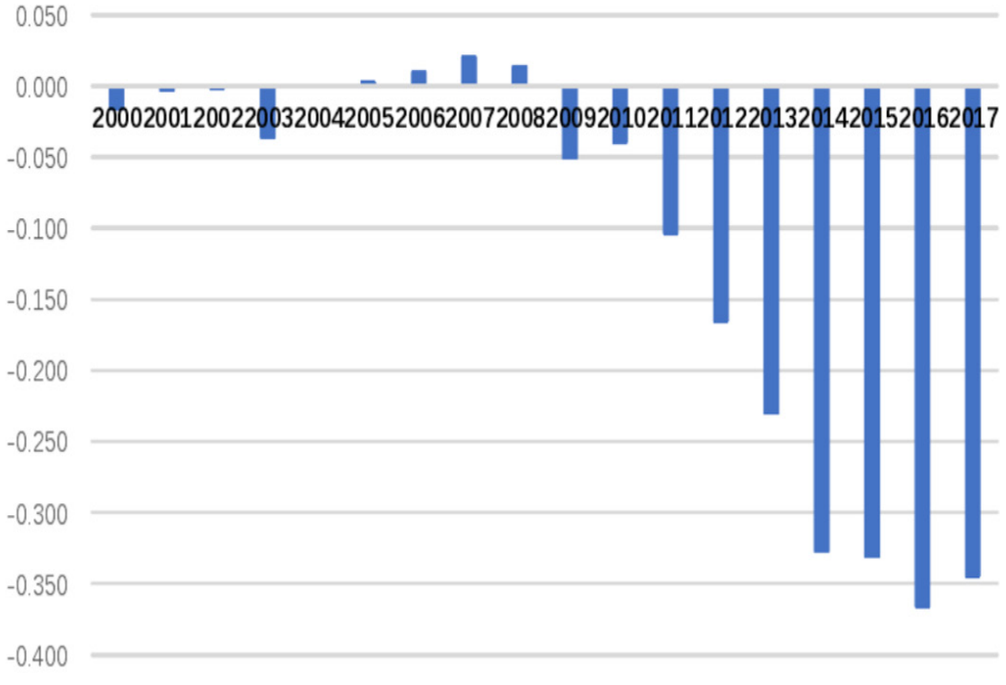
$$\text{RCA index} = (X_ij/Y_i)/(X_wj/Y_w)$$

Where X represents exports of this product, Y represents total exports, i represents a certain country, j represents a certain product, and w represents the world. When the revealed comparative advantage index is greater than 1, it indicates that the product has a dominant comparative advantage in the country. On the contrary, when it is less than 1, it means that there is no obvious comparative

advantage. Specifically, if a country is extremely competitive, the calculated RAC index will exceed 2.5; if it is between 1.25 and 2.5, it means it has strong competitiveness; when it is less than 1.25 but is greater than 0.8, it indicates that the competitive strength is at a medium level. If the competitiveness is weak, the RCA index will be less than 0.8.

As can be seen from the figure below, the revealed comparative advantage index of China's service trade is relatively low, showing a value of less than 1 at all times, and it is declining continuously. When the RCA index is less than 1, it means that the product does not have a dominant comparative advantage in the country. Therefore, China's service trade does not have a significant comparative advantage as a whole.

Fig. 2. 2000-2017: China TC Index



Source: Compiled from the "China Statistical Yearbook" and relevant World Bank databases.

IV. Problems in China's Service Trade1. China's Service Trade Deficit Is Severe and Increasing

According to the data and analysis compiled above, it can be found that although China's service trade has experienced rapid development and has continuously expanded imports and exports, it is still experiencing a serious deficit. At the same time, from the perspective of the growth rate, in recent years, the growth rate of China's service trade exports has been slower than that of imports. This state of growth has caused China's service trade deficit to continue to expand. This shows that the foundation of China's service trade is relatively weak, the supply of domestic service products is relatively

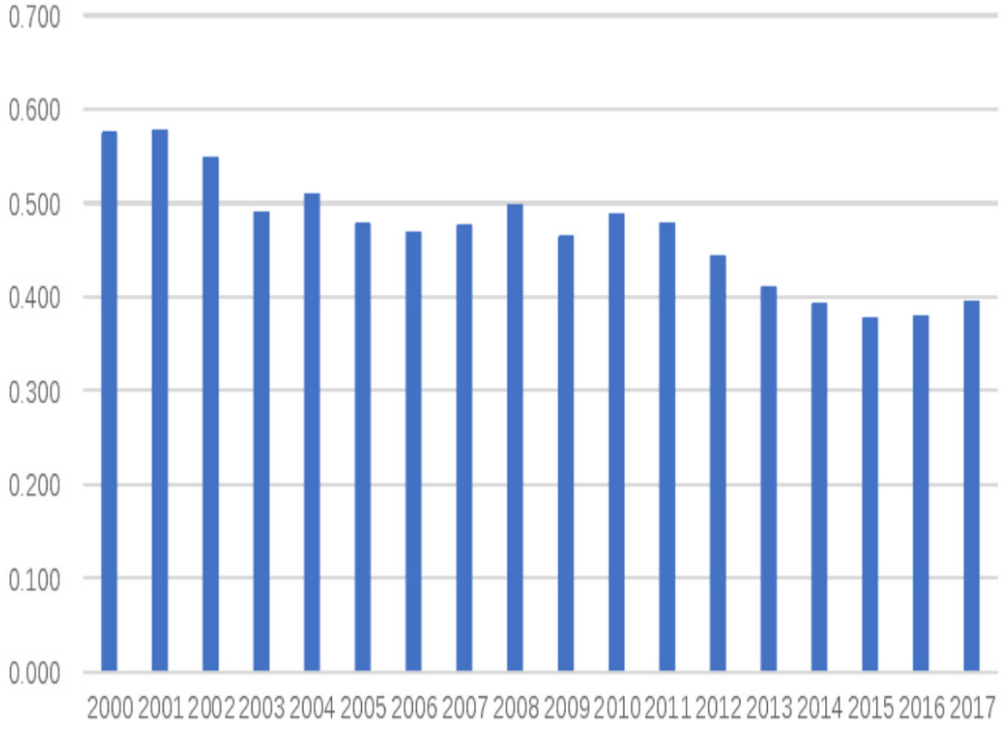
insufficient, and some high-end service products are mainly imported from abroad, which has led to a deficit in service imports and exports. The deficit of China's service trade in 2017 mainly came from two sectors: transportation services and travel services. Although there are surpluses in processing services, construction, telecommunications, computer and information services, and other business sectors, a small surplus cannot make up for huge deficits in other sectors. The increase in resident income and the increase in demand for service products have caused domestic demand to be unable to be met by domestic supply. This is one of the reasons why China's service trade is in a state of deficit. To a certain extent, the level of a country's trade can be reflected by the amount of trade exports. The state of the deficit can reflect that China's service trade level is relatively backward.

2. China's Service Trade Development Structure Is Unbalanced

By analyzing the data collected and collated above, it can be seen that the development of China's service trade in the import and export structure is very uneven. Labor-intensive and resource-intensive service trade sectors are still the main sectors involved in trade activities between China and other countries, while the participation of knowledge- and technology-intensive service trade sectors is relatively small.

From the perspective of the export structure of the service trade, the three sectors of transportation, tourism, and other commercial services are the main sources of Chinas service trade exports. These exports accounted for 18.02%, 15.79%, and 28.44%,

Fig. 3. 2000-2017: China's Service Trade RCA Index



Source: Compiled from the "China Statistical Yearbook" and relevant World Bank databases.

respectively, in 2017. The total proportion reached 62.25%, while the total proportion of the knowledge capital-intensive service trade sector was extremely low at only 5.97%. From these data, it can be seen that the capital and knowledge-intensive service trade sector as modern service trade exports lag far behind the traditional service trade.

In terms of import structure, two sectors, transportation and tourism, still dominate. In 2017, the total proportion of imports of services and travel was as high as 74.36%, of which the proportion of imports of tourism services had reached 54.59%, exceeding the total proportion of imports of all other service sectors. It can be seen that compared with exports, China's traditional service trade sector accounts for a larger proportion of imports, and the structure is even more irrational.

From the status quo of China's service trade import and export structure, it can be seen that the development structure of various sectors of China's service trade is unreasonable. The traditional service trade is the main sector of China's service trade, while the knowledge- and capital-intensive service trade sectors are involved in China's service trade. However, the proportion of exports is very small, at a relatively backward development level. The development of traditional and new sectors has seen a large scale imbalance. It is necessary to improve China's service trade in terms of development structure.

3. The Overall Competitiveness of China's Service Trade Is Relatively Weak

Through the calculation of the three competitiveness measurement indicators of market share, the trade competitive advantage index, and explicit comparative advantage index, it can be seen that the overall competitiveness of China's service trade is rising, but it is still low and not competitive.

Judging from the data from 2000 to 2017, the international market share of China's service trade is constantly rising. From 2000 to 2010, the data showed a more significant rate of increase. Although there was a slight decline afterwards, it was generally stable. From the trade competitive advantage data, except for the positive value of the TC index of China's trade in services from 2005 to 2008, the TC index of other years from 2000 to 2017 was all negative, especially since 2009. From the perspective of the explicit comparative advantage index, the RCA index of China's trade in services has been less than 1, and the overall trend is decreasing. Such data reflect that China's service trade does not have a competitive advantage in the international arena, and is at a disadvantage in international competition. This problem is more prominent in the capital-, knowledge-, and technology-intensive service sectors.

V. The Influencing Factors and Empirical Research on the International Competitiveness of China's Service Trade

1. Factors Influencing China's International Competitiveness in the Service Trade

This article is mainly based on Porter's "Diamond Model", selecting production factors, demand factors, support from related industries, and government factors as auxiliary factors to study China's service trade.

1.1. Factors of Production

Factors of production include labor factors and capital factors. First, in terms of labor factors, the strength of the labor force has an important impact on the efficiency of service production and the quality of service products, especially in the labor-intensive service trade sector. A large amount of labor support is an important foundation for the continuous development of the service trade. Therefore, labor is a production factor that cannot be ignored in the production and development of the service trade. At the same time, with the continuous improvement of living standards, demand for modern service trade products with high added value, and knowledge and technology as the main production factors, is increasing, and this type of knowledge and technology-intensive service industry needs more high-quality professional talents providing support. Therefore, the labor factor has an equally

important impact on the labor-intensive traditional service trade sector and the knowledge and technology-intensive modern service trade sector, and is an important production factor that affects its development level and competitiveness.

The second factor is the capital element. In foreign direct investment, the production factors of the host country will flow due to the entry of foreign capital, and the flow of production factors will have an impact on the international competitiveness of the host country's service trade. Among the many investment forms, multinational corporations, as one of the most important forms, play an active role in promoting the development of high-tech industries in a host country. Under such influence, capital and technology-intensive products have begun to be widely produced, which has improved the competitiveness of the service industry to a certain extent. As a capital element, foreign direct investment affects the level of competitiveness of the service trade. Therefore, this article will select the two elements of employment in the tertiary industry and foreign direct investment to represent the "factors of production" in the "Diamond Model" that affect competitiveness.

1.2. Demand Element

GDP per capita can reflect the income level of domestic residents in a country. Compared with GDP, there is a closer relationship between per capita GDP, the disposable income of residents, and consumer demand, and the former has a more reasonable explanation for the latter. Therefore, per capita GDP can better reflect market demand. Disposable income will increase with the growth of per capita GDP, thereby stimulating consumer demand and consumption levels. At the same time, the improvement of these two will stimulate competition between domestic related industries, and this kind of competition is benign; it will improve the overall level of the industry, thereby further increasing the level of international competitiveness. Therefore, GDP per capita is also one of the important factors affecting the international competitiveness of the service trade. This article will select GDP per capita as the "demand factor" to study the competitiveness of China's service trade.

1.3. Support from Related Industries

According to Porter's "Diamond Model", the support of related industries is also an important factor affecting the international competitiveness of the service trade. As the two major categories of international trade, there is a close relationship between the service trade and goods trade. They are not independent, but interconnected. Goods trade activities will drive the occurrence of related service trade activities. For example, the import and export of goods requires the support of labor, transportation, insurance, and other services; technical guidance and other related service trades will also occur with the export of related equipment or machinery; international trade in goods will also drive patents and licenses. Therefore, when studying the level of competitiveness of trade in services, the impact of trade in goods cannot be ignored and needs to be taken into account. Therefore, this article regards the export value of trade in goods as an element of the "support of related industries" in the "Diamond Model".

1.4. Government Element

The government, one of the two major auxiliary elements in the "Diamond Model", also has an important impact on the international competitiveness of the service trade. The reason why government is used as an auxiliary element to analyze competitiveness is because Porter believes that in industrial competition, as the main participant in the competition, enterprises need sufficient production resources, and the government is the provider of production resources that support the four basic elements in the model. The government can create favorable conditions for improving the competitiveness of the service trade through different channels. For example, increasing financial investment and introducing strong preferential policies will more specifically encourage and support the development of China's service industry and service trade. In this way, enterprises can be more active in scientific research and innovation, so that the overall production level of China's service sector can be continuously improved. It can be seen that the power of the government can play a role in improving the international competitiveness of the service trade. Then, the government can support the

improvement of the status quo of the service trade by increasing science and technology expenditures. Therefore, this article will select science and technology expenditure as the government factor in the international competitiveness of service trade.

2. An Empirical Analysis of the Factors Influencing the International Competitiveness of China's Service Trade

2.1. Selection and Description of Variables

This article takes the number of employees in the tertiary industry (HR), per capita GDP (PGDP), export volume of goods trade (EX), foreign direct investment (FDI), and science and technology expenditure (RD) as independent variables. At the same time, the trade competitiveness index (TC) is selected as the dependent variable, Y, to indicate the competitiveness of trade.

2.2. Model Establishment

In order to study the international competitiveness of China's service trade, the model established in this paper is:

$$Y=aX1+bX2+cX3+dX4+eX5+U$$

Where Y represents the international competitiveness of China's service trade, X1 represents the number of people employed in China's tertiary industry, X2 represents China's per capita GDP, X3 represents China's exports of goods, X4 represents the investment of foreign direct investors, and X5 represents China's science and technology expenditure.

2.3. OLS Parameter Estimation

OLS regression analysis was performed based on the collated data, and the regression results are as follows:

$$Y=0.19-1.68X1-0.0002X2+1.79X3+0.0005X4+8.40X5$$

t=(1.26) (-2.17) (-6.12) (3.70) (4.63) (2.33)

R2=0.9845 R2=0.9780 F=152.390

From the above regression results, the coefficient of determination R2 = 0.9845, which is 0.9780 after adjustment, and the F value after regression is 152.390, which is more significant, and shows that the overall significance of the equation is better.

2.3.1. Heteroscedasticity Test: White Test

In order to prevent the heteroscedasticity of the model from causing the failure of the T-test and the F-test and making the least square method meaningless, firstly, the White test method was used to test the model for heteroscedasticity. Eviews software was used to perform White's test on the model to confirm whether the model had heteroscedasticity; if there is, it needs to be corrected. After testing, the following results were obtained: Model nR2 = 4.991589. White's test shows that when the significance level is 5%, the degree of freedom is 5, then X2(5) =1 1.07 because 4.9915 89 < 11.07.Therefore, we accept the original hypothesis, reject the alternative hypothesis, and consider that the model has passed the test; that is, there is no heteroscedasticity.

2.3.2. Sequence Correlation Test

2.3.2.1. DW Test

According to the regression results of OLS, the DW value of the model is 1.697, and the number of explanatory variables is 5. The following results can be obtained by querying related data. According to the regression data, dL=0.71 and du=2.06. We compare these two values and the DW value found between dL and dU. In this case, it is impossible to directly determine whether the model has serial autocorrelation. Therefore, the model needs to be further tested by the Lagrangian multiplier (LM).

2.3.2.2. Lagrange Multiplier Test (LM Test)

The LM test is performed on the basis of the OLS regression results, and the LM test is performed on the lag periods of 1-6, respectively. The comparison results of nR^2 and the critical value obtained are as follows:

It can be drawn from the table that by performing LM tests on different lag periods, it was found that $nR^2 > X2(p)$ when the lag periods are 4, 5, and 6, which indicates that the model has serial autocorrelation and the hypothesis test for OLS estimation is unreliable, so the variables need to be corrected and OLS regression is performed again.

Table 1. Comparison Results of nR^2 and the Critical Value Obtained

p	1	3	4	5	6
nR^2	0.07	5.09	12.34	12.40	15.05
$X_2(p)$	3.84	7.81	9.49	11.07	12.59

After correction, OLS regression was performed to get the equation:

DY=β0+β1DX1+β2DX2+β3DX3+β4DX4 +β5DX5

$\overline{\beta}0=\beta0/1-p(p=1-DW/2)$ $\overline{\beta}1=\beta1$
$\overline{\beta}2=\beta2$ $\overline{\beta}3=\beta3$ $\overline{\beta}4=\beta4$ $\overline{\beta}5=\beta5$

Regression Equation:

DY=0.097-1.42DX1-0.0002DX2+1.80DX3 +0.0005DX4 +8.38DX5

T= (0.69)(-1.64) (-5.69)(3.47) (4.27)(2.26)
R2=0.981 $\overline{R}2=0.972$ F=111.08

In the regression equation, DY repesents the international competitiveness of China's service trade, DX1 represents the number of people employed in China's tertiary industry, DX2 represents China's per capita GDP, DX3 represents China's trade exports of goods, DX4 represents China's foreign direct investment, and DX5 represents China's science and technology expenditures.

2.4. Regression Analysis

According to the regression results, the coefficients of DX1 and DX2 are negative, indicating that there is a negative correlation between China's tertiary industry employment and per capita GDP and the international competitiveness of China's service trade. Professional high-quality talents play an important and positive role in the development of the service trade and the international competitiveness of the service trade. With the increase in high-quality talents, the development level of the service trade and the level of international competitiveness will continue to improve. The increase in per capita GDP means an increase in the disposable income of residents, and the increase in the disposable income of residents means that people will have more demand for service products. The increase in consumer demand for service products will drive competition within the service industry. In order to increase market share, companies will continue to improve their technical level and product quality in competition, thereby improving the overall level of China's service trade, and then improve its international competitiveness. Therefore, there should be a positive correlation between per capita GDP and the international competitiveness of the service trade. The increase in GDP will promote the improvement of the level of international competition in the service trade.

However, from the results of empirical analysis, China's employment in the tertiary industry and per capita GDP have not had a positive impact on China's level of service trade's international competitiveness, and may have even had an opposite impact. The reasons can be attributed to the following two aspects. On the one hand, although population density is high and labor resources are abundant, the quality of the labor force is relatively low, and there is a lack of specialized high-quality talents, which leads to a lack of a knowledge-intensive service industry as a main source of competitiveness from insufficient professional and high-quality talent support. Therefore, a large amount of labor cannot promote the improvement of the international competitiveness of China's service trade. On the other hand, the continuous increase in China's per capita GDP can reflect the increase in the disposable income of Chinese residents, which will make requirements for the quality of service products continue to increase, and the demand for the service trade continues to increase, especially for knowledge and technology-intensive industries. The demand for service trade products will greatly increase. However, the performance of China's service trade development structure is not satisfactory. The traditional service trade sector, with a large demand for labor, is still the main sector of China's service trade. In addition, although China's traditional service trade has certain comparative advantages, the existing comparative advantages cannot satisfy growing demand. How-

ever, the development of the modern service trade sector, which is knowledge- and technology-intensive, is relatively backward. Therefore, Chinese demand for a high-end service trade will rely heavily on foreign countries. As a result, China's service trade imports will increase substantially, the trade balance will continue to expand, and the TC index will become smaller and smaller. Therefore, China should focus on the cultivation and accumulation of high-quality talents, continuously improve the development structure of China's service trade, expand the comparative advantages of traditional service trade, and at the same time develop the modern service trade with high added value and improve the development structure of the service trade so as to give full play to high-quality talents that can play a positive role in promoting the competitiveness of the service trade and continuously improve the international competitiveness of China's service trade.

The coefficients of DX3, DX4, and DX5 in the regression equation are all positive, indicating that there is a positive correlation between China's export volume of goods trade, foreign direct investment, science and technology expenditures, and the international competitiveness of China's service trade. These factors are all positive. It can be seen from the data that the level of China's service trade competitiveness is less affected by foreign direct investment. This is because most of China's foreign direct investment funds flow to foreign companies, and China's service trade companies have a low utilization rate of foreign capital. Foreign-funded enterprises mainly meet the needs of China's domestic market for the service trade. In this way, the development of foreign companies will not only promote the export of China's service trade, but will impact the domestic high-end service companies in the domestic service market. In this way, the positive effect that foreign direct investment can have on China's service trade development will be impacted by this negative effect. Second, the healthy development of capital and technology-intensive service trade industries is key to promoting economic and social development. However, in China, foreign direct investment funds mainly flow to traditional service trade industries, and capital and technology are the main sources of competitiveness. The intensive service trade has a low capital utilization rate for foreign direct investment. The emergence of this situation hinders the positive effect that foreign direct investment can have on the improvement of China's service trade international competitiveness.

VI. Suggestions

1. Optimize the Industrial Structure and Improve the Competitive Advantage

With the improvement of living standards, more and more new service trade sectors have begun to develop. In developed countries, knowledge- and technology-intensive service trade occupies an important position in the country's service trade production activities. In the United States, the traditional service trade exports account for 38% of its international service trade, while the modern service trade accounts for 62%. Such an export structure is more reasonable and advantageous. Regarding the service trade export sector, the proportion of the knowledge- and technology-intensive service trade sector in the United States is showing an upward trend, while the proportion of the labor-intensive service trade sector continues to decline. If China wants to improve the international competitiveness of the service trade, it must have a more reasonable service trade structure like the United States. Therefore, optimizing the industrial structure, developing capital, and knowledge-intensive service trade are essential and important links.

From the previous analysis, it can be seen that China's modern service trade sector does not have a competitive advantage in international competition. Therefore, it is urgent to develop a modern service trade. First, the government should increase support for the modern service trade, such as reforming the tax system and fiscal expenditures to attract more companies to participate in the service trade, thereby expanding the market scope of the service trade industry. Second, the government should pay attention to the construction of infrastructure, build service trade enterprise parks, and reduce the production cost of the service trade through the cluster effect of enterprises, thereby increasing the competitive advantage of the service trade.

2. Increase Personnel Training and improve the Quality of Labor

For enterprises, it is necessary to pay attention to pre-job training, regular knowledge, and skill training for employees. The training of employee knowledge and skills can make employees more familiar with their own work, and solve problems encountered in a more efficient way. In addition to cultivating high-quality talents, companies should pay attention to constantly mobilize and improve the enthusiasm of employees. A positive working attitude and high work enthusiasm require a relatively complete incentive mechanism to achieve and ensure that it allows workers to continue to find ways to optimize the work process while completing work, and to continuously improve quality, thereby providing accumulated high-quality professional talents.

Secondly, for the government, education is important to improve the quality of China's human capital and cultivate high-quality talents. The government should increase its investment in education. Increasing investment in education can create a good educational environment for China and improve the overall level of education. However, investment in education cannot rely solely on the government. Therefore, the government should encourage all sectors of society to invest in education and mobilize the enthusiasm of the society to invest in education by formulating corresponding policies and regulations, so as to improve the sustainable development of education investment. At the same time, attention must also be paid to the distribution structure of educational resources. Only by rationally distributing education investment and resources can educational investment really play a positive role and improve the overall level of education in China.

3. Strengthen Scientific and Technological Research and Development to Improve the Independent Innovation Ability of Enterprises

The government should encourage enterprises to conduct independent research and development through policies, such as providing technical guidance, increasing fiscal expenditures, tax reductions and exemptions, and rewards. Next, while increasing investment in scientific research, the government should also actively learn from developed countries and introduce advanced science and technology. However, the following two points must be given attention. First, it must not be introduced blindly, but selectively. The introduced technology must be tangibly applied to the production and sales activities of China's service products so as to continuously improve and optimize the quality and performance of China's services. The second is to carry out secondary innovations. Although the technology imported from abroad is relatively mature and high-end, it does not necessarily meet the development needs of China's service trade. Therefore, China should carry out more localized secondary innovations on imported foreign technologies so that it can meet the world market's demand for Chinese service products, and thus better promote the development of China's service trade.

4. Strengthen Regional Cooperation in the International Service Trade

As one of the most active member states in the international political and economic arena since World War II, the United States has adhered to a global multilateral trade policy and has continuously strengthened regional trade cooperation with other countries in order to consolidate its position. This is also the development of its foreign service trade, which reduced trade barriers and created favorable international conditions. In recent years, China has also continuously strengthened regional economic cooperation. However, in this process, China still faces many difficulties and challenges. Therefore, in future development processes, China should formulate regional cooperation plans and strategies that conform to China's national conditions and development direction. Under the new opportunities brought by the "One Belt, One Road" strategy, it is necessary to encourage the establishment of free trade zones, actively carry out more exchanges and cooperation with countries around the world, continuously reduce trade barriers, and create a good environment for the continuous improvement of China's service trade international competitiveness.

5. Improve the Business Environment and Strengthen Intellectual Property Protection

The business environment has an important impact on the level of economic development of a country. A good business environment can promote a country or region to better carry out investment promotion activities, while strengthening international exchanges and cooperation, and participating in international competition. The development of these activities has played a positive role in improving the international competitiveness of the service trade. Therefore, improving the business environment and forming a business environment conducive to the development of the service industry are both very important for the development of China's service trade.

Strengthening the protection of intellectual property rights is an important aspect in building a good business environment. The protection of intellectual property rights is actually the protection of the labor and innovation achievements of an enterprise at the legal level. This is conducive to encouraging enterprises to carry out technological innovation, and innovation can enable an enterprise to continuously optimize its own production efficiency and increase the added value of its products, as well as promote exports and enhance international competitiveness. At the same time, attention must also be paid to expanding the scope of intellectual property protection. With the rapid development of the economy and technology, many new sectors and innovative products have emerged in the service industry, and for these new sectors and service products, the lag of laws will hinder healthy development. Therefore, it is necessary to continuously expand the scope of the protection of intellectual property rights so that it can adapt to the ever-developing service trade and create a favorable business environment for the development of the service trade.

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Sustainability Potentials of Informal Gold Recovery from Discarded Mobile Phones: E-waste Management Insights for Global Business and Trade

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ABSTRACT

Purpose – Electronic waste, or e-waste, continues to flourish as a result of exponential growth in technology. The large volume of e-waste generated can be a potential source of resource and energy, hence, providing a complementary means to the primary extraction of minerals such as copper and gold in addition to promoting a circular economic model. In the Philippines, informal gold recovery is one of the sinks for such e-waste.

Design/Methodology/Approach – This study evaluated the potentials of informal gold recovery from end-of-life cellular phones from the perspective of environmental soundness and socio-economic viability. It aimed to serve as a baseline measurement of the economic benefits of e-waste material recovery to strengthen the need to establish an effective e-waste management framework and tap its potentials as an emerging sector in the economy. Process-based Life Cycle Assessment (LCA) was conducted using 100g Au with data collected much earlier. The resulting impacts to human health and the environment were determined following the procedure indicated in ReCiPe (2008). Benefit-cost (BC) ratio was also computed as the measure of economic benefit while, for the social impacts, a criticality score was computed.

Findings – Results of the environmental impact assessment showed that informal gold recovery poses a large threat to human health due to the emitted gases. This result is verified by the high risk computed in the social impact assessment contributed primarily by the risk of poisoning, risk of acquiring eye injury and respiratory and nervous system diseases from inhalation of fumes. Nevertheless, the risks were lessened with improvements in the system. A benefit-cost ratio of 1.21 was computed, entailing an economic benefit from this practice, with labor cost contributing the highest.

Research Implications – Informal gold recovery is potentially sustainable, but to reap the greatest benefits and reduce the risks, some actions or interventions at the operational and national level are needed, such as usage of less hazardous substances, reduction of labor and protection of workers, utilization of methods engineering to improve efficiency and cost-effectiveness, formulation and assessment of national e-wastes inventory, and implementation of an e-waste management system policy to harness global business and trade opportunities.

Keywords: end-of-life cellular phones, e-waste management, informal gold recovery, sustainability
JEL Classifications: I15, M11, O14, Q53

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I. Introduction

E-waste is the fastest growing waste stream in the world today contributed primarily by the flourishing electronics industry (Balde et al., 2017; Bigum, Brogaard, & Christensen, 2012; Wu, Chan, Middendorf, Gu, & Zhong, 2008). Several other factors contribute to the proliferation of e-waste, the principal factor of which is the fast-paced technological development leading to the rapid evolution of equipment and devices with shrinking lifespans (Valero Navazo, Villalba Mendez, & Talens Peiro, 2014; Wang & Gaustad, 2012). This drastic decrease in the product lifespan is driven by planned obsolescence and disposability, which limits the durability and longevity of electronic products thus promoting repetitive consumption, boosting industry profit and remaining in the market (Christian, 2012; Jaiswal, Samuel, Patel, & Kumar, 2015; Wang & Gaustad, 2012). More so, the downward trend in the prices of electronics has also contributed to their rapid replacement and disposal (Tanskanen, 2013) and as a consequence, products are being replaced long before they have lost their functionality and value since they are no longer trendy or up-to-date (Christian, 2012). According to the report published by the United Nations University (UNU), International Telecommunication Union (ITU) and the International Solid Waste Association (ISWA), in the year 2016 alone, the global generation of e-waste has reached 44.7 million tons (MT) which is equivalent to almost 4,500 Eiffel towers (Balde et al., 2017). Of this volume generated, only 20% are recycled properly. Asia contributed 40.7% to this volume with a collection rate of only 15%. By 2021, this volume is expected to increase to 52.2 MT (Balde et al., 2017).

This rapid increase in the volume of e-waste and its improper management pose several challenges to the attainment of the sustainable development goals. For one, the toxic and hazardous substances contained can be detrimental to the environment and public health (Balde et al., 2017). In addition, the precious minerals and metals contained in e-waste could become the new plastics, creating new environmental challenges (Ryder & Zhao, 2019). The traditional take-make-dispose economic model wastes a huge amount of raw materials that could have been otherwise harvested and re-used for the same or other purposes (Balde et al., 2017; Yamane, de Moraes, Espinosa, & Tenorio, 2011). The raw materials contained from the 44.7 MT of generated e-waste in 2016 are valued at 55 billion euros. Nevertheless, e-waste should not be considered as pollution nor waste (Ryder & Zhao, 2019). It presents several opportunities that, when harnessed correctly, will bring many benefits to the economy, the people and the environment.

A circular economic model offers a more efficient and favorable approach to the management of e-waste; that is, e-waste is regarded as a resource rather than waste. The recovery of the valuable minerals and metals contained in e-waste "reduces the need for new raw materials, waste disposal and energy, while creating economic growth, new green jobs and business opportunities" (Balde et al., 2017, p. 55). Moreover, it also proves to be more advantageous than the corresponding primary production or resource extraction since the purity of the metals recovered are 10 times higher than that of content-rich minerals (Huang, Guo, & Xu, 2009) and creates substantially lesser CO_2 emissions (Menikpura, Santo, & Hotta, 2014).

Several studies dealing with the recovery of the precious metals have been conducted in the past years. These studies revealed that a suitable e-waste recycling program has the potential to attain significant environmental and resource consumption savings (Bigum, Brogaard, & Christensen, 2012; Menikpura, Santo, & Hotta, 2014). More so, a study conducted in Brazil proved that reverse logistics for the recycling and reuse of e-waste result in economic gains by the recyclers and reduce environmental impacts (de Oliveira Neto, de Jesus Cardoso Correia and Shroeder, 2017); however, reverse logistics of electronic home appliances is economically infeasible if e-waste will be bought from households at high expected prices (Liu, Tanaka, & Matsui, 2009). Nevertheless, these studies showed that the development of an effective and efficient e-waste management system is crucial in the attainment of economic and environmental gains, especially if there is a substantial volume of e-waste collected. These advantages are already reaped by developed countries that have adequate infrastructure and effective collection systems in place, like the United States, Europe, Japan, Singapore and Australia, among others (Menikpura, Santo, & Hotta, 2014; Wang & Gaustad, 2012). They have sophisticated material recovery

facilities that allow them to recover a number of precious minerals and metals. However, for developing countries like China, the Philippines and Pakistan, the informal sector dominates the field (Gutierrez & Agarrado, 2011; Umair, Bjorklund, & Petersen, 2015; Wei & Liu, 2012). This informal sector utilizes crude methods such as breaking and crushing, burning, and acid washing to recover specific materials while the waste generated and the non-valuable items are thrown with other household wastes which end up in landfills or garbage areas, thus exposing the workers to toxic fumes and the community to the hazardous wastes (Honda, Khetriwal, & Kuehr, 2016).

In 2016, the Philippines generated 290 kilotons of e-waste, approximately 2.8 kg/inhabitant (Balde et al., 2017). The country's population is projected to increase from 100.8M in 2015 to 115.4M in 2025 (PSA, 2019). With the growing population, the domestic generation of e-waste is also expected to increase. The amount of e-waste crossing the borders of the country as second-hand electronics from developed countries like Japan and Korea, among others, also contribute to the increase in the e-waste generated. Most of the e-waste domestically generated are either stored, landfilled, or sold to junkshops (Gutierrez & Agarrado, 2011) or are illegally dumped or thrown with municipal waste (Yoshida et al., 2016). Though formal recyclers exist, they merely transport "metal scraps and crushed electronic components for exports and further material recovery in other countries" (Honda, Khetriwal, & Kuehr, 2016, p. 164), thus, stripping the country of the opportunity to derive economic benefits like employment for its people and recovery and sale of gold and other precious metals for higher value trade.

The informal recycling sector in the country is one of the sinks for electronic waste. In an interview by the researchers with Mr. Johnny Ambatali, an informal recycler, it was revealed that there are currently several backyard recyclers who collect e-waste like cellular phones, computer units and household appliances and extract valuable metals like copper, gold and zinc. Those who have enough capital even join public biddings conducted by different public and private organizations alike. It was also stated in the interview that not all of their hauls provide good returns as such still depend on the quantity and quality of the e-waste collected. Nevertheless, they still see material recovery as a source of income, even at the expense of their health and the environment.

This study focused on the gold recovery process from end-of-life cellular phones, primarily because gold is a high value metal that, though occurring in very small amounts, the high price associated with it makes it the most highly-coveted metal (Valero et al., 2014; Vats & Singh, 2015). Moreover, cellular phones are the fastest growing group of e-waste (Bhuie, Ogunseitan, Saphores, & Shapiro, 2004) due to its "large quantity, high reuse/recovery value and fast replacement frequency" (Li, Yang, Song, & Lu, 2012, p. 470). In the year 2021, there is an estimated 24.9 million units of discarded mobile phones in the country annually. The study also revealed through a survey that 95% of the respondents have no knowledge of their mobile phones' proper disposal; thus, contributing to the already large problem of e-waste management (Galang & Ballesteros, 2018). Thus, this large volume of discarded mobile phones presents an opportunity for the country to extract valuable materials for trade.

The study sought to evaluate the desirability of informal gold recovery from the standpoint of environmental soundness and socio-economic viability. A functional unit of 100g of Au will be used as, on average, a cell phone contains 0.034 g or 0.1% of Au (Huang, Guo, & Xu, 2009; Sullivan, 2006). The results of the study hope to serve as a baseline measurement of the economic benefits of e-waste material recovery to strengthen the need to establish an effective e-waste management framework and program in the country which could possibly involve both the formal and informal sectors.

Researchers and policy makers can use the results of the study to explore new methods that will help reduce the environmental and health impacts while providing job opportunities to the people working in the informal sector. Moreover, understanding how this practice can contribute to economic growth may eventually lead to a new production system and business model in the country. The framework used in this study can also be used in the assessment of the recovery of other metals from e-waste.

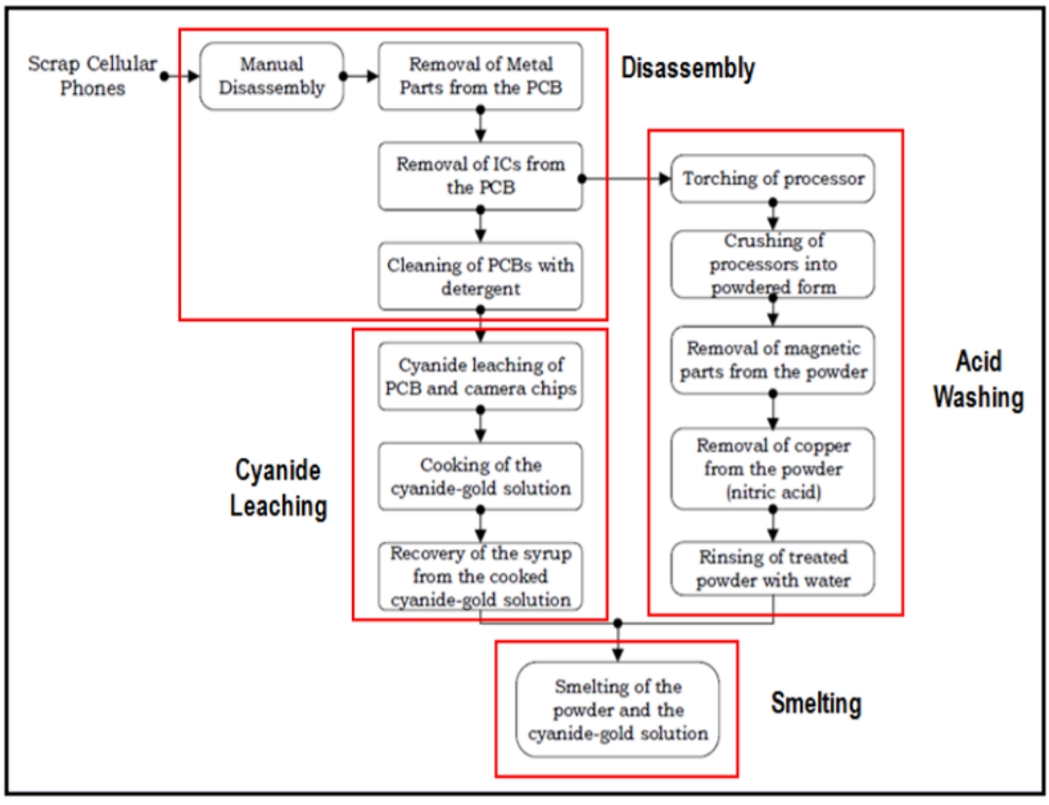
II. Materials and Methods

1. The Process of Gold Recovery

Scrappers from the provinces of Cavite and Bulacan in the main island of Luzon in the northern Philippines were interviewed and the processes involved in the actual gold recovery were observed. Three batches of cellular phones of different models were processed and the amount of inputs consumed and outputs generated from each step were measured using a digital weighing scale. The weight of gold recovered relative to the total weight of the cell phones processed was also measured. From this value, the average number of cell phones needed to extract 100g of Au was determined. The amount of inputs and outputs were calculated based on this projected volume and was used as the basis for the analysis of the environmental and socio-economic impacts.

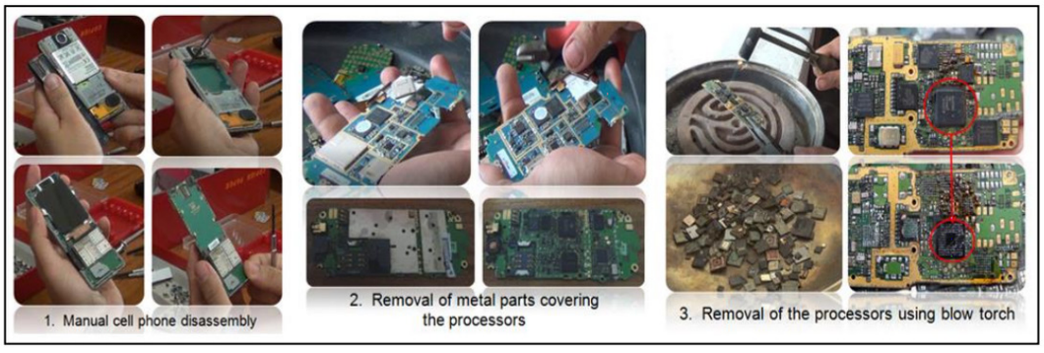
The steps used to recover gold, documented as observed, primarily involve manual disassembly, chemical treatment (cyanide leaching and acid washing) and smelting, as depicted in Fig. 1.

Fig. 1. Processes Involved in Informal Gold Recovery



Collected cell phones were manually disasse-mbled using pliers and screw drivers. Components like batter-ies, screws, liquid crystal display (LCD), printed circuit boards (PCBs) and other metal and plastic parts were segregated. Those parts with gold plating were also separated for gold recovery. Processors mounted on the PCBs are usually covered with metal and/or white copper. These were removed to expose the processors which were then removed using a blowtorch. The PCBs, now freed of the processors, were washed with detergent soap.

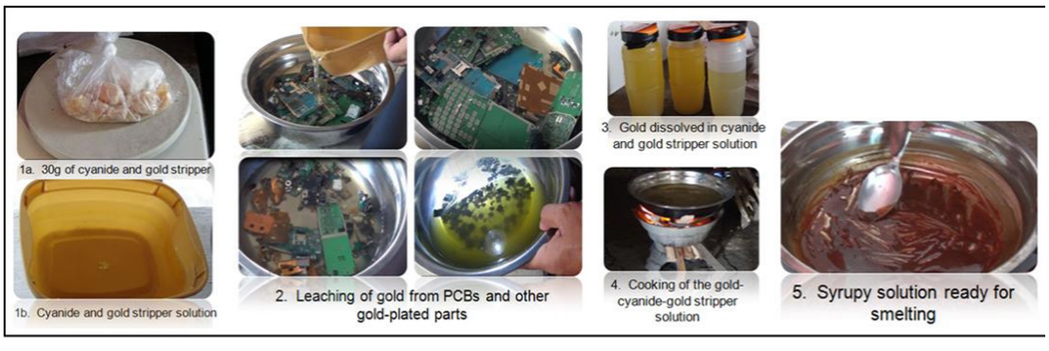
Fig. 2. Separation of Parts of the Phone



Upon drying of the PCBs, the cyanide-gold stripper solution was prepared. Fifteen grams of cyanide and fifteen grams of gold stripper were combined with one liter of water. The PCBs were soaked into the solution; the gold stripper served to detach the gold from the substrate, while the cyanide, of which gold has a strong affinity with, dissolved it. Other parts which contain gold plating were also soaked into the solution. From time to time, the solution was heated up to hasten the leaching process. The leached components were rinsed with water which is added into the solution to completely remove the cyanide and gold content.

The cyanide-gold stripper-gold solution was cooked until it became brown and thick. This syrup was collected from the cooking basin using tissue. It was set aside for smelting later. Fig. 3 shows a visual display of the actual processes performed.

Fig. 3. Leaching of Cell Phone Components Containing Gold



After leaching, processors were torched or cooked. These were then pulverized to very fine granules. Plastics, glass and metals alike were reduced to a sand-like texture and were filtered to further remove the large particles. It was magnetized to remove metal particles. Copper and bronze, which cannot be magnetized, are considered as impurities in the gold extraction. These two metals were eliminated as much as possible in order to recover the highest quality of gold. With the use of nitric acid, these copper and bronze substances were digested and evaporated. Bubbling indicates that the copper and bronze are still digested by the acid. The use of nitric acid easily exposed the gold particles which otherwise could not be seen by the naked eye. The acid was then washed off using water, at the same time removing excess granules by decanting. This resembles the

Fig. 4. Actual Acid Washing Process

panning process practiced in mining in which gold settles at the bottom. This was combined with the syrupy solution obtained through the cooking of the cyanide solution for smelting and recovery of gold. Fig. 4 presents the actual processes involved in this stage.

The syrup and the sand were melted in a smelting plant in the Bulacan province. They were subjected to continuous and consistent amount of heat which can only be provided by the smelting plant as oxygen required comes from a compressor. They were then combined with borax, which captures and separates the impurities from the gold. When all the impurities had been removed, an 18k piece of gold was obtained.

Fig. 5. Actual Smelting Process

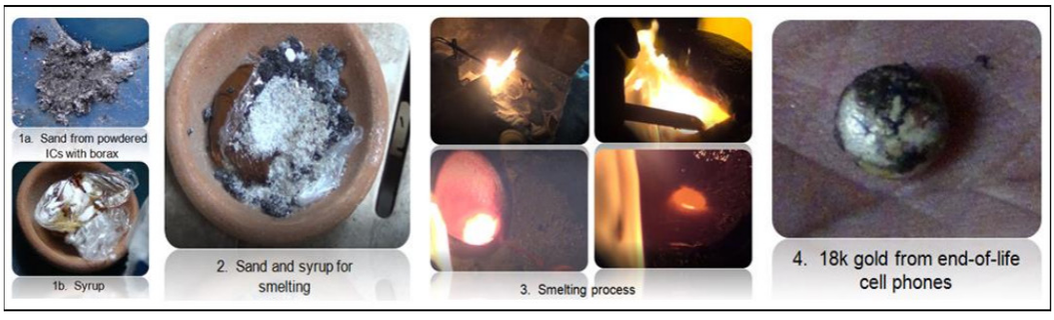


Fig. 5 presents the actual smelting of the syrupy solution and the sand obtained from acid washing.

With this process, there is an average of 0.016% gold recovery by weight, which is low compared to the actual gold content of the cell phone

2. Inputs and Outputs

Table 1 summarizes the inputs and outputs for each of the stages in the gold recovery process. Only the inputs which significantly contributed to the emissions and energy consumption were included. Emissions to air were generated from the use of fuel, such as diesel for processes involving the use of a blow torch and kerosene for smelting. The burning of fuels releases carbon dioxide into the air. In addition, the use of nitric acid to remove the copper from the powdered integrated circuits discharges nitrogen dioxide into air. Moreover, it is a labor-intensive process with minimal usage of equipment and a significant variety of chemicals.

Table 1. Informal Gold Recovery Life Cycle Inventory Parameters

Input	Stage	Output (Emissions)
Labor, blowtorch, diesel, dishwashing liquid, water	Disassembly	CO_2 (a)
Labor, cyanide and gold stripper, water, wood	Cyanide Leaching	CO_2(a)
Labor, nitric acid, water	Acid Washing	Wastewater, NO_2 (b)
Labor, compressor, kerosene, borax, lead	Smelting	CO_2(a)

Note: Inputs were listed as observed during the process while (a) emissions from fuel combustion were based from Pisupati (2018). (b) Emissions from acid washing were derived from the University of Oregon (2012).

3. Environmental Impact

Analysis of the environmental impact that was conducted is consistent with the Life Cycle Assessment (LCA) framework (Matthews, Hendrickson and Matthews, 2014), with major emphasis on energy use and CO_2 emission. This framework is embodied in the 14000 series of the environmental management standards of the International Organization for Standardization (ISO), and is the widely recognized procedure for conducting LCA (ISO, 2006). One hundred grams (100g) of gold extracted was used as the functional unit as 0.034g of Au can be found in cell phones. The study adopted the equations used in small scale mining (Cenia, Tamayao, Soriano, Gotera, & Custodio, 2018) to estimate energy and CO_2 emissions.

Equation 1 was used to calculate the energy use of the process and included energy from fuel, equipment and labor. Equation 2 presents the energy from fuel use, E^{FUEL}, in joules, where f_i is the amount of fuel type $i \in$ {diesel (L), kerosene (L)}. The electric energy, $E^{EQUIPMENT}$, used by the equipment was determined using Equation 3, where P is the power rating of equipment (in either kW or hp), α_1 is the unit conversion factor to joules, t^{OPER} is the operation time (in hours) of the equipment, and ε is the assumed efficiency of the equipment. The energy expenditure of the worker is estimated using Equation 4, where c is the metabolic equivalent of the activity, t^{LABOR}, is the total labor time (in hours), ω = 52.57 kg is the average weight of Filipino man, and α_2 = 4184 J/kcal is the conversion factor from kilocalories to joules. The energy expenditure is assumed to be like that of general carpentry which is assumed to be of medium intensity.

$$E = E^{FUEL} + E^{EQUIPMENT} + E^{LABOR} \quad (1)$$

$$E^{FUEL} = \sum(f_i \mu_i) \quad (2)$$

$$E^{EQUIPMENT} = \alpha_1 \frac{P}{\varepsilon} t^{OPER} \quad (3)$$

$$E^{LABOR} = n\omega\alpha_2 c t^{LABOR} \quad (4)$$

To assess the other impacts that informal gold recovery will have on the environment, additional emissions to air and water were also considered, but are limited only to those which can be directly measured. For example, to measure the emissions to water, wastewater samples were tested for commonly encountered heavy metals like nickel, copper, lead, zinc, chromium, cadmium, manganese and arsenic, using inductively coupled plasma-mass spectrometry (ICP-MS) and atomic absorption spectroscopy (AAS). Meanwhile, emissions to air were limited to nitrogen dioxide (NO2) and carbon dioxide (CO2). CO2 emissions due to direct fuel combustion, γ, were derived using Equation 5, where ϕi is the emission factor of fuel i, ϕ^{ELEC} is the Luzon-Visayas grid electricity emission factor (in kg CO2/kWh), and α3 is the conversion factor for joules to kWh. Meanwhile, the emission of NO2 was determined using mass/material balance. Air emissions from wood which were used as fuel was also excluded from the study as the type of wood used is unknown. Soil emissions were not considered due to the insignificant amount of sediment in the samples resulting from gold recovery process.

$$\gamma = \sum \Phi_i f_i + \Phi^{ELEC} E^{EQUIPMENT} \quad (5)$$

Accordingly, emissions were associated with relevant midpoint impact categories or problem-oriented which include marine eutrophication, terrestrial acidification, particulate matter formation, photochemical oxidant formation, global warming potential, human toxicity, terrestrial ecotoxicity, freshwater ecotoxicity and marine ecotoxicity. Characterization and normalization followed to complete the impact assessment process. In the characterization and normalization phases, emissions are converted to directly comparable impact indicators using equivalence and normalization factors derived from ReCiPe version 2008. To simplify interpretation, midpoint categories were translated into three endpoint categories or areas of protection: damage to human health, ecosystem quality and resource availability.

4. Socio-economic Impact

The materials and resources consumed to extract 100g of Au were measured. The prevailing selling price of the gold extracted, which in this case is 18-karat gold, was determined, together with the costs of the materials and resources used. Average labor hours incurred were also determined from actual operations. The benefit-cost ratio (BCR) was used as the measure of the economic impact or the value of informal gold recovery relative to the costs associated with it. Equation 6 was used to estimate the BCR where $Cost_i$ is the cost of resource $i \in$ (water, labor, materials).

$$BCR = \frac{Benefit}{Cost} = \frac{Value\ of\ 100g\ Au,\$}{\sum_i Cost_i,\$} \quad (6)$$

Meanwhile, social life cycle assessment also follows the ISO 14040 framework but the United Nations Environmental Programme-Society of Environmental Toxicology and Chemistry (UNEP-SETAC) framework provides a more elaborate life cycle inventory suited for social impact assessment (UNEP-SETAC, 2009). Thus, the UNEP-SETAC guidelines were used in selecting the stakeholders and impact categories for the study. Stakeholders considered include the workers and the local community. Impact subcategories chosen were limited to the health and safety of the worker and safe and healthy living conditions of the local community. To arrive at a single score describing the social impact of the recycling process, risk assessment was conducted. Risk assessment involves the identification and evaluation of hazards the identified stakeholders are exposed to (Canadian Center for Occupational Health and Safety [CCOHS], 2020). It helps in prioritizing the risks to be minimized by assigning a score to the probability of occurrence of the risk and its severity. The risk with the high probability of occurrence and severity entails priority for mitigation and improvement.

The risks the workers and the local community were exposed to were identified and assessed based on its likelihood of occurrence and the severity of the effect. Tables 2 and 3 present the scale of the severity and the probability of occurrence, as used in the study. Criticality for each risk identified was computed by multiplying the severity and probability of occurrence. A single score for the social impact was computed by getting the average of the criticality scores under the assumption that the risks have equal weights.

Table 2. Severity Scales

Risk Severity (Magnitude of Loss)	Score	Description of Risk Effect	
		Impact to Human Health	Impact to the Ecosystem/ Community
Negligible	1	Not requiring any medical treatment/tolerable	No significant threat to the ecosystem and the community
Minor	2	Requiring first aid treatment	Requires action such as tree planting, cleanup of bodies of water
Major	3	Injury requiring hospitalization	Requires restoration of the community
Critical	4	Severe injury, occupational illness/disability	Introduction of sediments and acids into ground and surface water which could persist for a long time
Catastrophic	5	Death	Irreversible damage to the ecosystem

Note: Severity description modified from a) Ciociano, Grisi, Bagnasco, Elberti and Mazzarella (2017) and b) Eccleston (2001).

Table 3. Occurrence Scale

Risk Likelihood	Score	Description
Extremely improbable	1	Incapable of occurrence
Improbable	2	So unlikely, it may be assumed occurrence may not be experienced in the lifetime
Remote	3	Unlikely, but possible to occur
Occasional	4	Likely to occur sometime in the lifetime
Frequent	5	Likely to occur often in the lifetime

Note: This occurrence scale was modified from Stapelberg (2009).

III. Results and Discussion

1. Environmental Impact Assessment

Table 4 shows the amount of energy used and the emissions to the environment from the gold recovery process for 100g of 18-karat Au extracted.

1.1. Energy Use and CO2 Emission

As reflected in Table 4, energy consumption is primarily contributed using diesel during torching (for manual disassembly) and kerosene during smelting. Carbon dioxide is the main gas emitted into the environment mainly coming from the combustion of diesel and kerosene and from the use of electricity.

The energy embodied and the carbon dioxide emitted by the informal gold recovery is compared with small scale gold mining (SSGM), which is 80% of the country's annual gold production. In a study that observed four mining processes in the provinces of Benguet and Camarines Norte in the Philippines (Cenia et al., 2018), energy embodied, and carbon dioxide emission were estimated using the same functional unit of 100g of Au. Process A primarily involves amalgamation, process B, cyanidation with carbon-in-leach (CIL), process C, cyanidation with leaching with zinc and process D, combination of amalgamation and cyanidation with CIL. Table 5 presents the results of the analysis vis-a-vis informal gold recovery.

Table 4. Resources Used and Emissions Produced in Recovering 100g of Gold

Description	Value	Unit
Energy	10, 114.14	MJ
Fuel	6, 800.10	MJ
Equipment	1, 352.20	MJ
Labor	1, 961.83	MJ
Emissions to Air		
Nitrogen dioxide (NO_2)	2.73	kg
Carbon dioxide (CO_2)	722.85	kg
Emissions to Water		
Chromium (Cr)	0.05	kg
Manganese (Mn)	0.19	kg
Nickel (Ni)	8.23	kg
Copper (Cu)	200.96	kg
Zinc (Zn)	1.63	kg
Arsenic (As)	1.21	kg
Cadmium (Cd)	0.00	kg
Lead (Pb)	31.45	kg

Table 5. Comparison of Energy Consumption and CO_2 Emission of Selected SSGM Processes and Informal Gold Recovery

Process	Energy Consumption (MJ/100g Au)	CO_2 Emissions (kg CO_2/100g Au)
SSGM Process A	6, 348.00	602.00
SSGM Process B	66, 565.00	5, 340.00
SSGM Process C	6, 615.00	949.00
SSGM Process D	3, 501.00	398.00
Informal Gold Recovery	10, 114.14	722.85

Based from the results presented, except for Process B, informal gold recovery performs poorly in comparison with the considered SSGM processes. However, considering that the projection of the usage of resources are computed proportionately based on the small batches of cell phones treated, processing in large batches will help them take advantage of economies of scale and, therefore, result in less energy use and CO2 emission.

1.2. Health and Environmental Impacts

Copper and lead are abundant in the wastewater generated from the process, with values of 218.60 ppm and 138.39 ppm, respectively. Copper is the base material for PCBs and the digested copper blends with the wastewater. Though occurring in significant amounts, copper poses a relatively low toxicity potential compared to lead and arsenic. These two substances greatly exceed the limit on toxic and deleterious substances as specified by the Clean Water Act. The very high concentration of lead poses the greatest concern since it is a "neurological poison and a probable human carcinogen" ((IPMI, 2003). There is a large amount of lead because it is primarily used as a soldering material in the PCBs, estimated to be at about 2, 000 – 10, 000 ppm. The same is true with arsenic, of which exposure to it may lead to cancer. Wastewater containing these elements, if not treated properly, could directly be ingested through the water and food that have been contaminated through absorption of these elements.

From the emissions, the midpoint level impacts were computed and presented in Table 6. It can be inferred that freshwater toxicity, human toxicity and marine eco-toxicity are the largest contributing impact categories. This is mainly due to the large amount of heavy metals and toxic elements found in the wastewater, like lead, arsenic, cadmium and chromium, which when thrown into the community's sewage system, could end up in bodies of water. The endpoint impact values registered small impacts to human health and ecosystem, however, normalization suggests it heavily affects human health, as indicated in Table 7. These results just confirm the studies on the adverse health effects of improper and uncontrolled recycling processes.

Table 6. Midpoint Impact Level Categories of Gold Recovery from End-of-life Cell Phones

Midpoint Impact Level Categories	Value	Unit
Terrestrial Acidification	1.53	kg SO_2 eq
Marine Eutrophication	0.11	kg N eq
Photochemical Oxidation	2.73	kg NMVOC
Particulate Matter Formation	0.60	kg PM10
Global Warming Potential	722.85	kg CO_2 eq
Freshwater Ecotoxicity	24, 512.53	kg 1, 4-DB eq
Human Toxicity	25, 365.51	kg 1, 4-DB eq
Marine Ecotoxicity	21, 158.61	kg 1, 4-DB eq
Terrestrial Ecotoxicity	1.29E-19	kg 1, 4-DB eq

Table 7. Endpoint Impact Categories of Gold Recovery

Endpoint Category	Normalized Values	Percent Contribution
Human Health	1.39	97.61%
Ecosystem	0.03	2.38%
Resources	0	0

Table 8. Cost of Resources Used in the Extraction Process

Description	Value	Unit	Price per Unit ($)	Total
Water	0.82	cu m	0.50	0.41
Labor	2, 477.59	Hours	0.90	2, 229.84
Materials and Resources				
Cyanide and Gold Stripper	2.48	kg	80.00	198.35
Nitric acid	4.96	L	6.40	31.74
Borax	6.20	kg	2.64	16.36
Lead	2.48	kg	2.40	5.95
Kerosene	111.57	L	0.81	90.48
Diesel	74.38	L	0.62	45.94
Dishwashing liquid	0.99	L	4.17	4.13
Total cost				$ 2, 623.19

Note: An average of Php 1.00 ≈ $0.02 for the years 2016-2019 was computed from Bangko Sentral ng Pilipinas (2020).

2. Socio-economic Impact

Table 8 provides the amount of materials and resources used throughout the process. Given that the estimated price of a gram of 18-karat gold is $31.61(Gold Price, 2020), 100 grams of gold would cost $3,161.00. The BC ratio computed was 1.21, suggesting that the activity will provide profit to the recyclers. Of the different factors of production considered, labor is the highest contributor, primarily from the manual disassembly of the scrap cell phones.

Meanwhile, risk assessment has shown that the recyclers are exposed to injuries due to the absence of protective gear. For instance, during the manual disassembly of cell phones and removal of metal components in the PCBs, the sharp edges could scrape and wound the hands of the scrapper. Moreover, the scrapper is also exposed to eye injury coming from components that could burst and fly-off into different directions during torching. The absence of gloves during cyanide leaching of the PCBs could lead to cyanide poisoning if hands are not properly washed.

Table 9. Social Impact Risk Assessment Results

Risk	Severity	Equiv-alent Point	Prob-ability of Occur-rence	Equiv-alent Point	Criticality (Severity x Occurrence)
Health and Safety of Worker					
Risk of Acquiring Injuries	Minor	2	Frequent	5	10
Risk of Poisoning	Catastrophic	5	Occasion-al	4	20
Risk of Eye Injury	Critical	4	Occasion-al	4	16
Risk of Respiratory and Nervous System Diseases due to Inhalation of Fumes	Major	3	Frequent	5	15
Muscle fatigue	Minor	2	Frequent	5	10
Health and Safety of the Community					
Contamination of Ground and Surface Waters	Critical	4	Occasion-al	4	16

The emission of poisonous gases also poses hazards to the health of the worker. In the process of removing the integrated circuits from the PCBs, lead oxide fumes could be inhaled and lead to difficulty in breathing. This is also evident in the smelting process where workers are both exposed to heat and fumes produced.

Muscle fatigue is also experienced by the scrapper as the blowtorch used needs a continuous supply of air, requiring continuous pumping of the blowtorch.

The community is also exposed to hazards coming from the wastewater generated from the process, which was disposed of in the surrounding area just like domestic wastewater. This poses a problem since, based from the results of the laboratory analysis of the wastewater samples, these contain heavy metals and toxic elements that could contaminate surface and underground bodies of water.

The summary of the assessment made is presented in Table 9 together with the corresponding points derived from the scoring system presented in Tables 1 and 2.

It can be noted that informal gold recycling is a backyard industry and is considered very small relative to mining, which is the primary gold extraction process practiced in the country. However, with the continued replacement of electronic equipment, and seeing that the practice is less capital-intensive and easy to learn, it would be more attractive.

The informal recyclers and the immediate community are at high risk due to the exposure to health hazards, and this could continue if left uncontrolled. This study further strengthens the findings of previous studies conducted in informal recycling areas. However, with the economic benefits provided by informal recycling, they tend to overlook these hazards. Gold recovery per se, is economically viable based on the results of this study, but if the purchase of end-of-life cell phones is taken into consideration, it would add up to the cost. From the interview with the scrapper, this is true since they buy the scrap cell phones on a per kilogram basis, and with the various models included with varying gold content, profit cannot always be realized. However, economic returns can be achieved not only from the recovery of gold, but also of other precious metals and the sale of the scrap materials.

3. Comparison of Informal Gold Recovery with Small Scale Gold Mining (SSGM): Environmental and Socio-economic Impacts

As discussed in Section 1.1, the energy consumption and CO_2 emission of informal gold recycling is higher than that of SSGM. However, considering other impacts such as land degradation, mercury emissions/pollution, siltation, erosion and water contamination (WHO, 2016) which are not readily measured and have long-term and irreversible effects, gold recovery presents a more environment friendly alternative, or given its limited scale, an environmentally-benign complementary mode of gold production. Moreover, artisanal and SSGM exposes workers, which also include women and children, to chemical and biomechanical hazards alike, due to the generally unsafe working conditions (WHO, 2016). Physical trauma such as burns, eye injuries, physical dismemberment and even death could be experienced due to "rock falls, explosions and inappropriate use and/or unsafe use of equipment" (WHO, 2016, p. 11). Meanwhile, while wastewater contains some hazardous chemicals, its effects can be controlled through proper management and treatment. Likewise, the risk workers are exposed to can be easier mitigated than that of SSGM since informal gold recovery can be done in a more controlled environment resembling an industrial production system.

The computed BC ratio of 1.21 is considered an acceptable value. However, as discussed earlier, this can further be improved once it is transformed into a more organized production system utilizing equipment that will enhance efficiency of operations and of course, take advantage of economies of scale for the supplies and consumables.

IV. Insights and Recommendations

Informal recyclers will continue to compete with formal recycling facilities in the country as there are economic benefits derived from it, though at the expense of the environment and human health. Informal recycling, in a way, supports the circular economy model, but through an inefficient and non-environmental friendly process. In order to take advantage of this new production system, there is a need to find mechanisms for the informal sector to improve and reduce its impacts.

A hot spot analysis was done to identify areas of informal gold recovery that can be improved with the results presented in Table 10.

Table 10. Opportunities for Improving Informal Gold Recovery

Opportunity for Improvement	Major Contributor	Recommendations
Energy Use and CO2 Emission	Combustion of Fuel	Use of Energy-efficient Equipment
Environmental and Health Impact Chemicals		
Health Hazards	Use of nitric acid Lack of personal protective equipment in all stages of operation	Proper disposal of waste water Replacement of nitric acid and cyanide Provision of personal protective equipment
Economic Labor		Replacement of labor with low-cost but efficient machines to disassemble phones Use of methods engineering to organize the production system

▪ **Proper disposal of wastewater.** Wastewater generated must not be disposed of in the common sewage areas of the community. There should be proper treatment of wastewater before disposal.

▪ **Replacement of hazardous substances used in the recovery of gold.** New methods and/or technologies that pose minimal to no health and environmental hazards must be identified and implemented.

▪ **Protection of workers.** In most of the operations, personal protective equipment are not in place or deliberately not used by the workers. Information, education and communication activities must be conducted so that the workers can be properly educated of the harmful effects of the substances they use. More so, personal protective equipment must also be provided to them such as gloves and goggles to prevent injury. Fume hoods can be installed to capture nitric acid gas. Working in well-ventilated areas far from residences would also be a great improvement.

▪ **Reduction of labor.** From the economic analysis, labor is the largest contributor to the costs of informal gold recovery. Aside from the PCBs and other parts containing gold, laborers also try to recover metal and plastic parts that can be sold. This could be reduced by replacing it with a more appropriate technology but with less environmental impacts; that is, equipment that is energy-efficient and does not rely too much on electricity. From a socio-economic perspective, the workers will be affected as less labor would be employed, but a balance can be achieved owing to the increase in the economic benefit due to the reduced labor cost and more efficient process.

▪ **Use of methods engineering to organize the production system.** Methods engineering will make the production system more efficient and therefore, result in lesser costs. It will help reduce the operating time, especially since it is a labor-intensive process.

From the results of the study, it can be concluded that informal gold recovery is desirable from a socio-economic sustainability standpoint. It is environmentally benign, economically viable and socially acceptable. Addressing the identified opportunities for improvement, informal gold recovery can be recommended for scaling up, thereby providing employment benefits while providing industries dependent on gold for production with a secondary source of raw materials. Moreover, the following recommendations are proposed for stakeholders to benefit more from this practice:

▪ **National e-waste inventory and assessment.** On a national scale, e-waste and the corresponding operations associated with it are becoming both a boon and a bane to the country. The emergence of e-waste provides a source of income to many people and recycling companies, but due to the lack of information on those operators and the lack of control over the operations, it causes additional problems with the environment. An e-waste inventory based on national data inclusive of domestically generated e-waste and transboundary e-waste, like the entry of surplus electronics into the country should be in place. Moreover, e-waste must also be classified and assessed as to their characteristics, storage conditions, among others.

▪ **Formulation and implementation of an e-waste management system policy.** The Department of Environment and Natural Resources has recognized the growing concerns over the impact of e-waste in the country, thus, the promulgation of DAO 2013-22, where e-waste is no longer classified and included as household waste but has a classification of its own. This administrative order also identifies the role of the local government in the successful implementation of national laws. However, one shortcoming of this law is the implementation. Local government policies are more strictly implemented than the national laws.

Public awareness, by educating people about e-waste, the toxic materials they contain and the corresponding effects to the health and the environment, must also be actively enforced. If possible, using popular media to enforce this should be done. Moreover, a system for the collection of e-waste must be in place, with the provision of incentives in order to increase collection rate. Informal recyclers must also be organized, clustered, educated and monitored. Currently, collection efforts for domestically generated e-waste are not centralized and are handled by a only a few organizations. The economic benefits of gold and other precious minerals and metals can be reaped if large volumes of generated e-waste will be collected systematically and more efficiently by recycling companies and e-waste traders.

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Corporate Governance and Financial Performance of the Firm: The Mediating Role of Capital Structure

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ABSTRACT

Purpose – The governance of firms as assured by the board through good decisions about capital structure is maximum profit with an aim to enhance the wealth of shareowners. We focus on the corporate governance relationship with the financial performance of firms and check whether this relationship is meditated by the capital structure of the company.

Design/Methodology/Approach – The study estimates said objectives using Pooled OLS, Fixed Effects, Random Effects, and a test for mediation analysis for total of 205 observations of 41 firms listed on the KSE-100 index of the Pakistan stock exchange for a period from 2013 to 2017.

Findings – The results show that there is a strong positive relationship between corporate governance, financial leverage, and firm performance. Non-executive directors and female directorship negatively related to the firm performance and financial leverage of financial firms of Pakistan. The study contributed to existing literature with financial leverage positively and significantly mediating the relationship between firm performance and non-executive directors, audit committees, and ownership concentration in developing nations.

Research Implications – The board of directors always consider the capital mix while making decisions as it helps to improve financial performance via good governance. Thus, this research has provided the best picture for firm policy makers, in particular, to help decide which components of corporate governance as mediated by capital structure are necessary for a firm's financial well-being.

Keywords: board member, corporate governance, financial performance, fixed and random effect, mediation effect, return on assets

JEL Classifications: B26, D53, E44, E58, F21, F55

I. Introduction

Corporate governance and leverage are very important to to maximize the wealth of owners. Good practices of corporate governance send a good signal to the market and increase market value. The motive of corporate governance is to safeguard the interest of shareholders and ultimately maximize the owner's wealth. Berle and Means (1932)

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introduced governance theory, then other authors followed with new theories such as capital structure theory by Modigliani and Miller (1958), and agency theory by Jensen and Meckling (1976).

Tahir, Rehman, and Rehman (2014) described that high leverage in a capital structure can decrease the value of firms by decreasing public confidence due to an increasing trend of bankruptcy. Capital structure is one of the major areas of corporate finance which deals with the question of how much debt should be used for financing as compared to equity. The debate over this issue was perhaps started by a study by Modigliani and Miller (1958), which proposed that capital structure is irrelevant in the perfect capital market. No tax is one of the major assumptions of the perfect capital market, and this cannot be true in the real world. Companies have to pay taxes, and capital structure becomes relevant. Hillier et al. (2011) noted that companies can have the benefit of a tax shield by including debt in the capital structure. The value of the firm will increase due to the deduction of the interest expense and tax benefit. However, if there is more and more debt in the capital structure, it will cause bankruptcy due to an increase in financial distress. By taking the tax shield and financial distress into account, we can expect an inverted U shape curve relationship between a firm's performance and financial leverage.

Further to the above perspective, we can study optimal capital structure with respect to corporate governance. Yaseen and Al-Amarneh (2015) found that corporate governance and optimal capital structure played a very important role in determining the market value of the firm. Corporate governance is the mechanism through which the corporation is controlled, so the right of minority shareholders can be protected (Wang & Muhammad, 2020b). The corporate governance mechanism provides two hypotheses relevant to capital structure. The first is the free cash flows hypothesis, and the second is the monitoring hypothesis. According to the free cash flows hypothesis, debt can reduce free cash flows available to managers (Jenson, 1986); they will not make an investment in negative NPV projects to pursue their objectives, and it will lead to an increase in the performance of the firm. Studies by De Jong (2002), Gul and Tsui (1997), Harford, Mansi, and Maxwell (2008), and Jenson (1986) confirmed the free cash flows hypothesis to some extent, but were not able to provide a clear association between firm performance and leverage.

According to the monitoring hypothesis, more debt can lessen the agency cost as a creditor will monitor the firm (Thomson & Coyen, 2012). When creditors monitor and control management, then they will not be able to pursue personal benefits, and it will lead to an increase in the performance of the firm. Studies by Degryse and Ongena (2001), James (1987), Lummer and McConnell (1989), and Slovin, Johnson, and Glascock (1992) explored the positive impact of bank loans on the performance of firms, but these studies also failed to provide a clear association between firm performance and leverage. Detthamrong, Chancharat, and Vithessonthi (2017) found that literature is focused on describing the impact of corporate governance on financial performance, the impact of corporate governance on leverage, and the impact of leverage on financial performance. None had tried to explore the mediating effect of leverage between corporate governance and financial performance.

Corporate governance has existed as long as companies have existed, but this received higher attention in the last four decades. Major legislation on corporate governance was made after the Enron scandal. The Security and Exchange Commission of Pakistan (SECP) issued the first rules about corporate governance in March 2002. Then, these codes were updated in early 2012 to make them more effective and competitive with global standards. These codes are applicable to companies listed on the Pakistan Stock Exchange. In this study, we have tried to explore if these corporate governance rules had any positive impact on the performance of financial sector firms.

Detthamrong, Chancharat, and Vithessonthi (2017) have pointed out that financial leverage can mediate the relationship between corporate governance and firm performance. We will also study the mediating role of financial leverage between corporate governance and the financial performance of the firm for the first time in the context of Pakistan.

This study will contribute to the literature of corporate governance, financial leverage, and firm

performance by using the latest data of the financial sector of Pakistan. This will help policymakers understand the mechanisms of corporate governance and firm performance under the mediating role of financial leverage. They will be able to understand if the code of corporate governance is effective, and if there is a need to improve these rules. The study also has significance for investors to understand this relationship and make efficient use of their funds.

The remaining paper is organized as follows. Section 2 elaborates the literature and hypotheses on the topic, followed by the methodology section. Then, the results of the study are presented and discussed, and the last section of the study concludes the findings of the study with future research recommendations.

II. Literature Review and Theoretical Foundation

This section briefly reviews the previous studies and extracts different theories and empirical evidence on the relationship between corporate governance and the financial performance of firms knowing the mediating influence of financial leverage. This section is divided into the five following subsections. Section I is about the theoretical foundation of the study, ans the further sections comprise the relationship between corporate governance and firm performance, corporate governance and financial leverage, financial leverage and firm performance, and the mediating role of financial leverage.

1. Theoretical Foundation of the Study

This study's theoretical foundation and hypotheses are based on agency theory, free cash flow theory, and trade-off theory.

Agency theory was generated by Fama and Jensen (1983) and Jensen and Meckling (1976), in which they discussed problems that are created at the workplace due to the separation of ownership (principal) and management (agent). This is true, and the most widely used theoretical framework to analyze corporate governance. This theory notes that the separation of ownership and management creates many problems for firms due to a lack of trust, insecurity, and fewer incentives for managers controlling assets (Grossman & Hart, 1986).

These problems are usually called agency problems, and these problems may disturb and destroy the value of the firm, which is called the agency cost (Ross, 1977).

Therefore, firms solve these problems using corporate governance through a board of directors (Paniaguaa, Rivellesb, & Sapenab, 2018).

This study considers mainly two areas of corporate governance: board members (size) and ownership concentrations that affect financial performance.

In the free cash flow theory of capital structure noted by Jensen (1986), leverage itself acts as a device of corporate governance, and it helps to reduce agency problems, resulting in increased firm value (Jensen, 1986). This theory suggested that the use of leverage as a device for corporate governance is very important. Due to a high level of leverage, there are higher chances of bankruptcy. On the other side, it might create motivation in managers to work harder to avoid the risk of bankruptcy by repaying the obligation to the debt holders. It will also create motivation in managers to not waste the firm's cash flows by engaging in no-profit projects. These increase the value of the firm. Due to these consequences, we may make note of the interest of the owner and managers.

This study utilizes trade-off theory in relation to capital structure. The discussion about the capital structure was started after a proposition given by Modigliani and Miller (1958). They said that the value of the firm is independent of its capital structure in the absence of corporate tax and bankruptcy costs. They also argued that the value of a firm increases if the firm increases its leverage when corporate tax is present (Harris & Raviv, 1991; Miller, 1977; Stulz, 1990). This means that the tax advantage of debt is offset by an increased risk of bankruptcy and the agency cost of debt when we use the optimal level of debt for any individual firm. All these arguments were supported by Berger et al. (1997) and Berger and Patti (2006), who said that

the theories of corporate governance come to the conclusion that agency costs can be reduced with the use of capital structure, and they can increase the value of the firm.

2. Corporate Governance and Firm Performance

Corporate governance is a system that ensures a company follows all compulsory rules and regulations under the instructions of the Security and Exchange Commission of Pakistan (SECP). It may use a tool to create an environment of trust, transparency, and accountability at the workplace to reduce conflict between the principal and agents of the firm.

Connelly, Limpaphayom and Nagarajan (2012), Mohamed, Basuony and Badawi (2013) and Mak and Kusnadi (2005) conducted research on the relationship between corporate governance and firm performance using different countries as the population of the study. Almost all studies considered board size (member), board independence, audit committee size, female directorship, and ownership concentration as proxies to measure corporate governance. ROA, ROE, and Tobin's Q ratios were proxies to measure performance (Chidambaran, Palia, & Zheng, 2008; Lei & Song, 2012; Yasser, Entebang, & Mansor, 2011). Different studies have confirmed that board structure and ownership concentration is the most relevant area of agency theory (Dalton & Dalton, 2011; Dey, 2008; Vu & Nguyen, 2017). Garcia et al. (2016) and Evans and Dion (2012) argued that board size has a negative relationship with firm performance. A large board was negatively related to the performance of the firm because any decisions taken by a large group of members have less efficiency. On the other hand, small boards encouraged the ability of members to initiate strategic interactions (Ducassy, 2015; Jensen, 1993). Scholars also confirmed that there was a negative relationship between firm performance and board independence (Haniffa & Hudaib, 2006). Audit committee size and female directorship had positive impacts on firm performance. There is a strong argument that the enhancement of audit committee size to reduce information asymmetry problems will improve management monitoring, and improving the monitoring process will create positivity for the firm (Aldame et al. 2012; Bhagat & Bolton, 2008; Klein, 2002). On the other hand, researchers found female directorship create a positive response for the firm. In the past, there was no evidence about any female representatives, but in recent years, there is a strong belief that female directors bring different points of view, so it may enhance firm performance (Erhardt, Werbel, & Shrader, 2003; Garcia et al., 2015). Another school of thought on ownership related to two features, ownership dispersion and cost of ownership, has an effect on the financial performance of the firm. Several pieces of research show that there is a positive relationship from the presence of a third large strong group of shareholders with the value of the firm, but a second large group of shareholders has a negative impact on firm value (Konijn, Kraussl, & Lucas, 2011; Maury & Pajuste, 2005). Some other researchers argued that ownership concentration helped to reduce conflict between the owner and manager, and it increased the value of the firm (Agrawal & Knoeber, 1996; Bhaumik & Selarka, 2012). The dividend is the main source of the financial cost of ownership. Easterbrook (1984) thought that the dividend was the main source used to align the interests of the owner and manager. In underdeveloped countries, high dividend-paying companies have the experience to reduce agency cost, so it increases the value of the firm (La-Porta et al., 2000). In developed countries, high dividend-paying companies face low growth in the firm's value (Gaver & Gaver, 1993; Gugler, 2003).

In spite of all the arguments above, some scholars have a mixed point of view regarding these relationships. Coles, Daniel and Naveen (2008) and Shahid et al. (2018) said that board size has an insignificant but positive relationship with firm performance. Ahmed and Hamdan (2015) and Muniandy and Hillier (2015) said that the independence of the board has a positive impact on firms. Rose (2007) and Aldermen et al. (2012) argued that there was a negative relationship between audit committee size, female directorship, and firm value. Demsetz and Villalonga (2001) found no significant relationship with ownership and the financial performance of the company.

3. Corporate Governance and Financial Leverage

In finance, financial leverage means the degree to which any company uses fixed-income long-term securities like debt and preferred stock in their financing. The more debt financing a company uses, the higher the financial leverage of the company. High financial leverage shows a firm pays a high level of interest expenses. A high level of interest payments negatively affects the earning of the firm.

Several researchers (Abdoli et al., 2012; Nguyen & Phan, 2016; Wen, Rwegasira, & Bilderbeek, 2002; Yaseen & Al-Amarneh, 2015) conducted research on the relationship between corporate governance and financial leverage in different countries using the financial leverage ratio as a proxy to measure the financial leverage of the firm. Jiraporn et al. (2012) said that weak corporate governance faces more significant leverage, which may result in poor performance. On the other hand, good corporate governance leads to low financial leverage, which results in better performance (Kheirollahi, Beshour, & Rizi, 2014). Indeed, a board of directors is one of the most important elements responsible for corporate governance effectiveness through the appropriate operations of the company (Chancharat, Krishnamurti, & Tian, 2012). They are responsible for key monitor activities and any strategic decisions, like decisions on capital structure. Alqisie (2014) and Berger et al. (997) said that board size was negatively related to financial leverage. The larger the board, the higher the financial leverage, and vice versa. Abobakr and Elgiziry (2016) said that an independent director's presence on the board caused higher leverage. Audit committee size provided productive information about financing and its risks, so it is better to have an ideal audit committee (Chen et al. 2016; Harris & Raviv, 2008). The effect of female directorship on financial leverage was negative (Abed, Al-Attar, & Suwaidan, 2012; Chang, Chou, & Huang, 2014). Strom et al. (2014), based on a sample of 73 countries for the period of 1998 to 2008, said that the presence of female directors on a board caused an increase in financial. According to Suto (2003) and Claessens and Fan (2002), the firm has another type of agency problem, a conflict between large shareholders and small shareholders in the presence of ownership concentration, which causes an increase in leverage. Al-Najjar (2016) and Al-Amarneh & Yaseen (2014) found that ownership concentration was positively related to financial leverage. The greater the ownership concentration, the higher the financial leverage, and vice versa.

4. Financial Leverage and Firm Performance

Markowitz (1952) provided a famous saying about financing in that the higher the risk, the higher return, and the lower the risk, the lower the return. As we have discussed that more debt financing in business shows that a firm is more leveraged, the greater the leverage, the greater the risk for that particular firm.

Modigliani and Miller (1958) said that capital structure was not relevant to calculate the performance of the firm. However, Ahmed, Awais and Kashif (2018), Javeda et al. (2015) and Awan and Abbas (2016) argued that capital structure, sales growth, leverage, and interest coverage are variables that have the most significant effect on profitability. According to this researcher, leverage is relevant to find the performance of a firm. Gill and Obradovich (2012) found a positive and significant association between financial leverage and the value of the American services and manufacturing firms with 3 years of data on 333 American firms listed on the New York Stock Exchange. Tahir, Rehman and Rehman (2014) and Khakwani et al. (2016) used financial leverage as independent variables to find the impact on performance, and they found a positive and significant relationship between financial leverage and performance. Other scholars (Connelly et al., 2012; Vithessonthi & Tongurai, 2015) said that there was a negative or non-relationship between leverage and value.

5. Financial Leverage as a Mediator Between Corporate Governance and Firm Performance

This section focuses on the idea that corporate

governance does not directly influence the performance of the firm, but it may affect the performance of the firm indirectly via financial leverage. As discussed in previous sections, almost all studies used corporate governance as an independent variable, and some also used financial leverage as an independent variable to measure the effect on performance. The results showed the same relationship, but some results showed mixed or no relationship between said variables. Here, one of the most important questions arises; Why do some studies' show no relation between corporate governance and performance? The answer may be that the effect of governance on performance is mediated by financial leverage (Detthamronga, Chancharata, & Vithessonthic, 2017). Juma and Wanga (2010) recommended that future studies be conducted to know the mediator or moderator role of financial leverage. One study by Detthamronga, Chancharata and Vithessonthic (2017), in which they used financial leverage as a mediator between corporate governance and the firm performance of non-financial listed firms, suggested other researchers conduct the same studies in their relevant regions. We use listed firms for this purpose using data extracted from annual reports. Detthamronga, Chancharata, and Vithessonthic (2017) argued that financial leverage has a mediator role between audit committee size and firm performance in the case of a large firm.

III. Data and Empirical Research Methodology

1. Research Methodology and Data Set

In this section the analysis methodology is briefly explained , along with the directional relationship of variables, sample, data sets, and the source of data. This investigation follows the positivist philosophical assumption and deductive approach to research. The study used panel data of 41 randomly selected companies from different financial sectors' listed companies on the Pakistan stock exchange for the period of 2013 to 2017. Data for all companies were collected from the official website of a state bank and all companies. The dependent variable is financial performance, which was calculated through ROA, as recommended by Abed, Al-Attar and Suwaidan (2012) and Chang, Chou and Huang (2014). The independent variable of the study is corporate governance, and it was measured through board independence, audit committee size, female directorship, non-executive director, CEO duality, ownership concentration, and board size. Firm size was used as a control variable for the study, as suggested by Chidambaran, Palia and Zheng (2008), Dalton and Dalton (2011), Dey (2008), Lei and Song (2012), Vu and Nguyen (2017), Wang and Muhammad (2020b) and Yasser, Entebang and Mansor (2011). Variables used and descriptions are listed below. Table 1 shows all variables included in this study for testing the designed hypotheses. The table also shows the measurement status, formulas, and proxies of all variables used for analysis purposes. To calculate the impact of corporate governance on the firm performance of companies listed on the Pakistan stock exchange, the following regression equation was proposed.

Model 1: Firm Performance (ROAi,t) = α+ βCorporate Governance (CGi) + γZi,t +ηi+ νt +εi,t

Model 2: Firm Performance (ROAi,t) = α+ β Corporate Governance (CGi,t) +δLEVi,t + γZi,t +ηi+ νt +εi,t

Here, ROA i,t is the ratio for all included firms i at time t, and ROA is a dependent variable in this case. CG is the vector of a firm's corporate governance variables (i.e. board size, board independence, audit committee size, female directorship, non-executive director, ownership concentration, and CEO duality,). LEV i,t is the financial leverage ratio for firms i at time t. The leverage ratio measures the firm's capital structure. Z is a vector of firm-level control variables, which is firm size, and for firm size, we used two variables. The first is log assets, and the second is log capital. ηi means the firm fixed and random effects, which is incorporated in the proposed model specification to control for unobservable firm-specific and time-invariant heterogeneity; νt is for the time-random effect, which is used in the model specifications to control for unobserved time-variant effects for all firms in the sam-

ple. When we use financial leverage as a dependent variable, then the following model is developed.

Model 3: Financial Leverage (Levi,t) = α+ βCorporate Governance (CGi,t)+ γZi,t +ηi+ νt +εi,t

Here, Levi,t is the financial leverage ratio used for measuring the capital structure for all included firms i at time t, and LEV is a dependent variable in this case. The explanation for all other variables is the same as above.

Table 1. Description of Variables

Variable Name	Measurement & Description
Financial Performance:	
ROA	The ratio of earnings after interest and taxes to assets.
Corporate Governance:	
Board Size/Members	Number of the board directors, including a chairperson and independent directors.
Board Independence	The ratio of the number of independent directors to the number of all directors
Audit Committee Size	The number of the audit committee members on the board.
Female Directorship	The ratio of the number of female directors to the total number of directors.
Non-Executive Director	Number of non-executive directors on the board.
CEO Duality	Dummy Variable: if the CEO is also the chairperson, 1, If No = 0
Ownership Concentration	The natural logarithm of a large number of shares taken by the top three shareholders
Capital Structure:	
Leverage Ratio	The ratio of total debt to total assets
Control Variable: Firm Size	
Assets	The natural logarithm of total assets.
Capital	The natural logarithm of total Capital.

Note: Table 1 shows all variables included in this study for testing the designed hypotheses. The table also shows the measurement status, formulas, and proxies of all variables used for analysis purposes. To calculate the impact of corporate governance on firm performance for companies listed on the Pakistan stock exchange, the following regression equation is proposed by the researchers.

IV. Results and Discussion

1. Descriptive Statistics

Descriptive statistics are the first type of statistics utilized to describe the essential highlights of the data in an investigation. These statistics give basic details about the sample and the measures of all variables' data. Our study's statistics are shown in Table 2

Means shows the average value of the data. S.D, the standard deviation, is for showing how much the average value may deviate from the average in case of uncertainty. Mean value of ROA, the board size, board independence, audit committee size, female directorship, non-executive director, CEO duality, ownership concentration, and leverage ratio are 0.7344, 7.7366, 0.2726, 3.5951, 0.0357, 3.1268, 0.8781, 7.7326, and 1.6414, respectively.

Table 2. Descriptive Statistics

Variables	Mean	S.D.	Minimum	Maximum	Observations
ROA	0.7344042	3.5787710	-1.890716	26.3594600	205
Board Size	7.7365850	2.1870560	4	17	205
Board Independence	0.2726066	0.16520590	0	0.8	205
Audit Committee Size	3.5951220	1.7814340	0	14	205
Female Directorship	0.0357499	0.0848322	0	0.6666667	205
Non-Executive Director	3.1268290	2.4098470	0	16	205
CEO Duality	0.8780488	0.3566677	0	2	205
Ownership Concentration	7.7325820	1.6057580	0.4771213	9.5834640	205
Leverage Ratio	1.6414090	6.3199560	0.0008144	45.3204600	205
Log Assets	7.1725230	2.3587000	2.2761110	11.7098900	205
Log Capital	6.610553	2.2800660	1.8678680	10.1663900	205

Note: The above table shows the summary statistics for the common sample of the 205 observations for all proposed varables.

2. Impact of Corporate Governance and Capital Structure on Firm Performance

Multiple regression is a statistical quantitative method used to calculate the relationship between variables. Panel OLS is used when the data set includes multiple time period data for multiple sources of time. Regression is a standard method is used to calculate the relationship between firm performance and governance (Juma & Wanga, 2010)

In Model 1, the value of the constant is (1.7241), which shows that if we assume that all the independent variables are equal to zero or constant, then the value of firm performance is (1.7241). The probability value, if less than 0.1, means the variable has a significant relationship with the dependent variable. The BOD value is (0.0960), which shows that if we assume a 1% increase in BOD size, it has a negatively effect (0.0960) on firm performance. If we assume a 1% increase independent board size and audit committee, then it has a negative effect on firm. The results show if we assume 1% increases in board independence, non-executive director, female directorship, and CEO duality, then there is a positive effect on firm performance. The R-square value in Model 1 is 0.109, which shows there is a positive relationship between corporate governance and firm performance, and about 10% of the variation in firm

performance is explained by the included explanatory variables. We reject the null hypothesis that there is no positive and significant effect of corporate governance on firm performance.

Model 2 includes financial leverage as a mediating variable in finding the impact on firm performance. The BOD value is (0.0685) which shows that if we assume that a 1% increase in BOD size, it has a negative effect (0.0685) on firm performance. If we assume a 1% increase in independent board size and audit committee, then it has a negative effect on firm performance. Results show if we assume a 1% in board independence, non-executive director, female directorship, and CEO duality, then there is a positive effect on firm performance. According to the results above, the coefficient value of financial leverage is 0.0802, and its probability value is 0.068. This means the mediating variable has a positive and significant effect on the model. The R-square value in Model 2 is 0.124, which shows there is a positive relationship between corporate governance and firm performance, and about 12% of the variation in firm performance is explained by the included explanatory variables.

Table 3. Panel Least-Squares of Financial Performance

	Without Mediation	**With Mediation**
Variables	**(1)**	**(2)**
Constant	-1.7241	-1.5617
Board Size	-0.0959**	-0.0685
Board Independence	0.9312*	0.7369*
Non-Executive Director	0.1012	0.0903
Female Directorship	0.3919**	0.4765
Audit Committee Size	-0.0691	-0.1056*
CEO Duality	0.7857	0.6373
Ownership Concentration	0.7704***	0.6545***
Leverage Ratio	-	0.0802**
Log Capital	-0.3295	-0.5030
Log Assets	-0.2236	0.0388
R^2	0.1094	0.1246
F-Statistic	2.6600 (0.006)	2.7600(0.003)
Observations	205	205

Note: Table 3 shows Panel OLS model results using firm performance as a dependent variable without or with the mediating variable of Financial Leverage. * is for statistical significance at the 5% level, ** is for the 10% level, and *** is for significance at the 1% level. Model 1 is the OLS panel regression model without a mediating variable. Model 2 shows the OLS panel regression model with a mediating variable. The values in parentheses with the value of the F-stat show the probability value of the F-stat test.

Table 4. Fixed and Random Effects Models on Financial Performance

	Without Mediation		With Mediation	
Variables	**(1) Fixed Effect**	**(2) Random Effect**	**(1) Fixed Effect**	**(2) Random Effect**
Constant	0.2188	0.1343	0.3353*	0.2668**
Board Size	-0.0136	-0.0147	0.0209**	0.0201*
Board Independence	0.0090***	0.0280*	-0.1233*	-0.1077
Non-Executive Director	-0.0310*	-0.0271	-0.0239*	-0.0220
Female Directorship	-0.2205	-0.2000	0.5099*	0.5048**
Audit Committee Size	0.0427*	0.0410**	-0.0227	-0.0230*
CEO Duality	-0.1240*	-0.0975	-0.1932*	-0.1746
Ownership Concentration	0.3155***	0.3314****	0.0996*	0.1168*
Leverage Ratio	-	-	0.1108***	0.1094***
Log Capital	-0.0082	-0.0181	-0.0605	-0.0713
Log Assets	-0.2379**	-0.2379**	0.0036	0.0023
Hausman Test Value	0.999		0.999	
R^2	0.0727	0.0763	0.0609	0.0650
F-Statistic	2.44(0.013)	24.74(0.003)	7.1(0.000)	75.3(0.000)
Observations	205	205	205	205

Note: Table 4 shows the Panel OLS model results with using ROA as a dependent variable without or with the moderating variable of Financial Leverage. * is for statistical significance at the 5% level, ** is for the 10% level, and *** is for significance at the 1% level. Model 1 is on the OLS panel regression model without a mediating variable. Model 2 shows the OLS panel regression model with a mediating variable. The values in parentheses with the value of F-stat show the probability value of the F-stat test. Model 1 is about the OLS panel fixed and random effects regression models without any lag value. Model 2 shows the OLS panel fixed & random effects regression models using a lag-1 value.

Table 4 shows the results of the impact of corporate governance on firm performance with the help of a random and fixed-effects model. According to the results of Model 1 without a mediating variable, board size, non-executive directors, female directorship, and CEO duality have a negative impact on firm performance. On the other hand, board independence, size of audit committee, and ownership concentration has a positive impact on firm performance. In Model 1, on the basis of the Hausman test value 0.999, we select the random effect model. The R-square value in Model 1 is 0.0763, which shows there is a positive relationship between corporate governance and firm performance, and about 7% of the variation in firm performance is explained by the included explanatory variables. The F-statistics value shows that the overall model is significant and a good fit, and corporate governance effectively impacts the performance of different sectors and supports the hypotheses we built. The result of Model 2 with the mediating variable of financial leverage showed board size, female directorship, and ownership concentration had a positive effect on firm performance and the variables of board independence, non-executive directors, audit committee, and CEO duality had a negative impact on firm performance.

Table 5. Panel Least-Squares of Financial Leverage

Variables	(1) OLS Regression	(2) Fixed Effect	(3) Random Effect
Constant	-0.219*	-1.052*	0.997*
Board Size	-0.343*	-0.312*	-0.356*
Board Independence	2.423**	1.195*	1.302**
Non-Executive Director	1.137**	-0.064*	0.185*
Female Directorship	-1.055*	-6.593**	-5.405*
Audit Committee Size	1.456*	0.591**	0.569***
CEO Duality	1.850	0.625	0.887
Ownership Concentration	1.445***	1.948***	1.773***
Log Capital	2.163***	0.472*	0.842*
Log Assets	-3.272***	-2.181***	-2.360***
R^2	0.240	0.190	0.200
Hausman test value		0.793	
F-Statistic	6.95(0.000)	7.58(0.000)	74.9(0.000)
Observations	205	205	205

Note: Table 5 shows the Panel OLS model results using financial leverage as the dependent variable and corporate governance as the independent variable. * is for statistical significance at the 5% level, ** is for the 10% level, and *** is for significance at the 1% level.. Model 1 is the OLS panel regression model without a mediating variable. Model 2 shows the OLS panel regression model with a mediating variable. The values in parentheses with the value of F-stat show the probability value of the F-stat test. Model 1 is the OLS regression, Model 2 is the OLS panel fixed and random effects regression models without any lag value. Model 3 shows the OLS panel fixed and random effects regression models using a lag-1 value.

The mediating variable also had a positive and significant effect on the model, and successfully mediates the relationship between corporate governance and firm performance. In Model 2 on the basis of the Hausman test value 0.999, we selected the random effects model. The R-square value in Model 2 is 0.0650, which shows there is a positive relationship between corporate governance and firm performance, and about 6.5% of the variation in firm performance is explained by the included explanatory variables. These findings align with a recent publication by Wang and Muhammad (2020b). The model is also a good fit as value of the F-test is significant. This result provides evidence in support of our hypotheses.

3. Mediating Role of Financial Leverage

In this section, we are measuring financial leverage as a mediator between corporate governance and the performance of firms listed on the Pakistan Stock Exchange. For this purpose, simple OLS and Fixed and Random Effects Models are applied with proposed variables, and the results are below

Table 5 indicates the results of corporate governance on financial leverage. Model 1 show the results of Pooled OLS, and it indicates that board independence, female board members, audit committees, and ownership concentration has a positive and significant effect on financial leverage.

Models 2 and 3 describe the results of the panel fixed and random effects models and Hausman test, which revealed the appropriateness of the random effects model to assume variations across firm, and it shows audit committee and ownership concentration have a positive and significant effect on financial leverage. In the previous section, governance factors and firm performance results showed that most governance indicators did not have a significant impact on the performance of firms. In contrast, this section shows that most governance factors have a significant impact on firm financial gain, indicating mediation between corporate governance and firm performance. However, we measure the depth of this mediation using follow-up analyses.

Table 6. Test for Mediation Analysis

Variables	Test Statistics	Standard Error	P-Value
Board Size	1.2052023	0.03500574	0.22812521
Board Independence	0.89594086	0.33264361	0.37028435
Non-Executive Director	2.78047437	0.05029753	0.00542795
Female Director	-0.20649983	0.62840244	0.8364005
Audit Committee Size	2.67324946	0.06699263	0.00751204
CEO Duality	1.43205182	0.15889788	0.15212899
Ownership Concentration	2.57504004	0.06902223	0.01002285

Note: The above-listed table shows the results of the Sobel Test of mediation, and according to these results there are three variables mediating the impact of corporate governance on firm performance. This result supports the hypothesis and indicates that financial leverage successfully mediates the relationship between corporate governance and firm performance.

4. Econometric Test for Mediation Analysis

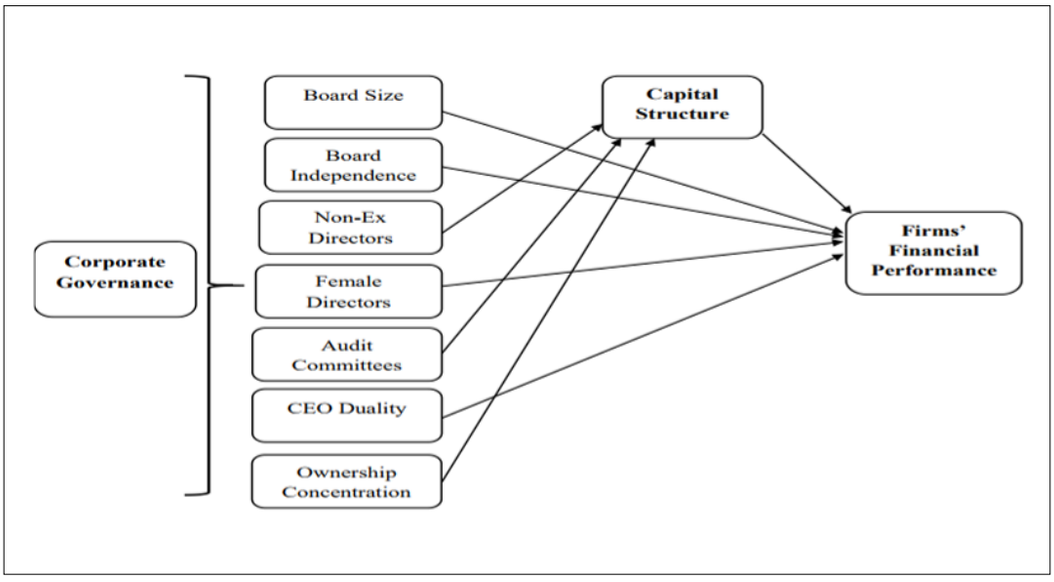
A mediation model is used to identify and explain the process or variable that mediates the relationship between an independent variable and a dependent variable. The Sobel test of mediation is recommended by Preacher and Hayes (2008) for the purpose of testing our mediator variable, financial leverage, as proposed by Detthamronga, Chancharata and Vithessonthic (2017). The equation and results of the test are listed in below.

z-value = a*b/SQRT(b2*sa2 + a2*sb2)

Here a is the regression coefficient for the association between IV and the mediator. sa is the standard error of a. b is the coefficient for the association between the mediator and the DV (when the IV is also a predictor of the DV). sb is the standard error of b.

Table 6 shows the results of the Sobel test, the test of mediation proposed by Preacher and Hayes (2008), and the acceptance rule for the test is at a significance level of 0.05. If the p-value given in the above table is less than 0.05, then it means that the relationship is significant and a mediator role exists. According to our results, there are three components of corporate governance; non-executive director, audit committee size, and ownership concentration are mediating financial leverage when we check the impact of corporate governance on firm performance. Financial leverage is not mediated through the relationship of female directorship and firm performance, which is opposite of the findings of Detthamronga, Chancharata and Vithessonthic (2017). Finally, we affirm the following mediating effect of financial leverage between corporate governance and performance.

Fig. 1. Mediation Effect



V. Conclusion and Practical Implications

The financial sector is playing the main role in the development of the economic system in Pakistan. Without good corporate governance, it is hard to attain economic prosperity. Indeed, corporate governance has been a very interesting topic for the last 10 years. After the financial crisis of 2008, it has become a very hot topic for researchers because one of the main reasons for this crisis was bad corporate governance. We reviewed two ideas in this study. The first was the corporate governance effect and the relationship with firm performance without the mediating variable of financial leverage. The second was the corporate governance effect and the relationship with firm performance with the mediating variable of financial leverage. Outcomes for all results showed that corporate governance and firm performance were positively related. Most variables showed a positive relationship between corporate governance and performance. We also checked the role of the mediating variable of financial leverage on the relationship between corporate governance and firm performance. The results showed that financial leverage mediated the relationship between firm performance and corporate governance positively and significantly. Successful mediation was found between non-executive directors, audit committees, ownership concentration, and the financial performance of listed companies, and has contributed significantly to the existing literature.

One of the important tasks of firm directors is to select the best mix of debt and equity in the capital structure to maximize the financial prosperity of the firm. The best mix of capital structure is the ultimate outcome of good corporate governance. Therefore, this research has provided the best picture for the firm policy makers to decide capital structure for the firm financial well-being.

UNO has provided us with a list of SDGs for the future sustainable prosperity of all Member States, and plays a vital role in the success of every country. Meanwhile, sustainable firm financial performance and growth is also an important factor in all SDG scenarios. Therefore, we strongly recommend future researchers consider sustainable firm performance while measuring relationships with corporate governance and capital structure.

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Purchasing Intention for Green Handicraft Products: The Role of Altruistic and Egoistic Values in Green Consumer Behavior

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ABSTRACT

Purpose – Over the years, the rate of green product consumption remins to be lacking despite developments in technology and redirection of business trends. Amidst scholarly studies exploring the diverse nature of this movement, egoistic and altruistic values were found to be valuable motivations in exhibiting ethical behavior toward positive consumption. These two values are strikingly distinct from each other and their influencing effects also vary for every product and/or industry. Hence, it is important to evaluate the effect of these values and motivations separately to develop a better understanding about the appropriate determinants of green product acceptance.
Design/Methodology/Approach – The study analyzed, under the robust foundation of the Theory of Planned Behavior, the green purchase intention for indigenous people-made handicrafts, under the contrasting altruistic and egoistic values. A single organization was subjected under the study with a total respondent turnover of 97. Considering the small sample size, structural equation modelling was used, using SmartPLS, to test the formulated hypotheses. To provide additional business insights for readers, respondent clustering was conducted.
Findings – Results showed altruistic values and attitude towards green consumption as significant positive determinants of green purchase intention. On the other hand, egoistic value is not a predictor of green purchase intention but has an indirect effect through attitude. It was also shown that egoistic values have a larger influence on green product attitude as compared to altruistic motives. These results, at the Philippine context, were relatively unique.
Research Implications – This study has somewhat different results compared to the extant literature, thus, suggesting that both egoistic and altruistic values have a significant and direct influence on green purchase intention. Generalizing the results of this paper might be a challenge considering its sample size, but future research can use its results as a take-off point for further analysis.

Keywords: altruism, attitude towards green consumption, egoism, green consumption behavior
JEL Classifications: D64, L20, M31, Q13

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I. Introduction

In the past decades, consumer consumption has increased immensely across the globe, leading to the degradation of natural resources and severe damage to the environment. Resulting concerns led the society to advocate for "sustainable development," which emphasizes the need to promote development initiatives and practices that will have a lasting positive effect in communities and societies. This advocacy aims to minimize the negative impact of continuous industrialization and encourage eco-innovation and green consumption. Green consumption focuses on the responsible behavior of consumers in considering the environmental effects of purchasing, using, and disposing of consumed products (Moisander, 2007). Unfortunately, through the years, the "green consumption movement" has not picked-up significantly in the Philippines. This was evidenced by the prevailing crises on plastics and the prevalence of unsustainable production practices in the country. In effect, the National Economic Development Authority (NEDA) had formulated a strategic plan for sustainable consumption and production in hopes of spurring green consumerism among Filipinos (NEDA, 2019).

Although numerous studies explored green consumption behavior, only a few studies were conducted to contextualize "green movement" in the Philippines. According to the exploratory study of Gregorio (2013), green consumerism is country-specific as it is relative to differences in beliefs and cultures, hence, the need for further studies under the Philippine context. Furthermore, comprehending Filipino green behavior also requires the investigation of motivational issues of the behavior. This study hopes to provide a scientific marketing approach, based on the theoretical foundation of the modified Theory of Planned Behavior to help understand Filipino consumers' intention to purchase handicraft products. Motivations such as altruism and egoism were tested as valuable predictors of purchase intention, along with the "attitude towards green purchase behavior".

Over the years, green consumerism remains an unusual practice despite developments in technology and diversion of marketing. Studies show that consumption behavior and human values are significant explanations behind this (Gatersleben, Murtagh, & Abrahamse, 2014; Paco, Alves, & Shiel, 2013; Stöckigt, Schiebener, & Brand, 2018). However, only a few studies have considered its influence (Bickart & Ruth, 2012), but some literature attribute egoistic values and altruistic values to be key determinants for demonstrating ethical behavior (Prakash, Choudhary, Kumar, Garza-Reyes, Khan and Panda, 2019; Yadav, 2016; Yadav and Pathak, 2016) that may lead to green consumption. With this premise, this study shall address the research question: "Do altruism and egoism values (motivations), along with green attitude behavior, influence consumers' intention to purchase eco-friendly handicraft products?"

The study aimed to provide another perspective on green consumer behavior and its underlying cognitive motivations. Specifically, it focused on the following objectives:

a. To understand the underlying determinants of purchase intention for indigenous-made handicraft products made by indigenous people, under the context of green consumption; and

b. To understand the role and effect of altruistic and egoistic values (motivations) on purchase intention.

II. Review of Literature

Green consumption, as defined by Connolly and Prothero (2008), is a form of consumption that prioritizes the sustainability for the present and future generations. This ascribes to consumers' responsibility in addressing environmental problems by developing environmental-friendly behavior, such as the use of organic products, cruelty-free, clean and renewable energy and the research of goods produced by companies with minimal to no negative impact to the environment. A green product is one which satisfies consumers' needs without damaging the environment, thus, resulting to green consumption behavior. Green products are derived from safe raw materials that underwent environment-friendly production process (Chen & Chai, 2010).

1. TPB and Green Consumer Behavior

To explain consumer green purchase behavior,

existing literature focused on describing attitude and behavioral intentions towards green products (Davies, Foxall, & Pallister, 2002; Vermeir & Verbeke, 2006; Wheale & Hinton, 2007). The Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980) and the Theory of Planned Behaviour (TPB) by Ajzen (1991) were the two prominent theoretical approaches utilized by earlier studies. The TPB, an extended version of the TRA, was used by many in exploring consumer attitude, intentions and actual purchasing behavior (Arvola et al., 2008; Smith & Paladino, 2010; Tarkiainen & Sundqvist, 2005). However, these studies show a weak relation between the attitude of consumers towards purchasing green products and their actual purchasing behavior. This is commonly referred to as the attitude-behavior gap (Joshi & Rahman, 2015). Nonetheless, despite the classical nature and limitations, TPB remains to be the most relevant and widely used behavioral framework for researchers especially in predicting and explaining green purchase intention. This is supported by recent studies in green consumption purchase behavior as cited in this study.

There is a dearth of studies pertaining specifically to handicraft purchase intention. Earlier literature stated a significant relation between demographic variables like age, gender, education, income, occupation and the consumer's buying intention. Some also cited the effects of intrinsic values (Rani & Banis, 2014), cultural and religious motivations, aesthetic and artistic value, and income and expenditures (Bal & Dash, 2010; Dash, 2011; Pani & Pradhan, 2016), and utility and functionality (Dasgupta & Chandra, 2015; Dash, 2011; Rani & Banis, 2014) as determinants of consumers' purchase intention. Researchers attribute this to the consumer's positive satisfaction of its needs and/or wants which can be summed as the egoistic motivations towards their intention to purchase because these have positive effects on the consumers (De Silver & Kundu, 2013; Joshi & Rahman, 2015). Few researches attribute eco-friendly related factors as determinants, collectively, these can be classified as altruistic values (Joshi & Rahman, 2015).

2. Altruism, Egoism and Green Consumer Behavior

Green consumer behavior may be defined by these characteristics: (1) choice of purchase, use and post-use of a product, household management, collective, and consumer activism behavior, reflecting pro-environment motivation (Peattie, 2010); (2) purchase and use of products which has low impact to the environment (Pinto, Herter, Rossi, & Borges, 2014); and (3) organic product consumption, made through either low energy and recycling (Haws, Winterich, & Naylor, 2013). A green consumer acts ethically motivated because of his or her respect and interest in the preservation of the entire society and he or she takes into account the environmental consequences (costs and benefits) of his or her private consumption. According to Bertoli, Bonera, Codini, Corvi, and Miniero (2014), there are two types of green consumers: prevention-type and promotion-type. Prevention-type consumers are those who have a sense of moral obligation towards a greener lifestyle; and the promotion-type consumers are those who are more focused on their aspirations and do not feel the pressure to quickly adjust in becoming environment-friendly. These two types of consumers exhibit values that are consistent to the concepts of altruism (self-less) and egoism (self-centric). Although green consumers are mindful of their assets, consumers, generally, are still not fully mindful of the importance of environment-friendly purchasing behavior, according to Bertoli et al. (2014). This implies that most green consumers do not behave consistently because of social and economic constraints, since green products are found to be much more expensive than non-green ones. The following literature that touched on the concepts of altruism and egoism as antecedents of green consumption behavior was tabulated in Table 1. The contradicting results of the studies had vital repercussion for future business research and management implications. The influence of each value might differ for every context which is why managers shall apply specific strategies depending on the given industry. Also, studies show that personal benefits (egoistic) have received more attention than environmental consideration (altruistic) in the context of ethical consumption (Andersch, Arnold, Seemann, & Lindenmeier, 2019; Tsarenko, Ferraro, Sands, & McLeod, 2013; Yadav, 2016).

Table 1. Literature Review Summary on Both Altruism and Egoistic Effect to Green Consumption Behavior

Author	Relevant Findings
Stern (2000)	• Altruistic and egoistic values influence green consumer behavior.
De Groot and Steg (2009)	• Altruism and egoism influence purchase intention, thru pro-environmental behavior.
Yazdanpanah and Forouzani (2015)	• Consumer motivations and values are important factors for green purchase intention; altruism and egoism influences both attitude and purchase intention; values and attitudes as predictors of green behavior rather than perceived behavioral control and subjective norms; attitude has the most effect on purchase behavior
Prakash et. al. (2019)	• Altruism and egoism influence both attitude and purchase intention; altruistic value (environmental concern) has the more significant role in predicting attitude and purchase intention for using eco-friendly packaging.
Kim and Kwon (2016)	• Altruistic value (environmental concern) has the more significant role in predicting attitude and purchase intention for faux furs.
Schuuring (2018)	• Altruistic value (environmental concern) has the more significant role in predicting attitude and purchase intention.
Filho, Cardoso, and Barboza (2019)	• Altruism and egoism influences both attitude and purchase intention; altruistic value (environmental concern) has the more significant role in predicting attitude and purchase intention for using eco-friendly packaging
Kareklas, Carlson, and Muehling (2014)	• Altruistic value has a higher impact on green behavior.
Murarolli (2014)	• Altruistic motivations have high impact on green consumer preferences and behavior.
Yadav (2016)	• Egoistic values have the most impact on green purchase intention.
Weibel, Messner, and Brugger (2014)	• Healthy food consumption is more affected by egoistic motivations rather than altruism.
Yadav and Pathak (2016)	• Altruism (environmental concern) and egoism (health consciousness) influence both attitude and purchase intention; Attitude has the most effect on purchase behavior.
Powers and Hopkins (2006)	• Altruism (thru environmental and humanitarian issues) were given importance by consumers.
Braga, Silver, Gabriel, and Braga (2014)	• Environmental concern (altruistic value) predicts purchase intention.
Goncalves, Lourenco, and Silva (2016)	• Angles of green purchase intention studies are the categorization of these values and motivations into self-centric (altruistic) or self-less orientation (egoistic), as relevant predictors of and in combination with attitude.
Dasgupta and Chandra (2015)	• Handicraft consumers were found to be motivated by seeking for novelty items reflecting the coveting of consumers to satisfy their egoist values; sustainability and pursuit of artisan connection viewed as an altruistic value concerning both the environment and the welfare of artists; The emotions, motivations and values were utilized as guiding factors in shaping purchasing behavior.
Choi and Johnson (2019)	• Egoism (hedonic motivations) and altruism (environmental concern), along with attitude were found to be significant predictors of green purchase intention; a notable omission to the model was perceived behavioral control and subjective norms.
Birch, Memery, and Kanakaratne (2018)	• Altruistic (environmental consciousness), egoistic motivations, along with ethical identity, were found to have relative importance in influencing Australian consumers' attitudes, and purchase intention to buy local food; egoistic value has a higher influence on purchase intention
Asif, Xuhui, Nasiri, and Ayyub (2018)	• Egoistic values, rather than attitude and altruism, have the most impact on green purchase intention.

III. Research Framework

The study of Joshi and Rahman (2015) validated the relevance of altruism and egoism as two of the future research directions in green purchase behavior through a critical review of 53 empirical articles. This review identified various motives, facilitators and barriers affecting purchase decision-making and provided possible explanations for inconsistencies reported in green purchase behavior. In the same study, consumer's environmental concern and products functional attributes emerged as the two major determinants of consumer green purchase behavior. These can be viewed as intermediaries to both the altruistic motive (environmental concern) and egoistic motive (functional attributes). These two factors are strikingly different for they have a negative correlation. Altruism is 'concern for others' while egoism is 'concern for self'. Thus, it is clear from the above discussion that consumer behavior is not only affected by attitude, but also by various other personal (motivations, values, among others) and situational (level of income, price sensitivity) factors. Further, these factors can either strengthen or weaken the attitude-behavior relationship. Despite the classical nature of the TPB, it remains to be a relevant and the most popular behavioral framework for researchers especially in predicting and explaining purchase intention. The robustness and applicability of the TPB in the context of modern green consumer behavior makes it the most viable theoretical framework for the analysis of purchase intention among handicraft products. The causal relationships of the two values/motivations with attitude to green purchase were no longer tested due to the established relationship, as cited in previous literature.

1. Altruistic Value/ Motivation

Several studies find environmental concern as a reflection of altruistic values. As per Heberlein (1972), altruistic motives are essential in shaping consumer behavior towards the environment. These motives and values drive environmental consciousness as reflected in their efforts to address environmental problems via green purchasing. This supported the significance of altruistic values as a vital determinant of purchase intention. Therefore, we assume that the environmental concern of customers is a key factor that influences their purchase intention of indigenous people-made handicraft products. Hence, this study hypothesized that:

H1: Altruistic values of customers positively influence their purchase intention towards indigenous people-made handicraft products.

2. Egoistic Value/ Motivation

In relation to egoistic motivations, most of the literature focused on commodities like organic food, rice and other perishable goods. The most common construct being used is the egoistic desire of being healthy as what was done in Yadav (2016), Yadav and Pathak (2016), Birch et al. (2018) and Prakash et al. (2019). Egoistic motivations that are deemed to be a self-enhancement and self-centric usually desire personal benefits. De Groot and Steg (2008) presented examples of egoistic motivations such as social power, wealth, authority, influence, and ambition. On a more grounded approach, Joshi and Rahman (2015) stated that functionality (e.g. price affordability, good aesthetics, cultural identity) is also an egoistic desire. This is consistent in handicraft purchase intentions. This makes the egoistic values/motivations a possible construct to be used in analyzing the green purchase intention of non-perishable goods, such as handicrafts. Egoistic values and motivations then will lead to an improved intention of green purchase behavior. Hence, this study hypothesized that:

H2: Egoistic values of customers positively influence their purchase intention towards indigenous people-made handicraft products.

3. Attitude towards Green Consumption Behavior

In the TPB framework, attitude is one of the determinants of behavioral intention. This means that attitude is interpreted as the extent of an individual's favorable or unfavorable assessment of a particular behavior (Ajzen, 1991). In the environmental context, attitude is defined as "cognitive and affective evaluation of the object

of environmental protection" (Bamberg, 2003, p. 21). Many studies have affirmed that environmental attitude is one of the strongest predictors influencing environmental behavior. The influence of attitudes on behavioral intentions regarding pro-environmental consumer behavior is also evidenced in some studies (Bong Ko & Jin, 2017; Prakash et al., 2019; Schuuring, 2018; Yadav, 2016; Yadav & Pathak, 2016). For example, the previously cited studies found a significant positive influence of attitude on green purchase intention. This led to the following hypothesis in this study:

H3: Attitude towards the product positively influences the intention to purchase indigenous people-made handicrafts.

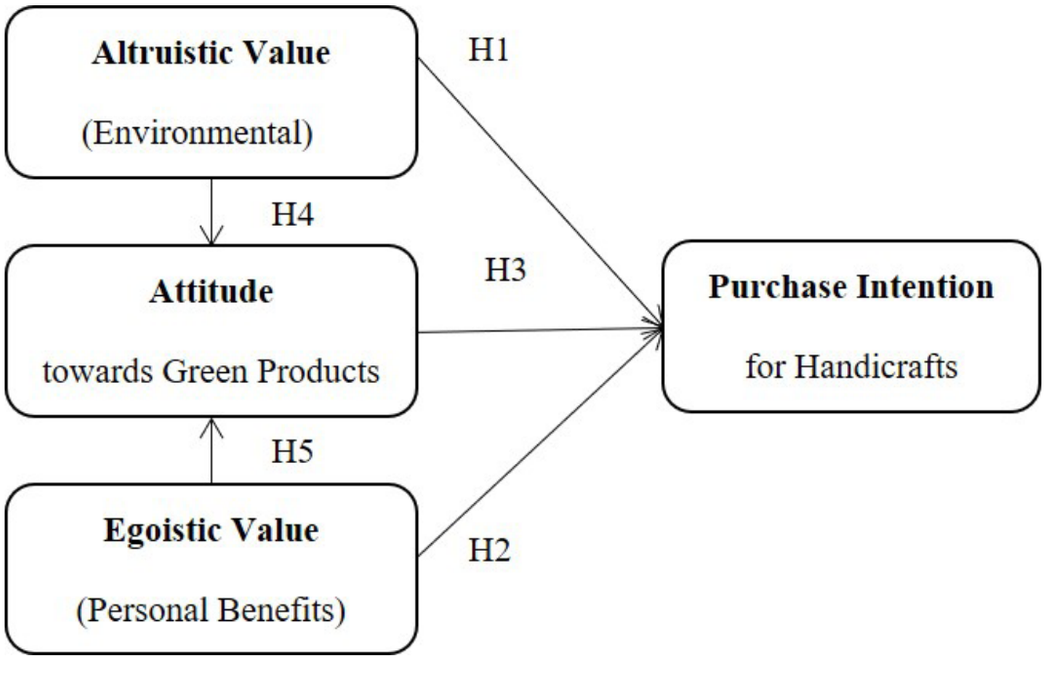
4. Effect of Altruistic and Egoistic Values on Attitude towards Green Consumption

As analyzed in the studies of Yadav (2016), Yadav and Pathak (2016) and Prakash et al. (2019), altruistic and egoistic consumers' values affect attitude towards green products, thus, leading to their behavior. To further provide a better understanding as to the effect of each variable on attitude, both were tested to compare their impact on green consumption using green behavior attitude as a mediating variable towards purchase intention. Hence, this study also hypothesized that:

Hypothesis 4 and 5: Egoistic and altruistic values positively affect consumers' attitude towards green behavior.

A notable omission to the model was the concepts of Perceived Behavioral Control and Subjective Norms. Studies on the perspective of egoistic and altruistic values as determinants of purchase intention (Birch et al., 2018; Choi & Johnson, 2019; Prakash et al., 2019; Schuuring, 2018; Yadav, 2016) have showed an insignificant relation of the norms with green purchase intention. Hence, these variables were no longer included in the theoretical aspect of the research framework.

Fig. 1. Research Framework for the Purchase Intention of Indigenous People-made Handicrafts



IV. Methodology

1. Research Design

The research employed a formal study that used quantitative methods and actual empirical testing to analyze the significant and causal relationships among the identified variables and the intention to purchase indigenous hand-made handicrafts. Relative to time-dimension, the study was cross-sectional in nature, which collected data at a single snapshot in time, based on respondents' individual perceptions. To test the theoretical applicability, structural equation modeling was employed, as what other literature into the green consumption field also employed.

2. Sampling Design

A total of 97 respondents were included in the study. They were sought from a single organization that was assumed to have historical inclination in exhibiting green consumption behavior. The organization is engaged in research, development, and transfer of forest-based technologies to both public and private organizations. With a population size of 200 personnel, 97 individuals were randomly selected for the study. Their demographical characteristics are summarized in Table 2. Gender representation among the respondents was relatively mixed with 55% males and 45% females. For educational background, all the respondents were college-educated, with 42% having advanced degrees. Single individuals were the most represented (71%) among the respondent pool with only 28% married. Also, the 97-sample size has reached the minimum size requirement of literature pertaining to the use of structural equations modeling. According to Hair, Risher, Sarstedt, & Ringle, (2014), minimum sample size for partial-least squares using structural equations modeling should be 10 times the largest number of formative indicators measuring a single construct. In this study, as shown in Figures 2 and 3, the largest number of indicators is 7, thus, requiring a minimum sample size of only 70.

Table 2. Summary of Respondent Profile

Demographic	Characteristics	Frequency	%
Gender	Male	53	55%
	Female	44	45%
Education	College	56	58%
	Post-Graduate	41	42%
Marital Status	Single	69	71%
	Married	27	28%
Generation	1946-1964 (Baby Boomers)	6	6%
	1965-1981 (Generation X)	27	28%
	1981-2000 (Generation Y)	64	66%
Monthly Income*	P9,821.00-P19,040.00 (Low Income)	14	14%
	P19,041.00-P38,080.00 (Low-Middle Income)	50	52%
	P38,081.00-P66,640.00 (Mid-Middle Income)	26	27%
	P66,641.00 and higher (Upper-Middle Income)	7	7%

Note: *To convert to U.S. dollar equivalent, one may use the following exchange rate: PHP 50.50 = USD 1.

Table 3. Summary of Construct Reliability and Validity

Constructs	Items	Loadings	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Altruistic Values	AV1	0.780	0.929	0.931	0.943	0.703
	AV2	0.812				
	AV3	0.877				
	AV4	0.887				
	AV5	0.844				
	AV6	0.850				
	AV7	0.813				
Attitude to Green Products	AGP1	0.942	0.968	0.974	0.974	0.845
	AGP2	0.934				
	AGP3	0.709				
	AGP4	0.957				
	AGP5	0.968				
	AGP6	0.952				
	AGP7	0.943				
Egoistic Values	EV1	0.758	0.959	0.967	0.966	0.805
	EV2	0.907				
	EV3	0.914				
	EV4	0.967				
	EV5	0.922				
	EV6	0.952				
	EV7	0.842				
Purchase Intention	PI1	0.638	0.871	0.933	0.898	0.601
	PI2	0.64				
	PI3	0.90				
	PI4	0.64				
	PI5	0.88				
	PI6	0.89				

Table 4. Discriminant Validity

Constructs	AV	AGP	EV	PI
Altruistic Values	0.838			
Attitude to Green Products	0.838	0.919		
Egoistic Values	0.848	0.901	0.897	
Purchase Intention	0.778	0.813	0.763	0.775

For the generational demographic, most of the respondents belong to the Generation Y group or much well-known as "Millennials." They were followed by Generation X (28%) and the Baby Boomers at 6%. To finish, information as to the income of the respondents were also collected. The classification was derived from the report of Albert, Santos and Vizmanos (2018). Based on this classification, most of the respondents are within the low-middle income (52%) group, with the upper-middle income group having the least depiction (14%). Mid-middle-income people were also represented with 27% of the entire sample. This description will be useful in the respondent clustering to be discussed in the latter portion.

V. Results and Discussion

1. Reliability and Validity of Research Constructs

To ensure scale reliability, internal consistency and composite reliability, the Cronbach's alpha was applied (Cronbach, 1951). As stipulated by Peterson (1994), acceptable Cronbach's alpha value is at least 0.70 or higher. As shown in Table 3, all of the constructs were acceptable with purchase intention having the least value at 0.871.

For internal consistency reliability, the composite reliability figures were shown to be mutually interchangeable. Lastly, to check for convergent validity, the Average Variance Extracted (AVE) was obtained to examine the proportion of item variance explained by the construct. Fornell and Larcker (1981), have set the standard for AVE validity to be at least 0.50, for it signifies that a construct can explain about 50% of the variance of its indicators on average. In Table 3, all of the constructs have passed the AVE threshold.

The next step was to check discriminant validity using Fornell-Larcker criterion. This method contrasts the square root of the average variance extracted (AVE) with the correlation of latent constructs; and the latent constructs should explain the variance of its own indicator better rather than the variance of other latent constructs. With this, the shared variance for all model constructs should not be larger than their AVEs (Hair, Risher, Sarstedt and Ringle 2019). As shown in Table 4, the diagonal values are higher than the correlations with other latent variables, which established the discriminant validity of the constructs.

2. Construct Correlation

Using SPSS 20, the correlation of the construct averages was obtained. This was made to establish the linearity as a required assumption in regression analysis. Table 5 showed that all of the variables are significantly correlated from each other with strong positive associations. It can be deduced that each of the variables has a significant influence on the other existing variables.

Table 5. Correlation Among Constructs

Constructs	AV	AGP	EV	PI
Altruistic Values	1.000			
Attitude to Green Products	0.823*	1.000		
Egoistic Values	0.831*	0.893*	1.000	
Purchase Intention	0.739*	0.744*	0.690*	1.000

Note: *Significant correlation at the 0.01 level (2-tailed).

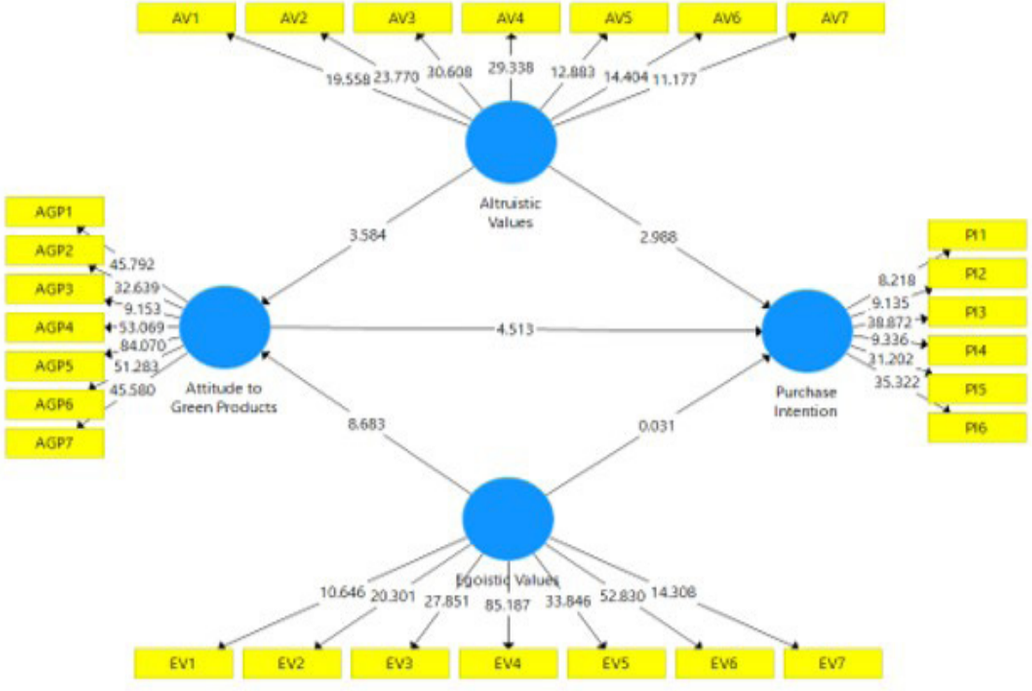
3. Hypotheses Testing

Moving forward to the analysis of path coefficients and the testing of the hypothesis, Table 6 summarizes these results. Table 6 showed that all of the hypotheses were supported by the results of the structural equation modeling, except for H5. This is consistent with several literature (Prakash et al., 2019, Yadav, 2016; Yadav & Pathak, 2016). With a p-value of less than 0.05, there is enough evidence to support the findings that the propositions have positive effects on purchase intention. On the other hand, egoistic values, in the form of looking for personal benefits, are not significantly influencing green purchase intention. However, it confirmed its strong indirect effect through AGP. The path diagrams were shown in Fig. 2 and Fig. 3 for illustrative purposes.

Table 6. Summary of Path Coefficients

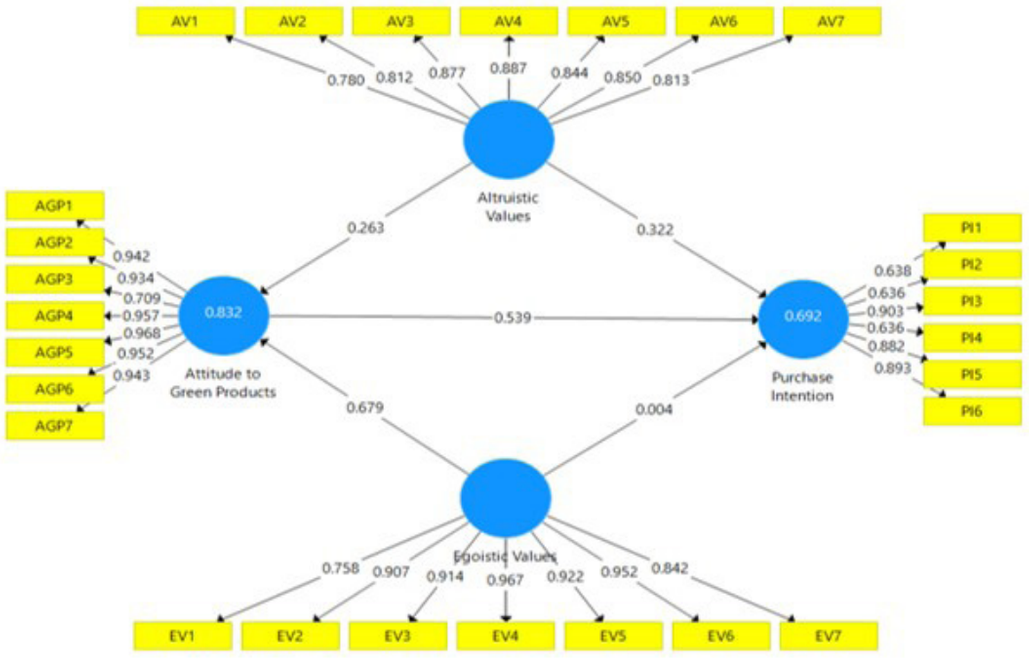
Path Coefficients	Beta Values	Sample Mean (M)	t-value	p-value	Decision
AV → PI	0.322	0.329	2.931	0.003	H1: Supported
AGP → PI	0.539	0.532	4.388	0.000	H2: Supported
EV → AGP	0.679	0.676	8.246	0.000	H3: Supported
AV → AGP	0.263	0.260	3.334	0.000	H4: Supported
EV → PI	0.004	0.003	0.033	0.975	H5: Not Supported

Fig. 2. Path Diagram of the Research Framework Using Structural Equation Modeling



AV can also be seen to have a significant positive indirect effect on PI, through AGP. It is noteworthy though that its path coefficient was higher in terms of direct effect, rather than indirect effect. Scanning by the significant constructs that have a direct effect on PI, AGP is higher as compared to AV. This means that attitude towards a behavior remains to be one of the most important aspects that lead to intention behavior as comprehensively discussed by the literature, behavioral theories and models pertaining to intention.

Fig. 3. Results of the Regression and the Predicting Power of the Model



Looking at the explanatory power of the model, understanding the influence of AV and EV to AGP was considerably strong (R^2=0.832; Adj. R^2=0.828). On the other hand, predicting for purchase intention was only considered moderate to strong (R^2=0.692; Adj. R^2=0.682). These results are summarized in Table 7.

Table 7. Coefficient of Determination

R-square	R-square	Adjusted R-square
Attitude to Green Products	0.832	0.828
Purchase Intention	0.692	0.682

4. Respondent Clusters According to Purchase Intention

As an added feature of the study, respondent clustering using their intention to purchase handicrafts were analyzed. This was summarized in Table 8. The score of each of the respondents regarding purchase intention was grouped according to the degree of their agreement in purchasing handicrafts. Values of 1.00 to 3.39 were classified to be the uninterested respondents. On the other hand, respondents who gave an average purchase intention score of 3.40-4.19 were labeled as undecided. Lastly, 4.19-5.00 was assigned as the most promising respondent group, that is, being the most interested people to purchase handicrafts. Each of the clusters was cross-tabulated with each of the demographical characteristics to formulate clustering information. Using a 5% level of significance, all of the demographical characteristics can be differentiated across the purchase intention clusters, except for marital status. It can be seen in Table 8 that most of the respondents belong to the interested group (71%), with the undecided bunch comprising only 23%. Lastly, the disinterested people are only at 6% of the respondent pool. This is relatively favorable since majority has the intention to purchase handicrafts made by indigenous people.

Table 8. Classification of Purchase Intentions per Demographic Characteristic

	Uninterested (1.00-3.39)	**Undecided** (3.40-4.19)	**Interested** (4.19-5.00)
No. of observations	6	22	69
Gender* **			
Male	3	17	24
Female	3	5	45
Education* **			
College	6	6	44
Post-Graduate	0	16	25
Marital Status[NS]			
Single	6	15	49
Married	0	7	20
Generation* **			
1948-1960 (Baby Boomers)	0	4	2
1961-1981 (Generation Y)	0	5	22
1982-2004 (Millenials)	6	13	45
Monthly Income* **			
P9,521.00-P19,040.00	0	6	8
P19,041.00-P38,080.00	6	0	44
P38,081.00-P66,640.00	0	16	10
P66,641.00 and higher	0	0	7

Notes: 1. ***Significant at 5% level of significance.

2. [NS]Not significant.

Most of the interested respondents are college-educated females who are single millennials. They also have low-middle incomes that suggest relatively enough financial capacity to execute such purchases. There are also representations from the mid-middle-income groups. On the other hand, the undecided group is mostly composed of single post-graduate males. Most of them also belong to the millennials group with some baby boomers. Their financial capability was characterized as that belonging to the mid-middle-income group, which is higher than the "Interested" cluster. To finish, the "Uninterested" cluster has no distinct age representation, and all are single individuals. All of them also are millennials with low-middle level salaries.

VI. Conclusions

The study provided important insights as to the cognitive motivations of consumers towards green behavior. It answered the questions of researchers as to the non-product motivations and values influencing green purchase intention. As what the results show, altruistic value has a direct, significant, and positive influence on consumers' purchase behavior. Furthermore, as supported by countless studies, attitude towards green behavior positively affects intentions to purchase (indigenous people-made products). The individual testing of independent variable relative to purchase intention showed that attitude, as compared to the other variables, has the most impact with regards to green purchase intention. Marketers can take advantage of this by focusing on improving and changing the attitude of consumers towards green behavior, rather than focusing on other aspects. Consequently, the combination of altruistic values and egoistic values showed a more intensive explanatory towards addressing attitude to green behavior. As significant drivers of attitude, management can center their attention to catering to these sub-constructs to improve their indirect effect towards purchase intention. Additionally, egoistic value (personal benefits) is being presented as a better motivator for Filipino consumers, which are the focal point of this study, compared to altruistic value (environmental concern). Marketers can use these to employ strategies that shall make 'personal benefits' as a centerpiece of marketing initiatives. These go along with the traditional differentiating activities that promised value according to the entire self-centric benefits that consumers might get from availing a product.

Furthermore, government institutions, as premier drivers of society, should be the main catalyst of improving consumer attitude towards green behavior. Issues on sustainability can be used as an appealing campaign in the hopes of convincing consumers to adopt green products instead of the natural resource-exploitative products. Greener alternatives that are renewable, yet which simultaneously cater to the individual needs of consumers, should be promoted for general consumption. Institutions that were tasked to change social behavior for the betterment of society would have an understanding of the importance of personal attitude in obtaining the green consumption behavior of the public. Awareness campaigns and incentive programs in the hopes of changing the mindset of consumers should be implemented. Agencies that help to push the consumption of green products to society would benefit from the results of this study since the general communication strategy can now be implemented with due consideration to the perception of the direct consumers. Marketing can now plan to revolve around a strategy towards improving consumer attitude towards green products. At the same time, highlighting environmental concerns that might motivate more buyers to purchase the indigenous people-made handicrafts should be given priority.

Despite the generally positive results of the study, it also has limitations that future researchers can look into. For one, as mentioned by the respondents during data probing, the fear components of unfavorable future events made them decide to be more of green consumers. This was mentioned in the studies of Lemanski and Villegas (2018). Research on fear level and options available for consumers to reduce their level of threat was undertaken to determine what effect these variables have on attitudes, purchase intentions, and emotions. Concern for the environment has an encompassing effect in the psychology of consumers, thus, future research can look into the possibility of fear factors as a possible antecedent of green purchase (intention)

behavior. Consequently, an aspect that can also be explored is the link of charity and empathy in consumer behavior. In the background of this study, indigenous people were viewed as marginalized minorities and a perspective on the uplifting of their lives through purchases will help their social statures. Studies on the link of empathy to consumer behavior were made by Escalas and Stern (2003) and Wieseke, Geigenmuller, and Kraus (2012). This dimension of human emotion and its effect to altruistic value and motivation may be looked into. The current study has limited sample size to be "generalized" and accepted for other contextual frameworks and industries. Future researchers may seek to delineate and explain why there is a prevailing trend on the aforementioned contrasting results. Lastly, this paper does not measure the actual purchasing behavior of customers in the given context and hence, does not address the issue of "value-action gap." Future researchers can use the results of this research to extend it to accommodate the actual purchase behavior of consumers under the context of egoistic and altruistic values.

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