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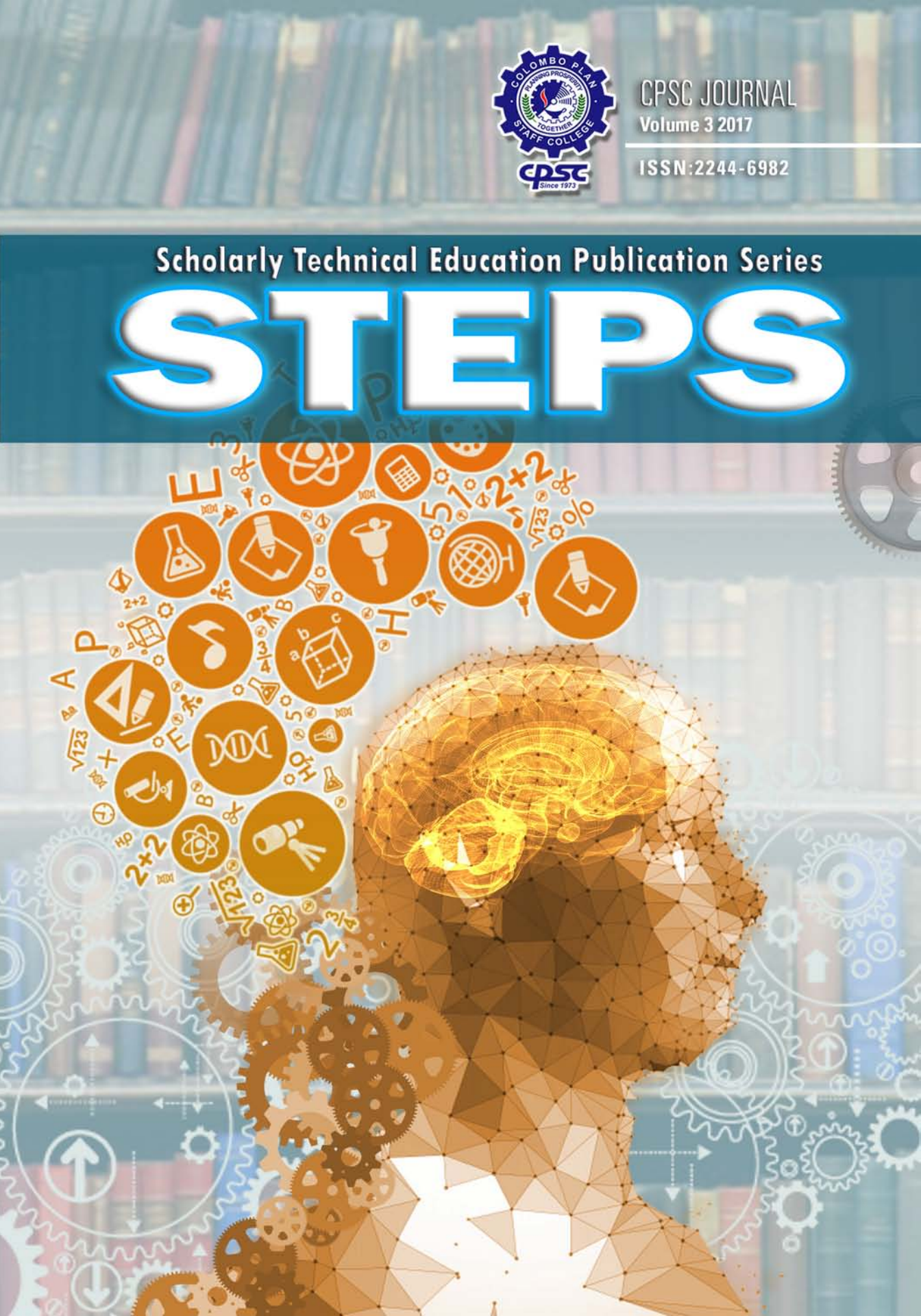

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Preface

Now on its third volume, the Scholarly Technical Education Publication Series (STEPS) is a testament of CPSC's continued effort to provide a venue for researchers and administrators to showcase their expertise in the field of TVET. Six authors from India, Malaysia, Philippines and Kenya, as well as from our organizational partner, UNESCO-UNEVOC, went through an arduous process of submitting and editing their manuscripts to conform to the highest academic and research standards that we expect for a journal like STEPS.

Themes highlighted in this issue include the relevance of TVET in the future of academic education, the significance of accreditation systems in TVET such as CPSC's Asia-Pacific Accreditation and Certification Commission (APACC), a conceptual framework for online learning designed for women and community attitudes towards TVET. Also featured in the journal are three initiatives developed by TVET students: First is a mechanism for the visually-challenged to enable a much comfortable mobility despite their disability; Second is a portable smokehouse that is conceptualized by the need to provide a community-based training in the author's locality; Third is an initiative that facilitated an easier communication by people who work in the maritime industry by using coordinated hand signals and gestures.

This volume is also my debut publication as the 11th CPSC Director General and I am pleased to communicate that initiatives such as these will be continued to further showcase the excellence of TVET practitioners not only in the Asia-Pacific region but in the whole world as well.

On behalf of CPSC and the Editorial Board, I am expressing my sincere appreciation to all the authors who responded to our call for paper submissions and gave their full trust and confidence to us to scrutinize, check or even evaluate their manuscripts. We have received numerous papers coming from people of different nationalities and backgrounds, and despite the difficulty of coming up with six papers, we acknowledge the effort placed by each author in their manuscripts that demonstrate their expertise or knowledge in the subject. Their contribution, definitely, is highly valued and we hope to further encourage more authors to develop and document their initiatives for future inclusion in the journal.

We also appreciate the efforts of the six authors featured in this volume. Their patience and understanding to answer and revise their manuscripts as recommended by the editors and reviewers is indeed a painstaking, and sometimes challenging, process that will eventually yield rewarding results. Their perseverance, expertise and wit further encourages us to adhere and pursue the best version of this journal with the interest of the reading public and researchers in mind.

Lastly, my sincere appreciation as well to the members of the editorial board who were relentless in their pursuit of the highest academic standard by conscientiously and meticulously going over each submission, recommending the best option for the authors and selecting only the best and the brightest among the numerous submissions that they received.

I and the contributing authors share a common aspiration that technical education is a gold mine of ideas, innovations and transformation that can someday help in shaping the way we provide skills to the members of our labor force. This academic journal forms the core of this vision. I am confident that through these efforts, we will establish TVET as a body that does not only provide technical skills but also a sector that encourages a rigorous academic engagement and exchange of ideas, in response to the challenges that we face today.

Ramhari Lamichhane, PhD
Editor-in-Chief

Table of Contents

TVET and Academic Education: A Blurring Distinction- New Opportunities for the Future

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Abstract

This paper attempts to study the blurring distinction between TVET and academic Higher Education (HE) and the prerequisites to create stronger ties between these sectors by improving the chances of permeability and facilitating learning pathways.

Despite significant economic and social progress until date, high youth unemployment, social disparities and environmental degradations create challenges for all countries, which require the transformation of TVET through economic, social and environmental dimensions. TVET graduates will have to acquire a holistic competence, whether this is related to work, education, citizenship or personal issues and which is expected to adapt to complex and unpredictable conditions. This is to address any address economic, societal and personal developments and changes that is unfolding in the world today. The authors assume that a consequently implemented shift to competence oriented learning outcomes, addressing both theoretical and practicable occupational requirements in the development of programs and qualifications, will make the capability to act in TVET, across the education and training systems and the labour markets more explicit.

The authors assume that more qualification types and programs with cross-sector doctrine and competence-compatible design of curricula and examinations will have to be designed and monitored, which address requirements of both the occupational labour market and the academic education at the same level. They conclude the discussed developments and demand generate a new space for TVET future by the fusion of academic drift in vocational program and vocational drift in academic program, which will reinforce solutions to promote permeability and mobility across education and occupational sectors.

The Global Context and the TVET Agenda

Our time is an era of transitions. This is also a time of turbulence as well as time of challenges. The challenges which threaten the economy, society and the environment

are numerous, complex and interconnected. In spite of significant economic and social progress till date, high youth unemployment, social disparities and environmental degradations create challenges for all countries. These challenges threaten human security, dignity and social cohesion. Peace is fragile. Large number of people in this world still suffers from poverty, hunger and inequalities. Many targets of the Millennium Development Goals (MDG) remain big unfulfilled promises and need to be redefined in new and challenging environment of economic, social and environmental perspectives. Therefore a new vision for people, the planet, prosperity, peace and partnership has to be holistic, universal, rights-based and humanistic.

Global goals require global solidarity, international dialogue and an inter-sectoral, interdisciplinary approach as expressed in the commitment made at the United Nations Sustainable Development Summit 2015, 'Transforming our World: The 2030 Agenda for Sustainable Development'. The 2030 Agenda has 17 Sustainable Development Goals (SDGs), including SDG 4 which reads, 'To ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'. (cf. United Nations 2015)

Three targets are of special significance for Education and Training by 2030:

- ensure equal access for all women and men to affordable and quality technical vocational education and training and tertiary education, including university;
- substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, entrepreneurship, societal participation and personal development;
- eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

Meeting these targets requires the transformation and expansion of TVET through appropriate conceptualizations in the design of qualifications and their articulation within education and between education and the world of work. TVET has a central role in helping youth and adults to develop the skills they need for employment, decent work and entrepreneurship, to support the effectiveness of their organizations and the development of their life and communities. TVET also contributes to promoting inclusive and sustainable economic growth, social equity and environmental sustainability. TVET contributes to gender equality, global citizenship education (GCE) and education for sustainable development (ESD). It is of high relevance to transform TVET in a way to maximize its potential to contribute to the achievement of global goals. Accordingly, it is a global task to follow each one of the 17 sustainable development goals (SDGs) including e.g. poverty alleviation and hunger, gender equality, good health, quality education, good decent jobs, renewable energy, fostering innovation and building infrastructure or actions towards the protection of the environment and social security & peace.

Figure 1: Focus Areas of the SDGs

These 17 SDGs are broken down into 169 targets which aim to realize inclusive and equitable economic, social and environmental sustainable development.

Transformative Dimensions and Concepts

Such holistic visions challenge TVET strategies require not only inclusive, equitable and relevant for the needs of work but also transformative and environmentally sustainable. Therefore, skills development and Technical Vocational Education and Training (TVET) being high on member states' policy agenda and so central to international debates, has never been so important and timely as now. It is now at the centre stage in the policy discourse and debate. A large number of member states are deeply engaging in reviewing TVET policies and repositioning its transformative dimension to meet the sustainability development goals (SDG). Following are the key elements of these transformative dimensions.

The most important effect of economic globalization on the modes of work has been manifested at the level of the organization of industrial production. The shift from mass production to a customized approach causes a fragmentation of value chains. A growing proportion of workers are employed in global value chains located in developing economies.

TVET graduates will have to acquire more than the technical Know How required in production but a range of soft skills e.g. the adaptability to constantly changing teams, work environments, communication skills and team work. This reflects a need for not just a more knowledgeable and skilled workforce, but one that can adapt quickly to new emerging technologies in a cycle of continuous learning. As a consequence, there is increasing demand for TVET systems with a greater focus on competency-based programs as well as on cognitive and transferable skills, which are expected to help people adapt to complex and unpredictable conditions. (Majumdar, 2004)

In addition the ICT based Industry 4.0 development will dramatically change company-based organized production and service as transnationally operating value chains. The ICT use is required in a large variety of existing occupations, as well as an expansion of new occupations in the ICT sector. Last but not least the politically induced shift form carbon-intensive production and consumption to economies and societies consequent following sustainable development principles require increasingly green skills, changing skills profiles in existing occupations and the emergence of new occupations, with the introduction of new regulations. Majumdar, 2010

To address these economic, societal and personal developments and changes appropriately TVET graduates will have to acquire prospectively a holistic competence, whether this is related to work, education, citizenship or personal issues.

Growing Demand of STEM and other Science Related Knowledge in Occupations

Knowledge-based jobs in the main occupational areas of manufacturing as well as primary and secondary service areas are increasing globally (Raffe, 2013). The policy debate has gained momentum due to the mere fact that today's global economy and society is driven by knowledge. The knowledge-based economy recognizes the key role of emerging technologies in providing a basis for the generation, management and utilization of knowledge as it has never been before. The major shift in emerging technology is dominated by the move from divergent to convergent technologies. Divergent technology had been earlier characterized as mono discipline and more structured with limited fusion between different disciplines.

In contrast, today's convergent technologies, including information & communication technology (ICT), bio technology, nano technology, energy technology, green technology, space technology, and entertainment technology etc., are interdisciplinary in nature and are a combination of more than one discipline. They are also oriented to research and development and largely information-intensive have relied upon Science, Technology, Engineering and Mathematics (STEM) as foundation or basis for growth and innovation.

With these changes in technology, technical knowledge has raised more demands, requiring solid foundation skills on STEM. These skills include adaptability and learning to learn skills that make learners adapt to the fast changing occupational challenges. They are vital to building up the future skills profile of the people. Thus the development of a strong STEM knowledge base would need need greater adaptability. There should be a creation of opportunities to develop trainable learners while keeping in mind the dynamic changes in technology. More and more complex equipment are expected to be used in all range of occupations, from construction to service sector.

Designing, building, installation, operations and maintenance- type of jobs will demand medium to high level of STEM skills as occupations continue to be profiled or skills are standardized to meet broad-ranging tasks. The expansion of STEM in vocational education is therefore critical to meet jobs and give the workforce valuable STEM skills that correspond to the rising quality of jobs in key sectors. Strengthening

the implementation of STEM in TVET will contribute to the conceptual change in the perception of TVET. The line between TVET and academic higher education is blurring and it is especially obvious in STEM fields. TVET qualifications increase the entry points to STEM jobs while these jobs are best filled by the workforce that possesses an adequate mix of STEM knowledge and practical skills. (Majumdar, 2015)

The trend toward higher qualification of skilled workers and managers promotes the discussion about the extent to which the vocational professionalization of this qualification can be designed along academic requirements in connection with higher education. In many countries, VET and HE institutions have different status, e.g. the scope, responsibilities and functions of competent institutions vary greatly when it comes to examination, recognition and the awarding of qualifications and certificates.

Importance of Theory-Practice Linked Education and Training

Occupational learning in work-based environments is to increasing extent practiced in the industries of many countries worldwide compared to the still dominant formats of full-time vocational and technical education practiced in schools. Currently a quarter of students in upper secondary vocational education attend work-based programs. Work-based learning refers to any form of learning for youth and adults that is implemented embedded in workplaces. Historically it has been predominantly developed as part of vocational training e.g. in apprenticeships in trades, but it can be practiced in many variations e.g. in internships. (Lerman and Rain, 2015)

It is generally acknowledged that work-based learning can meet appropriately the education and training needs of the learners and the employers. It improves pedagogy and pathways to adulthood. It reduces costs and increases capacities of initial and continuing TVET. Due to the increasing demand for systematized knowledge exclusive work-based learning is more and more extended by institutionally integrated learning formats as apprenticeships combined with vocational school or college-based education (work to school) or as company based internships of students at schools or colleges (school to work) e.g. in the US. Work-based learning is - still to minor extent - practiced in academic education. In recent years tertiary programs have been consistently introduced combining academic studies with applied learning in the professional world. They are systematically practiced in cooperation predominantly with private companies. (Rein, 2015)

Vocational Bachelor programs have been developed and implemented in France and in Germany (dual study) combining theoretical studies with on-the-job training. Students alternate between university education and work-based learning, giving them the opportunity to apply concepts learnt in class to practice and vice-versa bring in new ideas from their work placements into the classroom. This provision of education and training at higher qualification levels includes employer involvement in curriculum development e.g. Denmark in the agricultural sector, work-based assignments and company based thesis works e.g. Germany and Ireland in innovation and technology management courses. This may be practiced in apprenticeships e.g. France in the agriculture sector and in UK-England in nursing and in teacher training. Since a long time Higher Education cooperative education in the US extend academic programs on all graduation levels by academic external practical learning phases.

In a format systematized way the Graduate School of Education at the University of California in Berkeley developed even a Ph.D. apprenticeship program. (Lerman & Rein, 2015)

Facing a trend to systematized theory-practice linked education and training on initial and continuing VET as well as in academic Higher Education the question may be raised whether the institutional differentiation between work to school or school to work describe sufficiently the phenomenon work-based learning. Furthermore it may be critically questioned whether the comprehension of practice and the acquired relevant competence should be better understand and operationalized independent from only one specific learning location e.g. the enterprise as it has been done up to now.

The Shift from Input to Competencies and Learning Outcomes

In the 90s, education researchers and practitioners as well as employers in many countries started to set the ability of learners to solve problems and to accomplish tasks in education and at the workplace. Learning is increasingly interpreted as an integral part both of adapting to changing circumstances and innovation as well as essential for personal development. The focus shifts from providers to users of education and training. It is also an effort to increase transparency and strengthen accountability of qualifications for the benefit of individual learners and employers. This does not mean that any education and training input like content communicated and acquired in programs via curricula and appropriate didactic methodologies should be neglected but be regarded and applied as necessary prerequisites of the outcomes of learning. (Arnold & Muller, 1993)

It is assumed that a consequent shift to competence oriented learning outcomes, addressing both theoretical and practicable occupational requirements in the development of programs and qualifications, will make the capability to act in TVET, across the education and training systems and the labour markets more explicit. In terms of quality development of qualifications and programs, this might be further promoted by theory-practice integrated learning outcome concepts facilitated by cooperating education providers and work place training providers like enterprises. (Breuer, 2015)

Essential for any successful occupation provided by TVET is a provision of a profound basis of relevant technical knowledge and skills. Changing work environments, in addition lifelong learning, greening TVET, globalisation and other major drivers of transformation require domain independent transversal competencies concerning cognitive, interpersonal and adaptability skills, attitudes, values and work habits to enable any successful transformational process and task accomplishments. (Rein, 2012)

Emerging Trends in Post-Secondary Education: Some Exemplary Evidences

The increasing knowledge-based requirements in manufacturing and service areas in many countries require appropriate systemic and conceptual adaptations of postsecondary education and training to address the needs of the societies,

labour markets and the learners in terms of lifelong learning (Raffe, 2003). TVET is increasingly taking place at higher levels (e.g. EQF level 5 and more) and is growing in terms of enrolment in a number of programs. An increasing demand of learners and employers has led to a booming development of post-secondary TVET qualifications (EU, 2015). Demographic trends will have a direct impact on the size and orientation of education and training systems, the learner profiles and the design and delivery of programs. Adults are staying longer in the labour market and need increasing flexibility from education and training institutions, to combine work and study in order to improve their career prospects or to change careers in later life.

In recent years a number of programs have been developed in both initial and advanced TVET that contains elements of both vocational drift and academic drift in different forms to satisfy the emerging demand of labour market. The quantitative development of these kinds of programs largely reflected in ISCED 1997 Level 5 development. Although strictly speaking ISCED level-5 falls under tertiary education but researchers interpreted it as Tertiary TVET. It has been observed that ISCED 1997 does not have the level of detail required to reflect the tremendous diversity in TVET program globally. According to the OECD survey conducted in 13 countries between the years 1995 and 2011 as per table below, the level 5 program has increased by 19% points in OECD countries and even in country like Switzerland, Germany, Austria, Czech Republic and Finland it has been recorded more than doubled. (cf. Hippach-Scheider 2016)

Table 1: Comparison of first degrees at ISCED levels 5A and 5B (1995 and 2011, in %)

Country (selection)	Tertiary A (first degree)		Tertiary B (first degree)	
	1995	2011	1995	2011
Ireland	30*	43	15*	22
Spain	24	32	2	18
Australia	36*	50**	Not specified	17
Switzerland	+	32	13	15
Germany	14	31***	13	14***
United Kingdom	42*	55	7*	13
Austria	10	35	Not specified	12
OECD average	20	39	11	11
Denmark	25	50	8	11
Czech Republic	13	41	6	5
Poland	34*	58	Not specified	1
The Netherlands	29	42	Not specified	0.5
Finland	21	47	34	0

** survey 2000;* *** survey year 2010;*

**** break in the statistical survey between 2008 and 2009 due to a changed allocation to ISCED 2 and ISCED SB.*

Source: OECD (2013)

To understand, the trend in proper context, it is required to look further the evolution of the ISCED level 5 programs in some countries.

In Finland, tertiary education is separated between research oriented paths (Universities) and a more practice-oriented path (Universities of Applied Sciences, also called Polytechnics). The educational programs at the Polytechnics are allocated to ISCED level 5A although they are expressly assigned to the area of vocational education and training. To make sure that the qualifications relate to the labour market and the regional demand for skilled labour and innovation in the desired way, practical phases are an obligatory part of the courses of study considering that the "polytechnics" are a relatively new educational institution in the country. (Hippach-Scheider, 2016)

Similarly, in Austria, universities offer degree programs (Diplom Studiengänge) which offer two to three years of courses in artistic and vocational education and training. There are also vocational courses offered as a Bachelor's degree corresponding with a specific vocational area. There has been a significant increase in Level 5 A program in Austria and it is almost more than triple between the year 1995 to 2011 as per table.

Higher education programs combining academic and vocational elements respectively theoretical and practical learning have evolved in the Anglo-Saxon countries, as well. A common feature of these countries is a very high proportion of graduates from ISCED 5A programs (201): Australia, 50%, UK 55%, Ireland 43%. Short cycle tertiary education (ISCED 5) exist in both Higher Education and TVET. The "Diploma" is a qualification shared by both tracks. It leads to "Advanced Diploma" (TVET) or "Associate degree" (Higher Education. In Australia, the Associate Degrees (ISCED 5A) are understood to be both academically and vocationally qualifying and have been introduced as qualifications in recent years. They have been integrated into the Australian Qualifications Framework in 2004. The educational programs leading to an associate degree are open to all those who have acquired a vocational qualification (certificates III or IV), as well. The program duration is two years.

The traditional binary divide, i.e. academic Higher Education offered by universities and higher professional education institutions is becoming more complex. In Norway nursing education is becoming part of academic Bachelor and Master Degree programs. In UK meanwhile, polytechnics were reintegrated into the university sector in UK (England). Associate degrees in NL and degree apprenticeships in UK addressing EQF level 5 are on the rise during the last 20 years. The public regional dual Cooperative University in Germany design and provide Bachelor and Master programs in cooperation with enterprises following the German dual apprenticeship format. In addition private sector providers to address this development at higher levels can also be identified in some countries (e.g. in Germany and in Ireland). Associate Degree programs at level 5 of the European Qualifications Framework (EU 2008) are provided by Dutch higher professional education institutions. An increasing number of non-academic certificate programs become embedded in degree programs. In the US community colleges integrate e.g. occupational certifications and apprenticeships in associate programs since a long time. (Rein 2011)

In some of the countries in Asia like in China, the government is trying to develop a policy to establish good higher vocational college, by converting existing normal universities into Vocational Universities. "Gaozhi Higher Vocational Colleges" is the

most equivalent type to the ISCED 5 and 6 levels. According to Ministry of Education (MoE) of China, it has been observed that the number of the higher vocational colleges in China was 1341 during 2015. There are about 747 specialized subjects offered by higher vocational colleges which require strong academic background, and 344 of the subjects are coherent with the bachelor education. Following the Chinese government's policy of providing opportunities to students of secondary vocational schools to be able to pursue higher education (tertiary level) there has been an increasing number of Vocational Universities / Higher Vocational Colleges (see Table 2).

Table 2: Development of Higher Vocational Colleges in China with enrolment

Year	Number of Higher Vocational Colleges	Students enrolment of Higher Vocational Colleges (in 1000)
2015	1341	477
2014	1327	395
2013	1321	368
2012	1297	396
2011	1280	407
2010	1246	418
2009	1215	420

Source: http://www.moe.gov.cn/srcsite/A03/s180/moe_633/201607/t20160706_270976.html

Table 2 shows an increase of 126 in the number of Higher Vocational Colleges over last 6 years. The number of applicants who went on to vocational university or college has stay 42%-43% before 2009. And then it decreased continuously to 36.8% in 2013. However, there has been an increasing ratio of applicants for vocational schools as a result of government policies that facilitate students' move from general education schools to vocational schools from 2014. China's policies for vocational education converging with higher education program apparently have considerably improved its image in the public perception. Similarly, in terms of gender differences the statistics show that women score better in exams than boys.

In Germany, there is a movement to build bridges between higher and vocational education through cross cutting education program in IT occupations in particular. It has been observed that DQR Bridge 5 project is developing cross-cutting education measures at Level 5 of the German Qualification Framework (BMBF&KMK, 2011) for which credit transfer can be granted within the framework of an upgrading training program and a Bachelor's degree program.

The Federal Government funded project "Promoting permeability to produce skilled workers – developing cross-cutting education and training measures in Higher and Vocational Education at level 5 of the German Qualifications Framework" is exploring the potentials of this Qualifications Framework level (BIBB, 2016). In cooperation between vocational education and training providers, chamber organisations and higher education institutions with academic backup, interlocking forms of curricula provision are being developed which are valid for both sectors of education and training, i.e. as the first tier of upgrading training and also eligible for credit towards

a degree. The educational and training provision is coupled with advisory measures which are, in turn, being developed and realised across educational sectors.

The models are being developed in the DQR Bridge project for the Information Technology sector among others. The design of education and training measures across educational sectors can combine learning outcome units from different sectors of education, e.g. modules from degree program, units of learning outcomes from advanced vocational training and qualifications such as a recognised initial occupational qualification. In the figure below the cross cutting learning arrangement between TVET and H.E in the IT sector are shown in Figure 2.

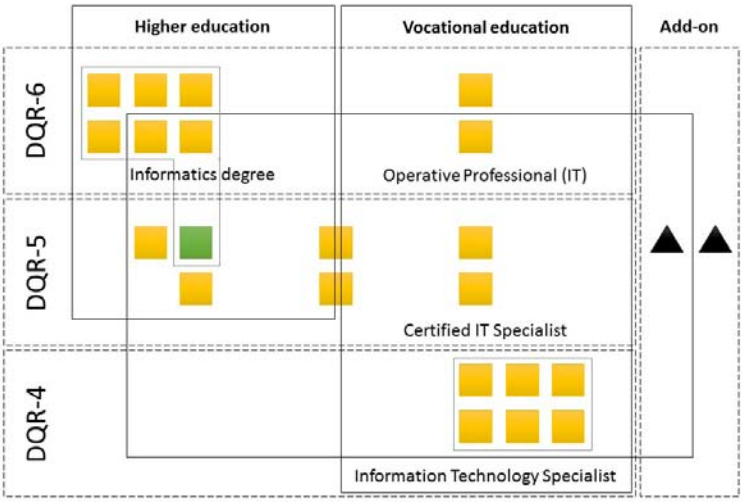

Figure 2: Cross-cutting learning arrangement in the IT sector

In the figure, units of learning outcomes are shown as squares; qualifications are represented by the outlined grouped units of learning outcomes, and triangles stand for the add-ons which are explained further below. In this respect, courses taught across educational sectors represent flexible structures. An individual assemblage of units of learning outcomes, qualifications and add-ons is denoted by the part of the diagram shaded in yellow. The individual provision represented by the yellow area contains a "complete" qualification from VE and training - The initial vocational qualification as an IT Specialist ("Fachinformatiker"). A higher education qualification – a degree in Informatics at Bachelor's level – is only partially integrated in this case. Cross-cutting courses may combine higher education degree programs or certificate courses, but also other modules; bridging courses, for example. Add-ons are additional elements which increase the attractiveness of the learning arrangements, for example, the prospect of taking over a skilled crafts enterprise. (Hemkes et al. 2015)

All these trends in different countries are showing that a growing evidence of developing higher VET programs and wide range of models to create stronger links between academic, professional and practice related learning. In the subsequent section we have made further analysis in terms of implication and lesson learned from these trends.

The Blurring Conceptual Distinction Between TVET and Academic Education

The reforms and developments in post-secondary education indicate a blurring conceptual distinction between TVET and academic Higher Education. The ongoing debate in many countries on the pros and cons of an academization of TVET or a vocationalization of Higher Education can be interpreted as a converging trend to design education and training based on enforced theory-practice linkages on all levels of workforce and learner requirements and competencies. In both TVET and academic Education there is a potentially compatible competence-related orientation for the design of educational pathways and qualifications evident, both implicit, and, to some extent, explicit. This inherent conceptual intersection of the educational approaches in the qualification goal of acquiring competence as capability to act represents a considerable prerequisite for the design of the permeability of educational pathways between vocational and higher education. (Rein, 2012)

However the traditional focus on the labour market as the exclusive empirical basis to identify required competencies for qualifications on higher levels with more complex requirement structures is not sufficient to design academic and advanced non-academic qualifications. Due to the dynamic development of research-based knowledge, Higher Education is directly involved in education and training program developments and identifies and defines labour market requirements and competencies (technical and transversal) inside and outside the academia, because it is an essential part of the economic and societal value production and innovation. This extended comprehension of academic Higher Education matches as well the ongoing convergence trend between the education and training systems. In addition it has to be stressed from a holistic education point of view that both VET and academic qualifications have to meet in many countries not only technical professional requirements but also societal and personal requirements, as it is legally established in their education acts. (Rein, 2015)

It is assumed that a consequent shift to learning outcomes, addressing compatibly both academic and occupational requirements in the development of qualifications, will make the capability to act across the education and training systems more explicit. Consequently, this will facilitate the visibility of the intersection and compatibility of Vocational and Higher Education approaches. In terms of quality development of qualifications and programs, this might be further promoted by integrated learning outcome concepts based on theory-practice linkages in 'traditional' degree programs as well as in embedded degree programs which integrate academic and work based learning in an adapted way e.g. as dual study.

More qualification types and programs with cross-sector doctrine and competence-compatible design of curricula and examinations will have to be designed and monitored, which address requirements of both the occupational labour market and the academic education and career pathways at the same level. Recent research on theory–practice integrated curricula in traditional and in embedded degree programs (e.g. dual or short cycle) has confirmed the promising development potential of these qualification formats for cross-sector and action-oriented learning promoted by a shift to learning outcomes. (Rein, 2015)

Way Forward: A New Space for TVET Future

To promote Higher VET within the tertiary sector the European Commission proposes three models: parallel track to academic education, HVET as one of the two segments of academic HE within the three-degree cycles of the European Higher Education Area framework and at last HVET qualifications could be part of Adult Learning and Continuous VET (cf. EUCOM 2016). In terms of bridging HVET and academic HE to promote cross sector education paths UNESCO stresses the demand to develop sustainable and practicable procedures of articulations aligned to national qualifications frameworks which had been developed and implemented in most of the countries (cf. UNESCO 2016).

The trends discussed above have generated a new space for VET future by the fusion of academic drift in vocational program and vocational drift in academic program. According to Raffe (2003), a drift can take many forms. However, it can be distinguished in three major forms of perspectives, content, longitudinal and integrated. The outcome of these approaches will reinforce solutions that promote permeability and mobility across education and occupational sectors. In turn, it provides more options and informed choices to the learners in selecting career and occupations across jobs.

The challenge for any TVET credentialing processes is not only to match a specific educational and occupational demand. In terms of a new lifelong learning continuum within TVET and across the systems it has to be safeguarded that any revised or new credential is connectible to others, to pathways across postsecondary education and training systems and matches acknowledged quality standards. Again, a consequent shift to competence oriented learning outcomes facilitated by transparency instruments like qualifications frameworks, aligned with recognition of prior learning regulations and credit transfer systems will promote such a development. Credential types and programs with a competence-compatible design of curricula and assessments are promising, which address requirements of both the occupational labour market and academic education and career pathways at the same level.

If the conceptual differences between tertiary education sub-sectors are considered to be limited, or of limited relevance from the perspective of the development of effective knowledge policies that include tertiary level VET, what is the rationale for treating tertiary level VET as a separate policy area. Will a converging part between vocational and professional education emerge without catching up with the traditional part of academic Higher Education? A further question is whether an occupational-oriented academic Hybrid-Sector could generate a greater dynamic, if it is not incorporated in the regulatory Higher Education system and in the vocational education at the same time. Does educational hybrid-sector and its specific programs and qualifications need an independent regulation system?

This paper attempted to study the above trends, to create stronger ties between TVET and academic HE by improving the chances of permeability, facilitating learning pathways and more and more blurring the distinction between H.E and Higher VET. However any substantial decision making process demand further insights on this matter with increasing priority

- to collect more evidences and conduct more researches to highlights its importance,

- to strive for broader agreements among member states in defining structure of post-secondary TVET qualifications and
- to improve the parameter of articulation between TVET and academic Higher Education
- to investigate the nature of academic drift in the post-secondary VET terms of the content and the didactics to justify the upgradation in substance.

Thus, by commissioning studies it can further reconfirm the great opportunities and potential for TVET to develop at higher qualification levels EQF level 5 and above in converging directions. Such VET at higher qualifications will help to overcome the age-old stigma of TVET unattractiveness by providing more learning pathways to the graduates in selecting career and occupations. Above developments generate a new space for TVET future by the fusion of academic drift in vocational program and vocational drift in academic program, which will reinforce solutions to promote permeability and mobility across education and occupational sectors.

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Role of APACC for Total Quality Management (TQM) in TVET

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Abstract

National Qualification Framework states the level and expected competencies of graduates. Graduates are the focal point for organizational purpose and achievement. Quality in the product/ service is impossible without quality in the process. Quality in the process is impossible without the right organization. The right organization is meaningless without proper leadership. Strong, bottom up commitment is the support pillar for all the rest. Each pillar depends upon the other four, and if one is weak, all are.

The paper tackles the relevance of Total Quality Management Systems and taking the Asia Pacific Accreditation and Certification Commission (APACC) as an example, it intends to further elaborate its significance in the improvement of TVET delivery in the region.

Introduction

Quality principles, concepts and initiatives as drivers for improving services and products have proven to be very valuable to individuals, groups of people and organizations. Many organizations have also discovered a strong relationship between quality, profitability and productivity.

Quality as value for the money paid has emerged as the managerial imperative of the decade. The slogans such as 'quality counts', 'do it right first time', 'TQM', 'zero defect', 'customer satisfaction', 'quality awards', and 'commitment to quality are talk of the street in production and service circles. Leaders could point to improved internal efficiencies resulting from their quality improvement efforts and assign cost savings to those efficiencies. They could point to process improvements that resulted in shorter development cycles and faster delivery that they intuitively knew contributed to increased customer satisfaction. Business results in terms of enhanced sale and profitability are improved.

Riding on the wagon for change/ improvement in quality of products and services has resulted in subscribing to a variety of systems and frameworks i.e. Total Quality Management, ISO-9000 quality standards series, National Quality Awards after Malcolm Baldrige quality awards and accreditation and certification frameworks. These systems for quality improvement have been adopted according to the nature of

organizations i.e. manufacturing/production units, service organizations, educational institutions etc.

The wave towards quality improvement in TVET activities, projects and programs has been taken with due importance by different TVET systems and has initiated different projects for quality improvement to produce highly employable and globally accepted skilled workforce. These initiatives are producing positive results. However, quality improvement will require a consistent commitment to stay conforming to the satisfaction level of the customers on a dynamic basis.

The Meaning of Quality

Quality is a relative term and it is generally used with reference to die end use of the product. It depends on the die perception of the person in a situation. The situation can be use oriented, cost oriented or supplier oriented. The word "quality" can be taken in the following meanings:

Table 1: Meaning of Quality (Akrani, 2010)

	Meaning	Description		Meaning	Description
1	Fitness for Purpose	Possess good quality, work well for purpose for which it is meant	8	Durability	It should give efficient and consistent performance.
2	Conformance to requirements	Customers' needs are assessed and translated into product design for specific applications.	9	Safety	Safe and Foolproof workability
3	Grade/ Quality Characteristics	Distinguished from others in features, appearance, performance, life and reliability, taste, odor, maintainability	10	Affordability	Should be economical
4	Degree of preference	Preferred over products of similar grade based on comparative tests, customers' feedback analysis	11	Maintainability	Easy to maintain
5	Degree of Excellence	Fulfill Promises made to customers	12	Aesthetic look	Look attractive
6	Suitability	Specific application	13	Economical	Reasonable price
7	Reliability	Give Efficient and consistent performance	14	Versatility	Serve number of purposes

Definition of TQM

Quality is a relative term. For a marketplace definition, Juran (1974) describes it a' fitness for use.' The ISO defines quality as the degree to which a set of inherent/ embedded characteristics meets the needs, wants and expectations of a given customer. It is evident that quality must be worked at and consciously achieved. Paying attention to the whole transformation process such as suitability of inputs, the manner in which input are processed into the finished product or service and the manner in which the product or service is delivered to the customer's satisfaction- all these or quality.

Total Quality Management (TQM) is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. TQM is for the most part common sense. Analyzing the three words, we have:

Total—Made-up of the whole.

Quality—Degree of Excellence a product or service provides.

Management-- act, art, or manner of handling, controlling, directing etc.

Therefore, TQM is the art of managing the whole to achieve excellence. The Golden Rule is simple but is an effective way to explain it. TQM is defined as both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of the quantitative methods and the human resources to improve all the processes within an organization and exceed the customer's needs now and within the future. TQM integrates fundamental management techniques, existing improvement effort and technical tools under a disciplined approach.

Whenever business is booming, quality appears to be working. But, whenever business goes down, the inevitable questions are asked: "why are we spending all this money on quality? Is our quality initiative paying off?" I believe that the reason why people ask these questions is that they do not view 'quality' in its totality. Many organizations have made the mistake of taking each element of a total quality initiative, and trying to implement each one as a separate intervention. Whenever an organization looks at total quality as a series of techniques that can be independently introduced, the organization runs the risk of not viewing the organic interconnectedness of the elements of an organization. After all, each intervention that impacts one aspect of the enterprise has a bearing on others as well. What is needed is a holistic approach to quality. Quality Management System (QMS) is a systematic approach to linking quality initiatives to each and every element of the organization and its culture. It is not just the implementation of an ISO 9000 Standard and Certification or just getting an accreditation. The underlying principle of this total quality view and its basic difference from all other concepts is to provide genuine effectiveness. Control must start from the design of the product or service and end only when the product or service has been placed in the hands of a satisfied customer.

TQM Concepts

Quality evolved as the managerial essential and inescapable thing of the times. Almost every professional or trade journal includes an aphorism like "quality counts" or "the key to survival is quality". Quality was a serious issue even in olden times. The obsession with quality may be explained by the meagerness of resources. Then, starvation became an actuality and handcrafted goods became extremely costly.

TQM therefore involves designing organizations to satisfy customers and it has two strands, namely:

- Careful design of products or services
- Ensuring that the organization's systems can consistently produce the design.

TQM is a new way of thinking about organizations. It is said to be the most significant shift in American management thought and practice. A great deal of attention has been given in recent years to the TQM process as an important quality and productivity improvement strategy. With TQM concepts, companies have learned that quality improvement truly goes beyond the product or service specifications required by the customer (Depew, 1993).

TQM requires a cultural change. The typical quality elements have changed meaning now and are shown on the table (1) given below. Small companies will be able to make the transformation in a much faster time period than large companies.

Table 2: The changing meaning of Quality and TQM

Quality elements	Previous State	TQM
Definitions	Product oriented	Customer's oriented
Priorities	Product oriented Second to service and cost	First among equals of service and cost
Decisions	Short term	Long term
Emphasis	Detection	Prevention
Errors	Operation	System
Responsibilities	Quality control	Everyone
Problem solving	Managers	Teams
Procurement	Price	Life cycle costs
Manager's role	Plan, assign, control, and enforce	Delegate, coach, facilitate and mentors

Popular Concepts/Guidelines and Techniques in TQM

Different concepts and framework that are used for quality enhancement is service delivery and production of goods.

1. The Basics of Quality Management System
2. TEAMS for TQM
3. Dr. Deming's PDCA cycle

The Basics of Quality Management System

Creech (1994) has mentioned about the five pillars of quality that are worth highlighting as it provides a strong foundation for TQ Managed organizations (Figure 2). This can become the focus of improvement in technical education and training in its transformation.

Figure 2: The Five Pillars of TQM

As an explanation of the five pillars, the product (or service) is the focal point for organizational purpose and achievement. Quality in the product (or service) is impossible without quality in the process. Quality in the process is impossible without the right organization. The right organization is meaningless without the proper leadership. Strong, bottom-up commitment is the support for all the rest. Each pillar depends upon the other four, and if one is weak, all are weak.

Besterfield (2003) et.al has suggested the following as key component of any quality management system and.

1. Leadership: a committed and involved management to provide long-term top to bottom organizational support
2. Customer satisfaction: an unwavering focus on the customer, both internally and externally
3. Employee's Involvement: effective involvement and utilization of the entire workforce
4. Continuous improvement: continuous improvement of the business and production processes
5. Supplier Partnership: Treating suppliers as partners
6. Performance measures: establishing performance measurements for the processes

Some additional information and knowledge management as a component part of the same. These concepts provide an excellent way to run a business. The purpose of TQM is to provide a quality product to the customers, which will in turn increase the productivity and lower the cost. With higher quality product and lower price, competitive position in the market place will be enhanced. This series of objectives

will allow the organization to achieve the business objectives of the business profit and growth with greater ease. In addition the workforce will have job security, which will create a satisfying place to work.

TEAMS for TQM

Since TQM involve the simultaneous integrated interaction of all the components that make up an organization and drive its functions, there needs to be a teamwork approach toward quality improvement efforts and undertakings to make it successful. Creech (1994) emphasized that organizing by teams helps to make all the other decentralized and TQM system elements work – and work together. Forming the teams is only the beginning The chart that follows highlights the actions that bring the team concept to life:

Table 3: Team Success Points

TQM	
The combined actions that make teams successful	
Trust them	After training them
Empower them	With wide latitude
Aim them	With objectives and goals
Measure them	For feedback and comparison
Support them	With backing and resources
Above all, recognize and reward them to provide a stake in the outcome	

It spells "TEAMS". It starts with "Trust" and ends with leadership "Support" enabling the teams to carry out their ownership free of micro-management. This approach helps eliminate the trust gap, the well-recognized contributor to employee apathy and alienation.

The PDCA Cycle:

The PDCA cycle stands for PLAN - DO - CHECK - ACT. To reduce the variation in any process, the analyst must PLAN--decide what action might reduce process variation, DO-try out the idea, CHECK-determine WITH DATA that the process variation idea was effective in reducing variation, ACT-implement the idea permanently. Upon conclusion of the cycle, another idea would be tried, and the cycle repeated. This variance reduction process would continue. The repeated application of the PDCA cycle to a process is known as Continuous Quality Improvement. (CQI).

Deming's contribution to the TQM/CQI philosophy was to expand upon Shewhart's SPC and PDCA ideas and develop a philosophy of management and management practices that would make this idea work in the real world. We must notice at this point, that the focus of TQM/CQI is on individual processes, one by one, not entire systems. The PDCA cycle has become the hallmark of ISO-standards for measuring organization's continuous improvement strategy.

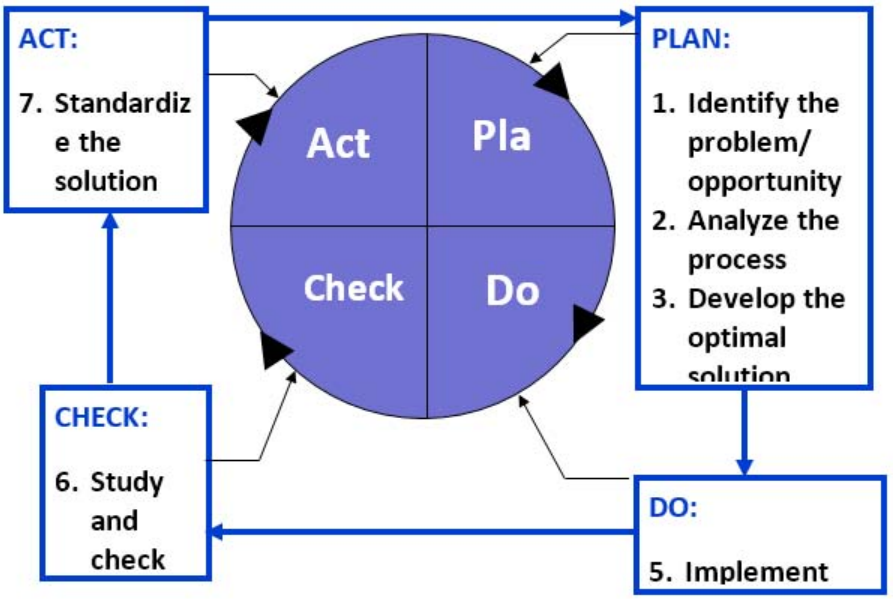


Figure 3: PDCA Cycle

TQM and TVET

TQM started penetrating in education mostly in American universities and schools after 1985. The reasons being that educational institutions in USA were thought and considered to be having many perennial problems for producing quality output such as the following:

- Inadequate emphasis on academic subjects
- Lack of standards
- Poor teaching
- Absence of teaching staff

In order to resolve these problems, it was realized that quality should be assured to produce the desired output and we need it because of the following reasons:

- Education needs to respond to the dynamic changing environments.
- Expectations of stakeholders impress upon education to undergo continual assessment and improvement.
- Education has to respond to the real fear of career obsolescence and career inadequacy.
- Financial constraints and cost cutting with cutting quality

In the Asia-Pacific region, the human capital (skilled people) is the region's most important asset. Being the most productive asset of a country, the people should be given quality skills and competencies in order for them to meaningfully participate

in economic and social development. Despite being a fundamental concept (quality and relevance) within the Technical and Vocational Education and Training System, it is only recently that quality concerns have increased within the system in most of the developing countries. Many countries in the region are reviewing the quality of participation, administration and outcomes in TVET system. At present, a heavy emphasis is placed and discussed on the registration and compliance of training requirements under a national and regional recognition framework.

Emphasis is also placed on consistency in the awarding of quality endorsed training programs. Generally it is also observed that a heavy emphasis is placed on 'front-end' quality assurance measures such as the endorsement of training packages, registration of training institutions and approval of training arrangements.

Very little emphasis is placed on ongoing monitoring and evaluation of quality and training outcomes of trainees. In managing the system there has been a tendency to react to quality concerns as they arise, rather than taking a strategic quality assurance approach. Audit or assessment is largely limited to compliance assessment of registered training organizations. Assurance of quality of training and accreditation of training institutions and programs are clearly one of the major challenges for the TVET system.

The quality assurance system can be applied at both the system and TVET provider levels and can therefore be used to assess the effectiveness of TVET. It gives a particular emphasis to the improvement and evaluation of the 'outputs' and 'outcomes' of VET in terms of increasing employability, improving the match between demand and supply, and promoting better access to lifelong training, in particular for disadvantaged people.

The idea that TQM only works in business, industry and private organizations is already an old saying. The changing workplace dynamics have a direct impact on the educational institutions and specially the TVET Institutions. Ideally the TETIs workshops needs to replicate the workplace conditions with all the training technologies and processes to work with. Theory and knowledge accompanying the skills taught is needed to conform to the workplace operations. This will maintain relevance of the TVET pass outs with requirements of the workplace and will ultimately ensure high chances of employability. We can say that more than a discovery, this is now an established understanding that quality assurance measures works well in educational institutions and especially in technical education and training (TVET). Thus, it is being espoused as a new management approach for TVET. According to the recommendations adopted in the World Education Forum at Dakar, Senegal in 2000, is "to improve all aspects of the quality of education…" (Goal 6). The third International congress on TVET at Shanghai (UNESCO, 2012) categorically prioritized relevance and quality in TVET in the first and second recommendations. This is particularly important since quality mainly affects the value and success of education programs. The "education for all" initiative is now embracing the challenge of TVET as well. Therefore there is a need to see the TVET system as a system that applies the principles of TQM aside from a system that merely delivers skills training.

The following are the main questions while TQM or quality assurance system may be introduced into a TVET system:

- What is the main business of TVET institutions?
- What processes are essential to accomplish the institutional business or functions efficiently and effectively?
- Who are the customers of the educational institutions?
- What is the final product of the institutions?

Educational institutions also consider the following as part of their business:

- Organize continuing education programs for people working in industry.
- Develop curriculum and design programs.
- Publish good books and other instructional material such as laboratory manuals, workbooks, video programs, models, CAI packages, multimedia courseware, etc.
- Provide distance learning courses and offer web-based instructions.
- Provide consultancy services to other organizations, including industries
- Run production centers.

In order to perform these businesses in an effective and efficient manner, the institutions nowadays work like a system which has several organs and components which in turn have several "processes" that receive input, process it and produce the output or product.

The most common objective of all quality assurance systems is to satisfy their customers by ensuring quality of the products or outputs and the processes involved. Process is defined as an activity or operation, which receives inputs and converts them to outputs. Almost all activities and operations involved in making a product or providing a service are processes. For any organization to function, they have to define and manage numerous inter-linked processes. Often, the output from one process will directly affect the input for the next process. The systematic identification and management of the various processes employed within an organization, and particularly the interactions between such processes, may be referred to as the 'process approach' to management.

The main processes that can be defined for educational institutions are:

- Needs Identification
- Curriculum design and development
- Student admission and other services
- Teaching - Learning process

- Institutional facilities such as classrooms, laboratories, workshops, library, hostels, sports facilities and their maintenance
- Students Assessment , Examination and Certification
- Staff recruitment, appraisal, promotion and development
- Industrial liaison and placement
- Skill Standards Development
- Marketing and Publicity of TVET programs
- Corporate Social Responsibility i.e. extension services to community.
- Research work i.e. Tracer studies and other innovative activities.

One can define more processes which would depend upon the size and the type of the institutions. After identification of processes that educational institutions may perform they must focus on its customers to understand their current and future needs/, requirements and strive to either come up or to exceed their satisfaction.

The educational institutions can identify more customers according to their functions and services. Of course the final products of the institutions are the skilled graduates and Teaching Learning Resource (TLR) material, among others.

Steps to Install TQM

To start with, there are underlying assumptions and principles of TQM. Schmidt and Finnigan (1993) presents some of these basic concepts:

- Organizations are made up of complex system of customers and suppliers, with every individual executive, manager and worker functioning as both a supplier and customer.
- Quality – meeting the customer's requirements – is the priority goal and is presumed to be the key to organizational survival and growth.
- Continuous improvement is the guiding principle.
- Teams and groups are primary vehicles for planning and problem solving.
- Developing relationships of openness and trust among members of the organization at all levels is the likely key condition for success

The question arose as to how we can start TQM in education. There came many models and suggestions with varied level of success stories. As a result of various researches and deliberations, following 11 steps were suggested to start TQM applications in educational institutions.

- Obtain commitment to Total Quality from the top management.
- Recognize your institution as a system with interacting subsystems.

- Identify all the customers and stakeholders
- Develop a shared vision and mission
- Develop goals and objectives
- Identify processes and study the impact of each major process.
- Form cross-functional teams to improve processes
- Training of all teams consistent with their job
- Implement the system to hold the gains that are made (Sustainability)
- Document all improvement exercises
- Repeat steps 1 to 10

TVET is often seen as "last choice education" because of a lack of quality. High-quality TVET, on the other hand, leads to a higher status and improved attractiveness of TVET. Also, high quality TVET program guarantee a strong link between what is learned and the needs of the labor market, with the result that graduates are more likely to find suitable employment. Quality assurance is therefore essential at all levels throughout the TVET system.

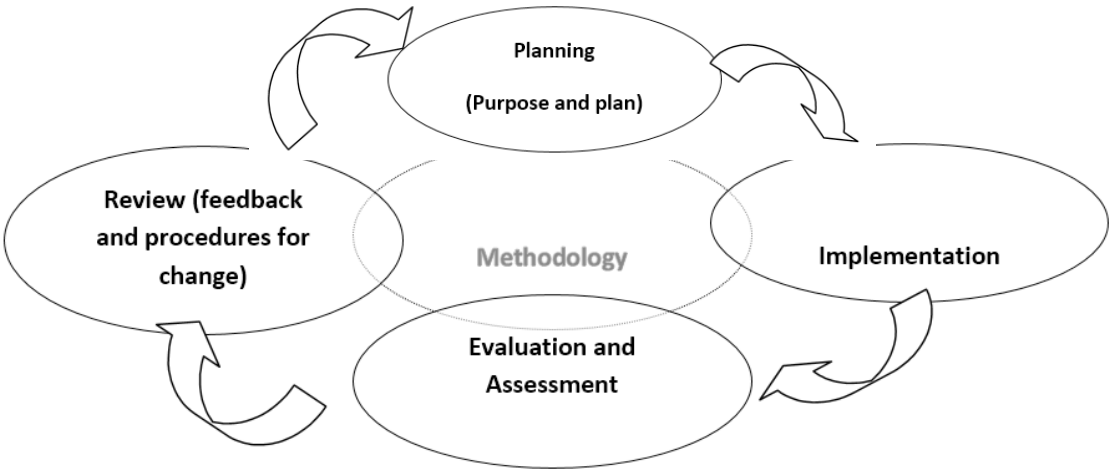
The introduction of these "quality-related" elements in TVET can contribute to additional costs. However, the long-term benefits for society and the economy are such that the initial costs related to upgrading of the quality are well-justified. Nevertheless, high-quality TVET might be seen as unaffordable by many governments, enterprises and training providers. It is therefore particularly important that institutions in countries that have already developed and improved certain elements of quality assurance in TVET share their best practices and innovations with other countries.

Many developing partners like UNESCO-UNEVOC, ADB, CPSC, ILO, British Council and others continuously provide technical assistance, share expertise and exchange best practices. This has become a common practice and many TVET systems of the member countries have benefited from it.

Applying the philosophy and concept of TQM in TVET, the following aspects of institutional functioning that are likely to affect the quality of education provided:

1. Outstanding teachers
2. Excellent examination results
3. Specialization
4. Well-equipped laboratories and workshops with dynamic up gradation for latest technology
5. Well maintained buildings and other facilities
6. High moral values
7. Adequate resources

8. Support of parents, industry and major stakeholders
9. Strong and purposeful leadership
10. Care and concern for students
11. A well balanced demand driven curricula
12. Good teamwork
13. Corporate Social Responsibility
14. Research and Innovation activities



Asia Pacific Accreditation and Certification Commission (APACC)

The Colombo Plan Staff College, an Inter-governmental, international organization for human resource development based in Manila, Philippines, established the Asia Pacific Accreditation and Certification Commission (APACC) as one of the specific targets in the implementation of the CPSC Corporate Plan 2003-2008. With the support and commitment of member countries to the CPSC Seoul Declaration of 2004 in Seoul, Republic of Korea, APACC ensures that it is able to guide Technical and Vocational Education and Training (TVET) institutions in equipping themselves with internationally-recognized standards and systems. It enables these institutions to produce workforce with great mobility to move across borders and with regionally-competitive qualification skills.

The Seoul Declaration of 2004 was further strengthened by the continued support and commitment to the mission and goals of APACC, as expressed by participating governments through the Manila Resolution 2005 and Cheonan Affirmation of Commitment 2007.

The purpose of the APACC are as follows:

1. To guide TVET institutions in equipping themselves with internationally-recognized standards and systems

2. To produce workforce with great mobility to move across borders, with regionally-competitive qualification skills

3. To harmonize the quality of TVET in the region and facilitate quality improvement programs

APACC accreditation is an internationally recognized sign of quality. Accredited institutions and stakeholders enjoy the following benefits:

1. Greater workforce mobility and mutual recognition of qualifications in Asia and the Pacific region;

2. Quality and employable workforce in member countries through APACC coordination among its network of institutions, agencies and other stakeholders;

3. Employer confidence on the selection of employees coming from accredited institutions. Accreditation status is important to employers when evaluating credentials of job applicants and when deciding to provide support for current employees seeking further education;

4. International recognition of the institutions' quality, accountability, and public trust;

5. Eligibility and reliability of TVET institutions for funding support from donors and other lending agencies;

6. Part of a regional network of quality institutions that expand schooling and learning opportunities for students; and

7. Transferability of credits earned by a student among educational institutions. Receiving institutions take note of whether or not the credits a student needs to transfer have been earned from an accredited institution.

Figure Table : APACC Accreditation Criteria

Criteria	Weighted Points
Governance and Management	46
Teaching and Learning	120
Human Resources	74
Research and Development	50
Image and Sustainability	50
Other Resources	110
Support to Students	50
Total	**500**

Role of APACC for TQM in TVET

The APACC award has direct link to the quality improvement. The APACC accreditation criteria (figure 8) are always focused on quality improvement.

Governance and Management:

Governance and management criteria focuses on how to governance and management system facilitate to enhance student learning environment and improvement of institutional effectiveness.

Teaching and Learning:

Assessment at this criteria focuses on the quality of the output and outcome of teaching and learning mechanisms and policies of the institution.

Human Resources:

Human resource is one of the key resources which contribute to enhance quality of programs and to enhance learning outcomes of the student. Therefore, assessment through this criteria facilitates the development of human resource policies and plan and human resource management. It indicates the right person in right place, time and with appropriate responsibilities.

Research and Development:

It is one of the tools to enhance creativity and innovation in TVET programs based on market needs. The criteria assesses the link with research and programs development and information management system of TVET institution.

Image and Sustainability:

This criteria mainly focuses on networking and partnership with industries and other relevant organization to enhance the quality of TVET programs. It assesses the involvement of employers before, during and after program implementation.

Other resources:

The criteria focuses on the physical facilities of the institution and covers criteria such as financial capability, buildings and laboratories, available training tools and equipment, library and other related resources. These factors affect the environment and influence the learning outcomes of the students and working environment of the faculty and staff. It tackles not only the availability of resources but also considers factors such as technological advancement, appropriateness, promptness and facility to control or monitor any foreseen or unforeseen challenges.

Support to Students:

This criteria assess the available services related to student development. Factors include the enhancement of student competencies, development of activities that promote their holistic development, and the achievement of a conducive, happy and sound learning environment that will have a positive impact to the students during their stay in the institution.

Keeping in view the aforementioned criteria, it is seen that the APACC standards and its role in developing the TQM culture in the institution seems to be high. It considers 360 degree evaluation approach and continuation of improvement which leads to institutional excellence. It indicates the area of excellence, right direction and need for improvement. Third party evaluation on management system of TVET institution provides eye opening path for them. It ensure the status of institutional quality to achieve learning outcomes of the student.

Who Benefits from a Quality Management System (QMS)?

For Training Institutions, QMS:

- bestows national quality recognition to providers of training
- promotes quality and current trends in education/training in the Technical Education and Vocational Training sector
- enhances credibility and image as a training provider
- establishes national quality standards among training institutions
- Promotes a culture of continuous improvement.

For Employers, QMS:

- ensures the continued supply of competent employees who have been trained at institutions that comply with established quality standards and criteria
- makes the search for competent employees easier by selecting candidates with qualifications from quality assured training institutions

For Trainees, QMS:

- provides recognition for entry into institutions, professions and business
- ensures quality of the training that they have received according to some agreed standards and criteria

For Parents, QMS:

- is an indication of the standard and quality of training provided
- Assures them that they are getting value for their investment in the training their children pursue at approved quality assured institutions and programs.

Challenges and Issues for TQM Implementation

The following are major challenges and issues for TQM implementation:

- Maintaining a quality management system
- Creating a quality culture
- Commitment of the employees to quality

- Leadership support
- Resources allocation to quality improvement activities
- Upholding the process based approach i.e. implementing PDCA cycle in Process improvement as routine activity.
- Document control and management
- Selection of the suitable certification agency

Conclusion

A successful implementation of TQM implies that all elements of the organization should be committed to quality. TQM is an obligatory way of thinking about organizations. Its primary goal is to meet the end-users' requirements – quality product or service. It believes in continuous improvement. TQ managed organizations are and should be learning organizations; advocates teamwork and thrives on a high-trust culture. All these are fertile grounds for exploration by TVET Institutions and show great potential for utilization within the TVET system.

APACC plays significant role to improve organizational quality and produce globally competent workforce. It is a tool for continuous improvement and a path towards excellence. As an independent third party assessment, APACC highlights the achievements, best practices and opportunities for improvement that the institution can consider for its own development.

With limited resources and the mandate to offer high quality TVET to an ever-changing environment and diverse group of learners is a challenge we all have to face in the coming millennium. This is a major task, but this has to be accomplished to sustain the system in this era of globalization and modernization.

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Online Learning for Sustainable Women Training: A Conceptual Framework

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Abstract

Bridging the gender diversity gap has become a key KPI for most organizations today, and many interventions are implemented to recruit and retain women in the workforce. One of the approaches is to equip them with necessary skills and competencies for which corporates today are relying on online learning. The objective of this paper is to provide a framework to guide the effective planning and implementation of sustainable online women training programs.

Introduction

Gender diversity has gained a lot of attention lately from organizations and governments. Gender equality is a sustainable development goal (UNWomen, 2015), and several measures, including the use of ICT are being put in place by the UN and organizations such as Google Inc. Organizations' primary challenge is to retain women in the workforce, encourage them to 'lean in' (Sandberg, 2013) for career development and prevent them from quitting the workforce due to family commitments – marriage, mobility, maternity (Kumar, 2015) as this affects their career and results in loss of knowledge and talent for the organization.

To address the issue, interventions such as; women forums, speaker sessions, child-care facilities, work from home, flexible work hours and training programs (Evans et al, 2014) are introduced. Training and professional development opportunities during the careers help retain women in the workforce (Davis 2012, Knight, 2012). They also build skills critical for them to grow their careers, such as self-awareness, self- confidence, leadership and work-life balance (Saxill-Danielle & Wong, 2015).

The training programs are offered in tandem with regular work and so are limited in duration and frequency. Continuous training is not feasible as women juggle multiple responsibilities and is also not sustainable for organizations due to the costs, logistics and loss of working hours. Online learning provides a sustainable and cost-effective solution (Pamfile et al, 2012). The UN has also advocated for the use of ICT for gender equality and to make education, knowledge, resources more accessible for women (UNwomen.org 2017). Training programs can be offered over

the organization's intranet or through education providers that design customized programs offered over their learning platforms. Although online learning has gained prominence worldwide for its sustainable benefits, there are limited studies to guide their implementation for training women in the workforce.

The objective of this paper, therefore, is to provide a framework for corporate women online training programs based on data from a leading Online University that has been offering such programs worldwide. Five critical dimensions are identified as a reference for HR/talent/diversity teams, educational service providers and learning design teams to plan sustainable educational interventions for bridging the gender diversity gap.

Background

Online Learning for Women in the Workforce

Online learning usually takes place over an LMS (learning management system) or VLE (Virtual learning environment) (Means et al., 2013). This can be purely online or blended with some face to face (f2f) and/or synchronous components such as webinars or video lectures. It offers several benefits such as reduced time for getting in touch with the source of learning, flexibility of learning schedule, less costs for participants as no travel or accommodation is involved, long term learning etc. (Pamfilie et al 2012) and access to global resources. Characteristics of online learning, that differentiate it from traditional f2f learning and make it beneficial and sustainable in the context of online training for women are:

Flexibility in terms of time, place and method of study. Learning activities can be completed within a fixed timeframe but at their own time, pace and place. It is portable making learning convenient and on-the-go (Kumar & Gulla, 2011). These features help women to study from home, after completing their other duties and over the weekends.

24/7 learning as the virtual classroom is always open allowing more time and opportunity for reflection and the convenience of learning anytime during the day providing women work-life and learning balance.

Collaboration & Interaction through the LMS for an engaging and collaborative learning experience to create a community of learners (Obura et al., 2011) which helps in retaining, motivating and inspiring women for career growth. A closed virtual classroom creates a sense of comfort for the women (Saxill-Danielle & Wong, 2015; Obura et al., 2011).

Accessible, convenient and safe learning alternative in some countries.

E-content with multimedia such as videos, audios, recorded lectures, animations, interactive exercises and quizzes to enhance knowledge transfer and better recall (Kumar & Gulla, 2011). Women participants benefit from listening to role models hence videos are useful. E-content is also far more sustainable and can be easily updated, customized and adapted than printed content.

Student-centered learning experience based on constructivism (Siemens, 2014) focuses on the issues and learning of the student and not on what needs to be taught. This aligns well with women corporate learners with prior knowledge and experience to control their learning (Huang, 2012) and construct new knowledge by contextualizing the learning to their strengths, weaknesses, challenges and opportunities.

Role of faculty in online learning, is that of a facilitator. They design the course, provide the content and assessments and manage the learning experience. They should be able to create a collaborative environment where women participants can learn the necessary skills and concepts but also feel free to share personal issues and challenges for peer learning.

Corporate Online Training for Women

Many companies are now leveraging online platforms for training considering the benefits such as reduced costs (Anderson & Woodill, 2004) and time spent on learning (Brandon, 1997), no logistical hassles, higher retention and faster application of the learning to the job (Fletcher, 1991). Some companies use internal platforms and resources to deliver training while most partner with institutes/ universities to customize the program to the women participants.

Online learning for corporate training, has its challenges such as: employee reticence in using learning technologies, insufficient corporate investment, lack of business-relevant courses, bandwidth/Internet access issues (Schweizer, 2004). For participants, the lack of f2f interaction and instantaneous feedback, distraction, technological difficulties/failure (Sitzmann, 2010), self-discipline are some of the major issues. For faculty, the challenges are in facilitating to ensure learning in a student centric environment. In online women training programs, the primary challenge is that women have less free time for learning, are usually averse to complex tools and platforms (Addah and Kwapong, 2012) and prefer f2f interactions. These challenges have to be kept in mind for sustainable corporate training for women. But there are limited studies to guide the implementation of sustainable online training programs for women.

Minar (2013) provides a template to guide the implementation of LMS based learning in a Distance learning institute and acknowledges the lack of studies on the use of online systems in higher education. Wu & Huang (2013) conducted a study to investigate sustainability of online logistics training. A similar study would benefit online women training. Headlam-Wells et al (2005) provided a guide for the use of E-mentoring for women employees, and a similar guide can help organizations increase women representation in the workforce. This study, therefore, aims to conceptualize an implementation framework for online training programs for women.

Methodology

Multiple sources of data such as the information on the best practices, insights, participant feedback and perceptions of online training were used for this qualitative exploratory study to build the framework through triangulation (Fielding 2012) and to cover the breadth of dimensions for a holistic framework. Data was derived from the

best practices of a leading Online University, GlobalNXT (part of the Manipal group of Institutions) based in Kuala Lumpur, Malaysia.

End of program feedback collected from the women participants after they completed a 6-month women leadership program (WLP) were also analyzed. Survey questions (appendix 2) covered aspects of the online program with quantitative data and qualitative comments. This is a standard end of program survey designed by the university to collect feedback on the program.

Data was also gathered from a semi-structured qualitative questionnaire sent out to about 13 working women in India & Singapore to incorporate perceptions of online learning as well into the framework. This questionnaire was designed based on the online learning themes discussed in the background section with the aim to capture perceptions of online learning. The semi structured questionnaire allowed participants to express related views without digressing too much. This data was collected over two months via emails, phone calls and face-to-face interviews.

Data from the above sources was analyzed and synthesized to identify themes and patterns (Stake 1995). The categorical-content method (Lieblich et al 1998) was used for analysis of participant answers to the open-ended questions to identify themes from the raw qualitative data. Data from the questionnaire was analyzed separately to help refine the framework. Data from the multiple sources was triangulated to arrive at the framework. For example program design as an element was identified based on data gleaned from the university's best practice and process of designing programs, but was also deduced from the survey participants' responses.

Framework for Online women training in organizations

Based on the analysis, a framework (fig. 1) was drawn to bring together critical aspects of online women training.

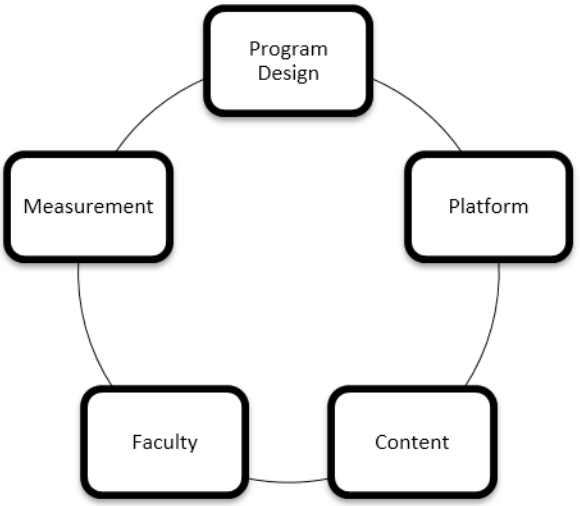

Figure 1: Framework for online women training in organizations

Program Design

Training programs have to be customized for a target group taking into consideration the organizational goals, requirements and participants' profiles. This leads to the determination of the program's objectives and learning outcomes. It is an important part of the talent development process in corporate e-learning (Garavan et al, 2012).

Clear learning outcomes allow for measurement of program effectiveness. Programs designed exclusively for women are better to make them feel at ease, to collaborate freely (e.g Saxill-Danielle & Wong, 2015). Module selection and program duration are determined next. Module selection depends on the program objectives. Duration has to be long enough to ensure learning yet not too long that participants lose interest. Weekly study hours have to be stated, so participants get the necessary support. Module choices depend on the program objectives.

Platform

Online learning platforms have improved dramatically over the last few years in stability, reliability, scalability, tools, collaborative features, integration with other systems, user interface and accessibility on mobile devices. For women training programs, the key is to keep the LMS simple and 'easy to use' (Pamfilie et al, 2012) as most participants agreed this was important for them. This can be a gender trait as shown by (He & Freeman, 2010) but is also important to prevent drop-out (Sitzmann et al, 2010) due to technical difficulties.

Content

As discussed in the previous narratives, the content for an online women program has to be interactive and engaging while also enabling participants to comprehend the concepts through self-study. It should include women related challenges and embedded multimedia as respondents mentioned that content has to be organized with videos, articles and readings embedded and customized to their industry and learning needs to ensure changes in behaviour to improve business results (Anand and Winters, 2008; Pamfilie et al, 2012). Customization is easy in E-Content (Pamfilie et al, 2011). Data also shows that videos of role models should be included in the content and assessments should be industry relevant case studies. Peer learning with the lively interactions on the discussion boards is preferred, underscoring the faculty's facilitating skills and choice of discussion topics for active learning (Salmon, 2013). Respondents stressed on the need to have synchronous sessions (webinars) mainly to address their perceived weakness distraction when online.

Faculty

Data reveals that reputed members of the faculty who can contextualize the learning, deliver webinars effectively and invoke enriching discussions are preferred. For online women training programs, the faculty should be effective facilitators of online

discussions and excellent orators for them to be able to inspire during the webinars and create a comfortable platform for women to share, reflect and learn from the interactions.

Participants indicate that having women faculty helps them share their issues openly. One participant in the program feedback said, "Female professors in the program understand our needs better than male professors would". In their study on women only training programs, Saxill-Danielle & Wong (2015) also found similar responses. Some women suggested that male speakers can be invited to conduct webinars to provide a balanced perspective on the issues and this is something program designers can keep in mind.

Measurement

Measuring the effectiveness of a program ensures that the program objectives and learning outcomes are achieved in a sustainable manner. It justifies the investment, improves the program and ensures talent development (Garavan 2012 but there is a dearth of models to measure the effectiveness of online training. Dorobat (2014) proposed a model for measuring e-learning effectiveness in universities, but this has to be modified to be made relevant to sustainable corporate women training.

End of program surveys help measure program effectiveness. Pre and post assessment of skills surveys are used when required by the client. Holistic surveys can be designed with input from participants, faculty, organizations' HR, reporting managers and other stakeholders to measure the behavioral change expected in the women for a positive influence on their careers and to assess the sustainability of the intervention.

Conclusion

The objective of the study was to develop a framework to guide the implementation of sustainable online women training programs. It provides a guide for implementing continuous and effective training programs for women with reduced costs and logistical hassles. It is also sustainable for the women participants due to the flexibility, accessibility and convenience. The framework is a guide for HR teams, diversity & talent management teams, educational and distance learning institutes, and policy makers involved in the planning and delivery of online training programs for women. This is important since several training programs fail to address the learning objectives, are expensive and unsustainable. This provides a basis for further studies that can examine, explore and text the entire framework or individual elements in further detail and in different contexts through a larger study with data from more online institutions. In doing so, this study initiates a research agenda in the area of sustainable online training for women.

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Community Attitudes towards Technical/Vocational Skills on Youth Enrollment for Skills Training: A Case of Youth Polytechnics in Kiambu County, Kenya

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Abstract

Education and appropriate skills training are key ingredients to individual and national development. Inadequate development level in Vocational Education (TVET) in a country, leads to poor industrial development. In Kenya, the technical/vocational education offered before independence created a negative attitude where few students opt for technical/vocational education. This hampers creativity, innovation and acquisition of entrepreneurial skills which are vital to the development of technologies that would lead to rural industrialization. Youth polytechnics have been identified as major centers for youth development and training, yet have very low enrollment. This study investigated community attitudes towards vocational education on students' enrollment for training in youth polytechnics in Kiambu County, Kenya. The population of the study included community members from Gatundu district. Purposive, sampling techniques were used to select the study sample. An interview schedule was the instrument used for data collection. Content analysis was applied on the qualitative data collected. Findings indicated, negative community attitudes and poor image on youth polytechnics as reasons for low enrollment levels. These findings are likely to stimulate action on restructuring the management of youth polytechnics to raise public appeal.

Introduction

According to the Skills Gap Analysis Report of the Government of Kenya (2012) and the Kenya youth policy paper (RoK 2007), seventy five percent (75%) of the population in Kenya are youth, and only 39% of this population are absorbed in the job market leaving the rest unemployed. Majority of the youth are found in the rural areas and due to the scarce resources they migrate to towns to compete for the scarce job opportunities. They end up in the slums where they are vulnerable to recruitment into gangs and militia groups to eke out a living. Upon realizing this, the Government of Kenya is in the process of restructuring technical/vocational education with emphasis on the crucial role of youth polytechnics (RoK, 2007). This training will harness the creativity and innovativeness of the youth through relevant education and skills training programs. Ultimately, it will prepare the country in focusing on realization of the millennium development goals and Kenya Vision 2030. The youth polytechnics (YPS) have been initiated not only to solve the problem of unemployment but also to offer an alternative path way for attainment of skills under the technical, industrial and vocational education and training program.

Geert (2008) defines Technical, Industrial, Vocational, Entrepreneurship Training (TIVET) program as a form of education which mainly leads participants into the acquisition of practical skills know-how and attitude necessary for employment in a particular occupation, group of occupations or self employment. Its main role of providing skills that improve productivity, raise income levels and improve access to employability has been widely recognized. Bonn resolution (UNDP, 2004) emphasize the importance of TIVET as a 'master key' for alleviating poverty, promotion of peace and environmental conservation to improve quality of human life and promote sustainable development in Africa.

According to Nyerere (2009) TIVET institutions in Kenya comprise of technical training institutions (TTIs), demonstration centers, Youth Polytechnics (YPs), Institutes of technology (ITs) and National youth service skills development centers. These institutions were established to offer TIVET education programs. Kenya's political violence in December 2007 exposed the threat of a large population of unskilled and unemployed youth amidst growing poverty. To address some of the underlying problems the government made an initiative of reviving the youth polytechnics in the country.

There are over 700 youth polytechnics in Kenya but only 639 are registered with the Ministry of Youth Affairs and sports as vocational training centers. Out of this number, 134 are private while 505 are government-owned. The courses offered in the youth polytechnics include: fashion & garment making technology, building technology, hair and beauty, carpentry and joinery, welding technology, electrical installation and wiring, information technology, agri-business and entrepreneurship. Nyerere, (2009) points out that out of a youth population of 75%, a total of 61% are unemployed and have no employable skills majority living in the rural areas and urban slums.

Community Attitude Towards Technical/Vocational Skills

The negative attitude towards vocational education dates back to the colonial history of Kenya. Academic education was perceived to have a higher social status than vocational education. This also means that they generate opportunities that attracted higher wages in white collar jobs, creating a stereotype that those working under the technical field are second-class workers. (Bogonko, 1992). The report from the Government of the Republic of Kenya (1999) points out that the vocational education introduced in Kenya before independence helped its graduates to perform subordinate tasks while foreigners supervised them. This created a negative attitude and as a result few students opt for vocational education especially in rural areas. This, therefore, would cripple creativity, innovation and entrepreneurial skills, which are vital to the development of technologies that lead to industrialization.

According to Kinyanjui (2007), a negative attitude towards vocational education is not only among the community members, but also manifested among teachers/ instructors and learners as they feel inadequate academically. This acts against effective mentorship from the teachers. The lack of business mentors or positive role models within the rural set up whom the youth can look upon with admiration, reinforces this perception. Having been used to a curriculum that is too academic

and theoretical, the youth have developed a culture of dislike for practical based courses. This may have militated against the concept of self employment and rural industrialization propagated by vocational training through youth polytechnics. The optional nature of technical subjects in secondary education tends to create the impression that the non-technical subjects are more important. This attitude is strengthened by the recurrent inadequate budgetary allocation by the government to TIVETs and the recent developments where technical institutions and national polytechnics are being transformed into universities to offer non-technical subjects (Muindi, 2011). The fact that technical/vocational education is not well established in the public Universities reinforces the attitude as observed by Mahinda and Mcleanard (2004).

Ngerechi, (2005) argues that for Kenya to cater for the changing technological systems and economic development, a change of attitude towards vocational education must be addressed. The author further suggests that TIVET education system should not create inequalities in the education system. Instead it should provide good quality vocational education and training comparable to general academic education to avoid suspicion on quality by the society and raise public appeal. The skills gap analysis report published by the Government of Kenya (2011) finds that the buildings and other teaching learning resources in public youth polytechnics are in poor condition compared to other public learning institutions. This could also create an impression that the youth polytechnics are of less importance as training institutions. Tilak (2006) observed that vocational education is an equity measure with a rural bias; it allows the rural community to acquire skills, develop talents and creativity. It serves the needs of the relatively poor by providing employment opportunities within the rural set up. However, contrary to the foregoing argument, the low enrolment seems to suggest otherwise.

In 1985 Kenya introduced a new education system where students would take 8 years in primary school, four years in secondary school and four at the university, hence the term 8-4- 4-education system. The system was introduced to inculcate knowledge, skills and attitudes, which would change their perceptions and prepare the youth for the world of work (Obura 1996). However, technical education at primary school does not exist at present, while at secondary school level technical subjects are optional, and only few students opt for the subjects due to negative attitude and the cost burden (ROK, 2006). The community was also supposed to contribute towards the cost of offering technical subjects, which meant more financial burden on the parents.

This strategy was meant to help the society understand vocational training better (ROK, 1991).Technical/Vocational education has not recovered from the tainted image as it is still seen as low quality education. Semejju (2004) suggests that community involvement would create a better understanding of the socio-economic benefits of the youth polytechnics to the development of the catchment area. Community involvement promotes a sense of ownership and increases accountability to avoid misuse of resources. The community may also be involved in curriculum design and implementation to ensure that courses offered are appropriate to the available opportunities and socio-economic development activities in the area (ILO, 2001). The

programs in the youth polytechnics lack public appeal and stature due to negative publicity and poor image arising from the physical structures and the traditional nature of the courses offered. For them to take their rightful place in the community, youth polytechnic courses need to be more responsive to the development activities of the areas as well as the technology in place. This may be in terms of participating in social economic activities and projects that address the immediate needs of the society. This approach may lead to increased community acceptance (UNDP, 2005), and an increase in enrolment.

According to Shiundu and Omulandu (1992) the youth polytechnics were intended to provide socio-economic development to the rural community by implementing the following: Introducing the youth to certain ethics to prepare them for the world of work; Equipping the youth with skills and attitudes that would lead to their involvement in income generating activities; use of the skills acquired to engage in sustainable livelihood, to uplift their standard of living and that of their communities by creating employment for self and others thus stemming rural-urban migration. This mandate has not been achieved since independence.

Community attitudes towards youth polytechnics are not an issue of concern in Kenya alone. Tilak (2006) highlights factors that work against TIVET in Asian countries, as socio-cultural attitudes towards vocational education and a negative attitude towards vocational oriented jobs, which reduces the demand for vocational education. It is further argued that vocational education is perceived as a preserve of the poor and the educationally backward sections of the community, low achievers and drop outs that are not eligible for admission into higher education. Consequently, it only attracts the racial minorities and women. This perpetuates inequalities in the education system which is a common phenomenon in many developing countries. Gill and Fluitman, (2000) argue that mechanisms for resource allocation in developing countries do not favour vocational education, as it is more expensive to sustain than general education. The authors further argue that most of the developing countries do not allow the provision of sufficient resources for vocational education due to budgetary constraints. As a result, the returns from the system are very poor. This trend also tends to promote negative attitude towards TIVET education.

The Government of Kenya (2008) acknowledges the role that the youth polytechnics could play in imparting the youth with the necessary skills for rural development and self-employment. The gap analysis on youth training report points out that, investing in youth polytechnic training means investing in national security as this reduces idleness giving the youth an alternative productive involvement rather than engage in dysfunctional behavior.

The focus of this study was on Gatundu district which had twelve (12) youth polytechnics out of which eight (8) were public and four privately owned. The total enrolment in these polytechnics at the time of this study was 581, yet there is a large population of out-of-school youth. Training acquired from youth polytechnics would empower the youth with skills to start business ventures in the area. This would in return provide jobs to the youth, enhance security, as well as provide some of the unavailable services to the community. This would make the youth polytechnics more beneficial and change the community perception on vocational skills.

Purpose & Objective of the Study

The purpose of the study was to determine community attitudes towards technical/vocational skills and its influence on youth enrolment for training in youth polytechnics in Gatundu district.

The following objectives guided the study:

1. To determine the community attitude towards technical/vocational skills
2. To determine the perceived benefits of youth polytechnics to the community
3. To assess the community's attitudes towards the courses offered

Research Methodology

This study used the descriptive survey design. The population for the study included members of the community in the areas where the polytechnics are located. Out of the eight public youth polytechnics in the district, seven (7) were purposively selected for the study on the basis of the number of trainees enrolled and how long the institution had existed at the time of the study. Snowball sampling technique was used to select a sample size of 50 respondents from parents of students in these polytechnics and opinion leaders from the local community. An interview schedule was used to collect data from the respondents, which was analyzed qualitatively. Experts in educational research validated the instruments. The instrument was piloted on 5 community members in the neighbouring Kiambu district.

The main area of focus was community attitudes towards vocational skills; attitudes towards courses offered, and perceived socio-economic benefits from the training

To achieve the objective the responses were captured at three levels as follows:

i. The community general attitude towards technical & vocational skills.
ii. The perceived benefits of polytechnics to the community.
iii. The community attitude towards the courses offered by the polytechnics.

Results and Discussions

Table 1 below shows community responses as to whether they thought the youth polytechnics in their areas were effective training institutions. All the respondents (100%) confirmed that they are aware of the existence of youth polytechnics. Probing further on the role of these institutions as sources of youth training in skills, (12%) felt that the polytechnics were good for training people with intellectual disabilities. These responses were rated as negative, positive or neutral. Those whose responses were 'yes' to the statements were rated as negative, while those whose responses were 'no' were rated positive.

Table 1: Community general attitude towards youth polytechnics

Statements	N=50	Yes	No	Neutral
Dumping ground for school dropouts		6	-	-
A place for students to mature		7	-	-
A place for people with intellectual disabilities Institute to accommodate the poor		12	-	-
Institute to accommodate the poor		5	-	-
Rural institutions of vocational training		-	14	6
Total		**30 (60%)**	**14 (28%)**	**6 (12%)**

Source: Field data

Table 2 shows the responses on the perceived benefits of the polytechnics to the community. All the respondents (100%) perceived the polytechnics as beneficial to the community, but each had their own perceived benefits. Majority (60%) felt that polytechnics kept the youth engaged, 26% felt that they reduced crime in the area, while only 14% felt that they were offering some useful training to the youth.

Table 2: Perceived benefits of youth polytechnics to the community

Responses	N=50	F	%
Offers training to the community youth		30	14
Reduces crime		13	26
Preoccupies the youth (reduces idleness)		7	60
Total		**50**	**100**

Source: Field data

The study was also interested in finding out what the community thought of the courses offered by the youth polytechnics. Table 3 shows a summary of the responses on community attitudes towards the courses offered. The results showed that 60% of the respondents felt that the youth polytechnic courses were only good for those who could not afford to train in other institutions. Further, 24% and 16% respectively felt that the courses were good for non-academic performers and school drop-outs.

Table 3: Community's attitudes toward the courses offered

Responses	N=50	F	%
Assist those in need/ the poor		30	60
Good for non-performers		12	24
Good for school dropouts		8	16
Total		**50**	**100**

Source: Field data

The figures in table 1 show that the largely negative attitude expressed by the respondents had perceptions that were not supportive of youth polytechnics while the positive were supportive of the youth polytechnics. This large percentage (60%) with negative perceptions shows that though the polytechnics are located within the community, they did not view them as credible institutions for skills training. Surprisingly, the respondents are parents and members of the community and the negativity demonstrates that they may not encourage their children to enroll in these institutions. The courses offered did not relate to the local activities either through provision of goods and services. This perception is also supported by Kinyanjui, (2007) who observed that the institutions lacked public appeal and that the courses were too traditional to attract the youth.

The results in table 2 indicate that the community did not perceive youth polytechnics as important training institutions. This may also suggest that those who enrolled their children only did so as the last resort because the fees charged are low hence affordable. For the institutions to gain acceptance in the community, they must be seen to contribute positively in terms of enhancing the quality of the lives of the community members. The old program which started in 1966 then referred to as 'village' polytechnics, was mandated to train the rural youth with knowledge skills and attitude leading to self employment. This would raise the living standards of the community and initiate rural industrialization (Kings, 2005). This study observed that this objective has not been accomplished, due to community attitudes' towards the polytechnics which affect enrolment and security of workshops and equipment in these institutions.

Youth unemployment fosters dysfunctional behaviour, high levels of crime, violence and substance abuse. Unemployment also results in socio- psychological problems as it blocks their passage to adulthood due to prolonged dependency, inability to join a career and capacity for productivity. It also alienates the youth from the society and the democratic process, which may result to social unrest. The post election violence experienced in 2007 is a clear indication of the danger posed by unemployed youth.

Technical/vocational training would provide the youth with skills for productivity in self-employment, the youth would then be able to take advantage of the established revolving youth fund to create jobs for themselves and others. This could be done through having programs with skills that directly relate to solving prevailing problems in the catchment area and the job market. Since Gatundu districts' main economic activity is small scale farming, short courses in farming and value addition as well as using the polytechnics as centers for community forums or activities that support the socio- economic life of the community would help to change the negative attitudes. A majority of respondents associated the courses offered with specific classes or categories of people in the society, for example; non academic performers, dropouts and the poor. These are perceptions likely to work against the trainees' self-concept.

The study also found out that only 14% of the respondents viewed the polytechnics as beneficial but the skills offered could not be applied in the area as most shopping centers lacked electricity and the roads net work was poor. This fact limited the number of youth enrolling for skills training as there are no businesses relating to the offered courses except in garment making and public service vehicles driving. Twenty six percent (26%) viewed them as beneficial in reducing crime and idleness by offering the youth an alternative engagement and enhancing security in the

community. The majority felt that the institutions could play a more meaningful role in empowering the youth if the skills provided were different or more advanced than what was offered by informal sector which a majority of the youth preferred. The results showed that the respondents supported the existence of these institutions. However, the institutions did not meet their expectations and this reinforced the negative attitude. A report from the Government of Kenya recommended the increase its financial and management support to youth polytechnics as they are critical in youth development. Public image of the institutions must be improved for them to be recognized as effective training institutions for the rural youth.

Conclusion

Based on the analysis of the participants' responses to the survey questions, it can be concluded that the community attitude towards the youth polytechnics' training is generally negative and that technical/vocational education is perceived as a preserve for the poor and non-academic performers in the society. The courses offered only lead to blue collar jobs; as a result the community did not perceive them to have any economic benefit. It is also concluded that the youth polytechnics have not achieved their mandate of training the rural youth with employable skills. The government, through its development blue print (Vision 2030) emphasizes on youth polytechnics as a pillar in youth development. This resulted to the commendable support that the government is currently giving to these institutions. The community is a main stakeholder in the polytechnics and ownership may be encouraged for them to be good ambassadors. Despite that, the view about youth polytechnics is still largely negative and the government should further explore more opportunities to erase that perception.

By providing technical/vocational training that matches the technological developments in place, the polytechnics would attract more students and reduce suspicion on the part of the community. Positive community attitude towards vocational education will be created if Kenya will achieve its rural development goal as envisaged in vision 2030.

Recommendations

Based on the findings, it is recommended that the youth polytechnics should further increase its involvement in activities such as construction of cattle dips, churches and caring for the environment in the rural areas would increase public awareness. This would enhance positive attitudes among the community and in return increase the level of enrolment and productivity.

It is also recommended that the youth polytechnics can be venues that will offer short courses to farmers and community groupsThese courses will be tailored to address the problems that affect the everyday living of these people and it will strengthen the reputation and image of youth polytechnics as reliable centers for learning and holistic development.

The government is also urged to consider matching the skills training with the job market and the development needs in the catchment area this will make the graduates competitive not only in Kenya but in the region.

Further research on a larger scale may be conducted to explore on how best to implement the recommendations made in this paper.

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Vision for the Blind: Challenge for TVET

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Abstract

The World Health Organization (WHO) estimates that in 2012 there are 285 million visually impaired people in the world, of which 246 million had low vision and 39 million were completely blind. In terms of the worldwide prevalence of blindness, it is present on a much greater scale in developing world countries than in developed world countries. According to WHO statistics 90 percent of blind people live in the developing world. This paper brings into the limelight a pair of navigation glasses named IRIS-A VISION FOR THE BLIND which the author has designed and implemented, and can be used by the blind people for navigation. These all-round vision glasses consist of a pair teamed with an earpiece. It helps the sight impaired to avoid obstacles while they walk and thus avoid accidents. Proximity sensors have been fitted inside the glasses. These sensors in the glasses sense and detect the presence of an obstacle in the path of a blind person and the buzzer gives out a beep, thus warning the person of an impending danger. This technology is very economical and is expected to serve the needs of blind people in the future.

Introduction

Blindness is defined by the World Health Organization as vision in a person's best eye of less than 20/500 or a visual field of less than 10 degrees (Maberley et.al 2006). This definition was set in 1972, and there is an ongoing discussion as to whether it should be altered somewhat. But whatever be the definition, the blind people suffer from this handicap of not being able to see and face a large number of problems that need to be addressed.

According to a recent survey, India is now home to the world's largest number of blind people. Out of the 37 million people across the globe who are blind, over 15 million are from India. Very often, blindness occurs in combination with other conditions such as intellectual disability or hearing impairments. Visually impaired people thus, find it extremely challenging to perform their routine activities. Various measures have been taken to provide such people with technology that would take some part of this burden off their shoulders and with intensive research going on in this field, there indeed is a bleak ray of hope (World Report on Disability-UNICEF).

Recognizing the fact that nowadays, technology continuously find ways to provide a normal life to the physically handicapped and acknowledging their contributions to the field of literature and science, the project called IRIS-A VISION FOR THE BLIND

was born. This was presented during the MAKE-A-THON project competition held from 10th to 11th August 2013 at VIT University in India. The project was under the supervision of Prof. Ted Moallem, Professor from the Massachussets Institute of Technology (MIT), in the USA.

Presently, many people with serious visual impairments can travel independently, using a wide range of tools and techniques. Orientation and mobility specialists are professionals who are specifically trained to teach people with visual impairments how to travel safely, confidently, and independently in the home and the community. They can also help blind people to practice travelling on specific routes which they may use often, such as the route from one's house to a convenience store. Becoming familiar with an environment or route can make it much easier for a blind person to navigate successfully.

Tools such as the white cane with a red tip - the international symbol of blindness - may also be used to improve mobility. A long cane is used to extend the user's range of touch sensation. It is usually swung in a low sweeping motion, across the intended path of travel, to detect obstacles. However, techniques for cane travel can vary depending on the user and/or the situation. Some visually impaired persons do not carry these kinds of canes, opting instead for the shorter, lighter identification cane. Still others require a support cane. The choice depends on the individual's vision, motivation, and other factors (Joseph, 2013).

Government actions are sometimes taken to make public places more accessible to blind people. Public transportation is freely available to the blind in many cities. Tactile paving and audible traffic signals can make it easier and safer for visually impaired pedestrians to cross streets. In addition to making rules about who can and cannot use a cane, some governments mandate the right-of-way be given to users of white canes or guide dogs.

Some blind people are skilled at echolocating silent objects simply by producing mouth clicks and listening to the returning echoes. It has been shown that blind echolocation experts use what is normally the "visual" part of their brain to process the echoes (Thaler et.al, 2011 and Batman, 2014).

Objective

The objective of this project was to facilitate the visually impaired persons by designing a pair of all-round navigation glasses for the blind. The glasses should help for navigation purpose and also help the sight-impaired people deal with everyday situations much more.

These all-round vision glasses consist of a pair of glasses teamed with an earpiece. It helps the sight impaired to avoid obstacles while they walk, thus avoiding accidents. Proximity sensors have been fitted inside the glasses. These sensors sense and detect the presence of an obstacle in the path of a blind person and the buzzer gives out a beep, thus warning the person of an impending danger. IRIS is a low cost, feasible as well as an economical solution to help the blind people navigate an unfamiliar environment and assisting them towards their independent mobility.

Proximity Sensors

A proximity sensor enables to sense and detect the presence of a nearby object without any physical contact. It emits an electromagnetic field and looks out for significant changes in the return signal. The object to be sensed is referred to as the target. Different proximity sensors have different nominal ranges. The nominal range of a proximity sensor is defined as the maximum distance up to which it can sense the presence of an object.

How a Proximity Sensor Works

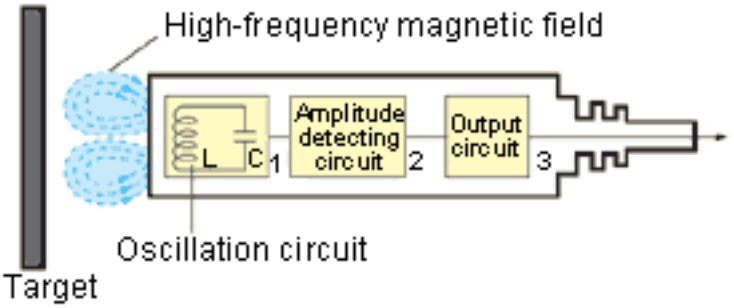


Figure 1: working of a proximity sensor

A proximity sensor works on the principle of electromagnetic induction. Electromagnetic induction is a process by which a conductor placed in a region of varying magnetic field causes the production of a voltage or a potential difference across the conductor. A high-frequency magnetic field is generated by coil L in the oscillation circuit. When a target comes in close proximity of the sensor, an induction current, which is also called an eddy current, flows in the target due to the process of electromagnetic induction. As the target approaches the sensor, the induction current flow increases, which causes the load on the oscillation circuit to increase. When the load on the oscillation circuit increases, the oscillation attenuates and finally stops. The sensor detects this change in oscillation with the help of the amplitude detecting circuit and sends an output signal.

Working of IRIS Instrument for the Purpose of Navigation

This sleek concept utilizes built-in sensors to alert the wearer of nearby objects, whether these are in front, behind or beside the wearer. Further, a separate earpiece that extends across the face has been attached to a pair of glasses. The sensors fitted inside these glasses pick up the elements around the person and warns them using the buzzer sound. The project has also focused on making the glasses as accessible as possible. For one, the glasses do not require any surgery or special training to use. The glasses also use off-the-shelf products, such as proximity sensors, beeping buzzer, arduino board to keep the product inexpensive.

The functioning of IRIS can be explained as follows:

- A pair of glasses is worn by the intended user.
- The user is then free to navigate an unfamiliar environment.
- Whenever there is an impending obstacle that the user encounters, the proximity sensors are able to sense and detect the presence of that obstacle.
- This information is then sent to him using the buzzer that beeps every time such a situation occurs.
- Thus the visually impaired person is warned of the impending obstacle and should change his path in order to avoid accidents.

PROJECT TECHNICAL DESIGN

Figure 2: Prototype model of the product

Hardware Requirements:

1) Arduino Uno Board

An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields.

2) A pair of eye glasses used by the blind people

3) 12 volt battery

4) Capacitive proximity sensors (model name: BEF-KH-M12)

5) Connecting wires

6) PICKIT 2 software

7) Buzzer

8) Personal computer

Software Requirements:

1) Mikro C

2) Embedded C

3) Arduino software

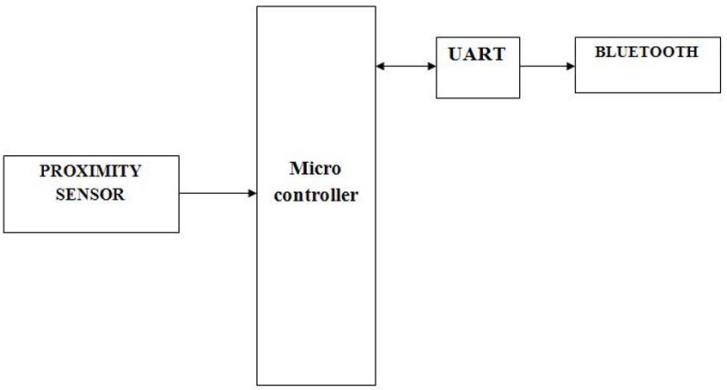
The following is the code snippet of the design:

```
// Simple Proximity Sensor using Infrared
// Description: Measures the distance to an obstacle using infrared light emitted by IR LED and
//  reads the value with a IR photodiode. The accuracy is not perfect, but works great
//  with minor projects.
// Author: Ricardo Ouvina
// Date: 01/10/2012
// Version: 1.0
intIRpin = A0;              // IR photodiode on analog pin A0
intIRemitter = 2;           // IR emitter LED on digital pin 2
intambientIR;               // variable to store the IR coming from the ambient
intobstacleIR;              // variable to store the IR coming from the object
int value[10];              // variable to store the IR values
int distance;               // variable that will tell if there is an obstacle or not
void setup(){
Serial.begin(9600);         // initializing Serial monitor
pinMode(IRemitter,OUTPUT);  // IR emitter LED on digital pin 2
digitalWrite(IRemitter,LOW);// setup IR LED as off
pinMode(11,OUTPUT);         // buzzer in digital pin 11
}
```

```
void loop(){

distance = readIR(5);      // calling the function that will read the distance and passing
the “accuracy” to it

Serial.println(distance);   // writing the read value on Serial monitor

 // buzzer();              // uncomment to activate the buzzer function

}

intreadIR(int times){

for(int x=0;x<times;x++){

digitalWrite(IRemitter,LOW);            // turning the IR LEDs off to read the IR coming
from the ambient

delay(1);                                  // minimum delay necessary to read values

ambientIR = analogRead(IRpin);  // storing IR coming from the ambient

digitalWrite(IRemitter,HIGH);       // turning the IR LEDs on to read the IR coming from
the obstacle

delay(1);                                  // minimum delay necessary to read values

obstacleIR = analogRead(IRpin);  // storing IR coming from the obstacle

value[x] = ambientIR-obstacleIR;   // calculating changes in IR values and storing it for
future average

 }

for(int x=0;x<times;x++){       // calculating the average based on the “accuracy”

distance+=value[x];

 }

return(distance/times);          // return the final value

}

//-- Function to sound a buzzer for audible measurements --//

void buzzer(){

if (distance>1){

if(distance>100){ // continuous sound if the obstacle is too close

digitalWrite(11,HIGH);

   }
```

```
else{  // beeps faster when an obstacle approaches
digitalWrite(11,HIGH);
delay(150-distance);  // adjust this value for your convenience
digitalWrite(11,LOW);
delay(150-distance);  // adjust this value for your convenience
   }
 }
else{  // off if there is no obstacle
digitalWrite(11,LOW);
 }
}
```

BLOCK DIAGRAM OF TRANSMITTER-



BLOCK DIAGRAM OF RECEIVER

Transmitter Section

The proximity sensor collects the signals that are received when a nearby object is detected. The microcontroller then sends the data using Bluetooth to the personal computer. The purpose of UART (Universal Asynchronous Receiver/Transmitter) is to convert bytes from the PC's parallel bus to a serial bit-stream. The cable going out of the serial port is serial and has only one wire for each direction of flow. The serial port

sends out a stream of bits, one bit at a time. Conversely, the bit stream that enters the serial port via the external cable is converted to parallel bytes that the computer can understand.

Receiver Section

The signals are detected as warning signs of an impending obstacle. This triggers the buzzer which starts beeping as soon as the warning signals are received. Thus the visually impaired person is warned and is able to avoid coming in contact with the obstacle.

Summary and Results of the Pilot Test

IRIS was designed keeping in mind the basic working of a proximity sensor. It consists of a pair of glasses teamed with an earpiece. The glasses have capacitive proximity sensors (model name: BEF-KH-M12) fitted inside them. Capacitive proximity sensors are designed to sense and detect the presence of both metallic as well as non-metallic objects. The presence of a metallic object (inductive) or any material (capacitive) in the operating area will cause a change in the oscillation amplitude. The rise or fall of such oscillation is identified by a threshold circuit that changes the output state of the sensor. When worn by a visually impaired person, the glasses serve as a navigation device. The sensor senses the presence of an obstacle that is at a minimum of 8 feet and a maximum of 10 feet away from the person. It then gives out a buzzer beep as soon as the obstacle's presence has been sensed. Thus, the person is warned of an impending obstacle and may change his direction to avoid accidents.

The pilot testing of IRIS received positive results. IRIS was designed in a period of 36 hours and the first test was done following the end of that time period. It was tested on 4 blind persons in the first test. The measure of effectiveness was considered to be distance of the obstacle at which the new instrument will start beeping thus giving the warning to the blind person. In all the 4 cases when a sample obstacle was placed four feet away from IRIS, the buzzer started beeping. That proved the efficacy of IRIS. The second trial was repeated two days later on a set of 7 blind persons and it proved effective as it had done in the first trial. This signifies that the project has been a success.

IRIS – an Economically Feasible Technology

IRIS has been designed to cater to the needs of the common middle class man. The product is thus an economical as well as a feasible solution for bringing an end to the plague of blindness that surrounds India as well as the whole world. IRIS mainly targets people who are visually impaired or blind by birth. The approximated cost of the navigation glasses comes out to be around US$ 20 which is a very reasonable price to pay in exchange for the gift of vision. As regards the breakup of the cost for the customer, broadly the equipment and glasses cost is about US$ 11, the cost of frame around US$ 5 and the US$ 4 has been kept as a margin of profit per piece.

Future Enhancements and Role of TVET

For a visually impaired person, the future holds nothing but a bleak ray of hope. IRIS aims at widening that ray of hope and making it possible for such people to

have a tomorrow to look forward to. Intensive research is being carried out in this arena and Technical and Vocational Education and Training (TVET) sector can play an important role in further refining the product. Future enhancements could lead to a better refinement of this technology that the author has worked upon. The navigation glasses could be worked upon to include audio controls with the help of image processing to give an audio feedback about the impending obstacle to the visually impaired person. In addition research in TVET can help in improving the range of coverage of the effectiveness of the product which at present is 4 feet, making it possible to identify the obstacles as far as 10-15 feet for the blind people. With further research and development the cost of the IRIS can be brought down making it possible for the poor people to also afford the product.

Conclusion

With advances in every field of technology, the world is slowly becoming a better place to live in. These navigation glasses fulfilled the objective of assisting the visually impaired in identifying the obstacles on the way. It can still be further improved in terms of its design, range of coverage and if produced on a mass scale the cost can be further brought down. The author is confident that IRIS is a feasible product capable of giving the blind people a new vision and, thus, a new hope and a new outlook on life.

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Portable Smokehouse and its Potential to Solve Problems in Community-Based Training in the Food Processing Program

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Abstract

The study explores the creation of a portable smokehouse that can be portable, easy to use and efficient. This is in response to the request of the surrounding community for the Puerto Princesa School of Arts and Trades (PPST) to constantly organize food processing courses as part of its extension activities.

Upon the development of the portable smokehouse using cheap materials that are readily available in the institution, a pilot test was carried out. It was found out that the smokehouse needed lesser charcoal and sawdust and was able to smoke fish 10 minutes faster as compared to the conventionally-designed smokehouse. Furthermore, its collapsible feature ensured an easier storage and transport than the regular smokehouse.

It is seen that this smokehouse will now be able to address the training needs of the community by demonstrating a working prototype that can actually be used as a substitute to the conventional.

Realizing the need to upgrade the skill of the seminar participants in preserving food, the instructors of the Food Processing course developed an in-house smokehouse that is designed to cater to the training needs of the community.

Background of the Study

PPSAT conducts institution-based training programs or qualifications and facilitates numerous community-based trainings in different areas of the city and in northern and southern part of Palawan. One of the most requested trainings conducted in the community is the Food Processing NC II. This course is one of the program offerings in Puerto Princesa School of Arts and Trades (PPSAT). It is divided into basic, common, and core competencies, and has a training duration of 568 hours, with the core competencies taking 90% of the total span. The core competencies are composed of the following: 1)Process Food by Salting, Curing, and Smoking; 2) Process Food by Fermentation & Pickling; 3) Process Food by Sugar Concentration; and Package Finished/Processed Food Products.

In a regular institution-based training, Food Processing takes four to five months of training. However, majority of the partner agencies only requests for short-term trainings in far-flung municipalities, having two to three weeks as the longest duration. Hence, to meet the needs of the community even in a short period, not all core competencies are provided. Among the most common offered trainings in distant municipalities is the first Certificate of Competency (COC) of Food Processing, the Process Food by Salting, Curing, and Smoking.

According to its lead trainer, Ms. Eleonor H. Solomon, she found smoking process to be quite challenging especially when held outside the school because the equipment used for smoking is too large and bulky. Bringing it outside was inconvenient. The design of the smoking equipment only suits the institution-based training but not the community-based. When conducting trainings in municipalities, Ms. Solomon used to recycle cans of cooking oil as smoking equipment. These cans were quite sustainable but only for a very short period. It may pose danger to the end-users, and may affect the quality of the output. Changing smoking equipment every now and then was inconvenient, too.

To solve the issues encountered in the first COC of Food Processing, Ms. Solomon came up with an idea of creating a collapsible smokehouse. She collaborated with Mr. Rene J. Socrates, the lead trainer of Machining NC II regarding the project idea. After discussing, they decided to propose a portable smokehouse that could be used in community-based trainings.

RESEARCH OBJECTIVE

This study aimed to create a functional portable and collapsible smokehouse for community-based training in Food Processing - COC 1 (Process Food by Salting, Curing, and Smoking).

SIGNIFICANCE OF THE PROBLEM

The research project aimed to address the issues encountered in COC 1 in Food Processing, which includes smoking. It would make the training more efficient and convenient to the trainer and trainees. It may also save more time and effort on part of the trainer, and save resources on part of the institution. The training may smoothly continue without limiting the quality of the smoked product.

RESEARCH PARADIGM

The research project followed an I-P-O paradigm. Input contains the knowledge, hardware and human requirements. Process describes how the research ran, and output states the finished and functional product. See the illustration on the next page.

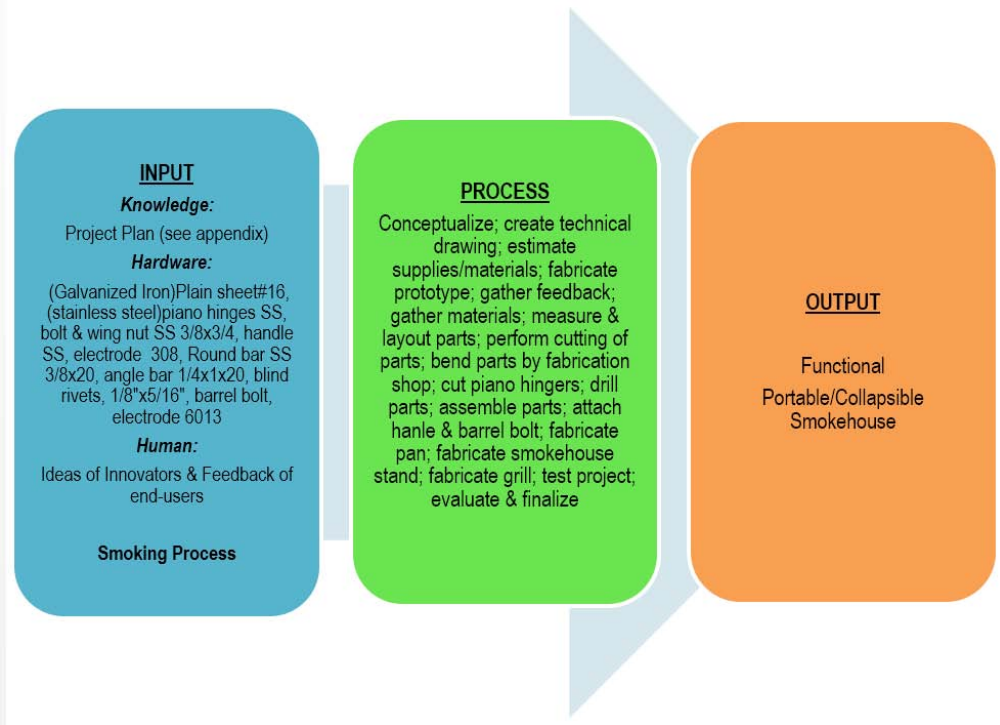


Figure 1: Input-Process-Output Framework of the Smokehouse Project

Table 1: Raw materials used for the Smokehouse Prototype

No.	Raw Material	Properties		
		Physical	Chemical	Thermal
1.	Plain Sheet (GI), gage 16	A cast iron sheet coated with zinc that has a high resistance against corrosion. Solid and bendable, metallic (silver-like) color, malleable	A zinc coated cast iron, moderately magnetic	Melting point is above 700 oK

2.	Piano Hinges	A 1.5m long stainless steel material whose width is one (1) inch cut into required length of the pro-ject. Solid and bendable, metallic (sil-ver-like) appearance	Main Alloy element is 10-20% chromium, corro-sion resistant, corrosion resistant (atmospheric) not in warm seawater. Other composition Mo, Ni, and N	Thermal expansion is16-18 μ oK . Low Thermal Conduc-tivity, Melting pt is 1673-1723 oK (Azom.com)
3.	Round bar	Pieces of stainless steel material with the diameter 3/8 of an inch cut into required lengths; 32 inch-es for the grills 18 inches. Solid and metallic (silver-like) appearance.		
4.	Handle	3 inches long. Solid and metallic (silver-like) appearance.		
5.	Bolt & wing nut	Bolt whose diameter is 3/8" and length of ¾" wing nut diameter is 3/8" . Solid and metallic (silver-like) appearance.	Main Alloy element is 10-20% chromium, corrosion resistant, corrosion resistant (atmospheric) not in warm sea water. Other composition Mo, Ni, & N	
6.	Blind rivets	Size is 1/8" by 5/16". Solid and metallic (silver-like) appearance and hard		
7.	Angle bar	20-ft long angle bar size ¼" by 1" cut into required lengths, gray appearance, hard	Cast Iron, Highly Magnetic, prone to corrosion if exposed in air, Melting pt 1536 oC	Conductivity 55W/m-C, density of 7.92x103 kg/m3 sp heat of 456 J/kg-oC
8.	Barrel Bolt	Solid, gray appearance, hard		
9.	Electrode, 308	Solid, rod, metallic appearance, brittle,	Compose of Fe, C, Cr,Mn,Mo,Si, Ni, S, and P. Density 8g/cm3	Conductivity is 15.2 W/moK
10.	Electrode, 6018	Solid, rod, bronze appearance, brittle, non- Volatile, diameter 2.5-5.0 mm,	Composed of C, Mn, Si, Mo, Cr, V, Ni. Reactive with acids, non-explosive, insoluble in water.	Melting pt. 1000-1500 oC

Operational Framework (Methodology)

This part describes the raw materials used, how the study worked, the steps of development, the validation and testing procedures, and the evaluation.

Table 2: Equipment used for the Smokehouse Prototype

Unit	Item	Quantity
Ft2	Plain Sheet (GI) gage 16 (4'x 8')	48
m	SS Piano Hinges (width 1")	5.25
pair	SS Bolt & wing nut 3/8" X ¾"	10
pc	SS handle	2
pc	Electrode, 308	8
ft	SS Round bar ø 3/8"	20
ft	SS Angle bar ¼" X 1"	15
pc	Blind rivets 1/8" X 5/16"	250
set	Barrel Bolt	3
g	Electrode, 6018	500

Table 3: Project Timeline and Development

Date and Time	R & D Activity	Accomplished Task/Output	Personnel Involved
	Planning & Conceptualization	Meeting conducted	Eleonor H. Solomon & Rene J. Socrates
December 19, 2016	Preparing working drawing (2D &3D)	Technical Drawing	Rene J. Socrates
December 19, 2016	Estimating supplies and materials needed	Purchase Request	Rene J. Socrates
January 31, 2017	Fabricating prototype smoke house	Fabricated prototype	Rene J. Socrates
January 1-2, 2017	Seeking feedback on fabricated prototype	Gathered feedback	Eleonor H. Solomon
January 13, 2017	Gathering of purchased materials from Supply Office	Gathered required materials	Rene J. Socrates
January 14, 2017	Measuring & layouting the dimensions of the different parts of project	Measured and layout parts	Rene J. Socrates
January 14, 2017	Cutting parts using angle grinder	Performed cutting of parts	Rene J. Socrates
January 14, 2017	Bending two (2) ends of top & bottom parts and three parts of front side parts	Bended parts by fabrication shop	Rene J. Socrates
January 15, 2017	Cutting pianohinges according to required length of parts	Cut piano hinges	Rene J. Socrates
January 15, 2017	Drilling parts based on the holes of piano hinges	Drilled parts	Rene J. Socrates
January 16, 2017	Assembiling parts with the use of blind rivets and hand riveter	Assembled parts	Rene J. Socrates
January 16, 2017	Attaching handle and barrel bolt	Attaqched handle and barel bolt	Rene J. Socrates
January 17, 2017	Fabricating pan	Fabricated pan	Rene J. Socrates
January 20, 2017	Fabricating smoke house stand	Fabricated smoke house stand	Rene J. Socrates
January 21, 2017	Fabricating grill	Fabricated grill	Rene J. Socrates
January 22, 2017	Testing for functionality	Tested project	Eleonor H. Solomon & Rene J. Socrates

Testing and Operating Procedure

After the project was created, the trainer in food processing together with a group of end-users operated the smokehouse during the COC 1 in Food Processing to test and evaluate its functionality. They processed different types of fish such as salay, lumahaw and bangus. As observed, the portable smokehouse has exceeded the performance of regular drum-type smokehouse in terms of fuel consumption, smoking duration, quality of the smoked product, portability, and ease of use.

The portable smokehouse needs a lesser amount of charcoal and sawdust than the bigger, traditional drum-type. Moreover, unlike the common drum-type that takes 45 minutes to one hour of smoking four to five kilos of salay, lumahaw or bangus, the portable smokehouse only takes 30 to 35 minutes. Both can accommodate the same load of fish though, with a maximum capacity of four to five kilos. Meanwhile, based on the quality of the smoked product, it was observed that the fish processed in the portable smokehouse is juicier, has a better texture, and has a more brilliant

golden-brown color than the fish processed in drum-type. These observations may be attributed to the small size of portable smokehouse that evenly distributes the heat and smoulder inside the device.

Furthermore, the portability of the smokehouse was proven effective due to its collapsible feature. In fact, it was already brought and used in community-based trainings in the distant municipality of El Nido, and in the island municipality of Cagayancillo. In terms of ease of operation, initially, the trainers and other end-users found it hard to assemble and disband due to lack of user's manual. But this issue was immediately solved as Mr. Socrates created the user's manual.

Despite the identified strengths of the portable smokehouse device, further modification may be employed to improve capacity for smaller-sized fish, and ease of transport.

Trainees of Food Processing testing and operating the portable smokehouse.

Evaluation

Table 1: Functionality of the Portable Smokehouse as Perceived by the Users

Functionality	Frequency			Total	Percentage (%)			Total
	Trainee	Expert	Colleague		Trainee	Expert	Colleague	
4-Excellent (0% revision)	10	1	2	13	67%	7%	13%	87%
3-Good (1-25% revision)	2	0	0	2	13%	0%	0%	13%
2-Average (26-50% revision)	0	0	0	0	0%	0%	0%	0%
1-Fair (51-75% revision)	0	0	0	0	0%	0%	0%	0%
0-Poor (76-100% revision)	0	0	0	0	0%	0%	0%	0%
Total	**12**	**1**	**2**	**15**	**80%**	**7%**	**13%**	**100%**

Table 2: Design efficiency of the Portable Smokehouse as Perceived by the Users

Design	Frequency			Total	Percentage (%)			Total
	Trainee	Expert	Colleague		Trainee	Expert	Colleague	
4-Excellent (0% revision)	8	1	2	11	53%	7%	13%	73%
3-Good (1-25% revision)	3	0	0	3	20%	0%	0%	20%
2-Average (26-50% revision)	1	0	0	1	7%	0%	0%	7%
1-Fair (51-75% revision)	0	0	0	0	0%	0%	0%	0%
0-Poor (76-100% revision)	0	0	0	0	0%	0%	0%	0%
Total	**12**	**1**	**2**	**15**	**80%**	**7%**	**13%**	**100%**

After going through operational testing, a questionnaire determining the functionality and design was administered to the end-users, trainees, trainers, and experts. The results are as follows:

In terms of functionality, the evaluation reveals that the portable smokehouse receives an average of 3.86. 87% of the end-users also rated it as excellent. This indicates that the innovation is highly functional.

On the other hand, in terms of design, the smokehouse garnered an average of 3.67. This means that the project requires negligible revision. Likewise, 73% of the evaluators see it having an excellent design the Tables below show the Gantt Chart and the Budget Plan

Table 4: Gantt Chart of the Project

Year	2016			2017		
Month	Oct	Nov	Dec	Jan	Feb	Mar
Conceptualization						
Need Analysis						
Planning						
Developing						
Testing						
Modifying						
Finalizing						
Evaluation						

Table 5: Budget Plan of the Project

Unit	Item Description	Quantity	Unit Cost	Total Cost
Pcs.	Plain Sheet, Gage #16	1.25	1,200.00	1,500.00
Pcs.	Piano Hinges, SS	3.5	180.00	630.00
Pcs.	Bolt & Wing Nut, SS, #/8" x 3/4"	10	41.00	410.00
Pcs.	Handle, SS	2	69.00	138.00
Pcs.	Electrode, 308	8	16.00	128.00
Pc.	Round Bar, SS, 3/8" x 20'	1	800.00	800.00
Pcs.	Angle Bar, 1/4" x 1" x 20'	0.75	350.00	262.00
Box	Blind Rivets, 1/8" x 5/16"	0.5	230.00	115.00
Sets	Barrel Bolt	3	12.00	36.00
Kg.	Electrode, 6013	0.5	120.00	60.00
Total				**4,079.50**

FINAL OUTPUT

Portable/Collapsible Smokehouse

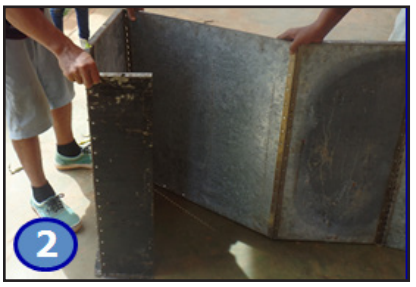
Height: 26 inches
Width: 15 inches
Length: 30 inches
Capacity: Maximum of 4 - 5 kilos of fish (5 pcs per kilo, regular-size)

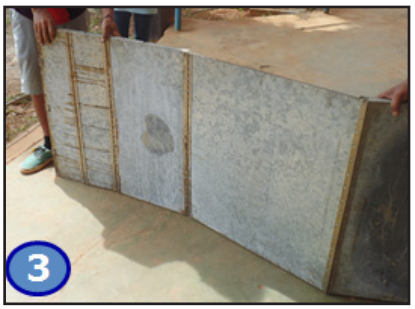
How to Use the Portable Smokehouse

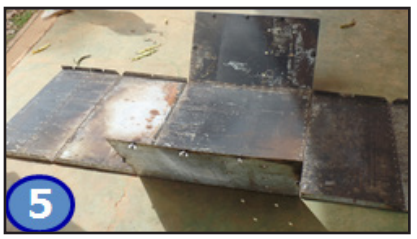
1. Remove the nylon strings that ties the grill and smokehouse.

2. Unfold and place the smokehouse on flat area.

Note: Follow the illustration/figure to unfold the smokehouse.

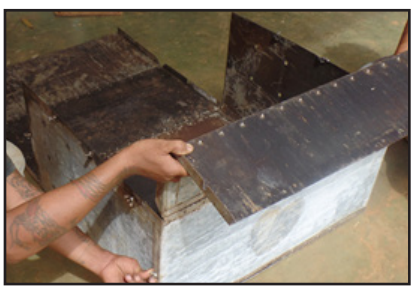






3. Set simultaneously the right side panel, left side panel and bottom panel of the smokehouse perpendicular to the rear panel.

4. Tighen the wing nut both on the left and right side panel.



Note: Temporarily set and tighten the lower firebox front panel and top panel to be stable in setting the smokehouse in upright position.

5. Set the smokehouse on upright position then fold the top panel backward

6. Attach the bottom grill and then the upper grill as shown on the figure below.

7. Set the top panel and tighten the wing nut.

8. Put the smokehouse on top of the base.

9. Loosen the wing nut to fold the fire box front panel downward.

10. Put the firebox on the smokehouse

Precaustion: Fire box should be put on the smokehouse after the charcoal is hot and burning enough for cooking. Ensure that the charcoal does not produe flames.

Note: If the load of fish to be smoked is already placed in the smokehouse then the latter is ready to close.

11. Close the food chamber door and tighten the wing nut.

12. Close the upper firebox panel and lock the smokehouse with the use of barrel bolt.

Instruction on How to Fold/Transport the Smokehouse

Note: Proper care in folding the smokehouse should be taken. make sure that the surface of the plain sheet is in normal temperature.

1. Remove the smokehouse from the base.

2. Place on flat area.

3. Open the top fire box front panel and lay down.

4. Loosen the wing nut of the food chamber door and top panel and fold it fold it on backward position.

5. Remove th eupper top grill and then the lower grill.

6. Loosen the wing nut of the lower firebox front panel and lay down on a flat position

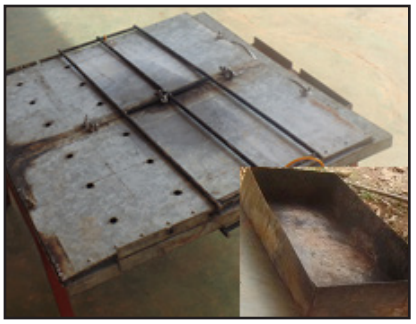
7. Remove the fire box and set aside.

8. Loosen the wing nut of the left and right side panel.

9. Lay down the smokehouse as illustrated, and fold the left and right side panel.

10. Set the smokehouse in upright position, to the right or left, then start folding it as illustrated.

11. The smokehouse is ready for transport.



Recommendations for Future Researchers

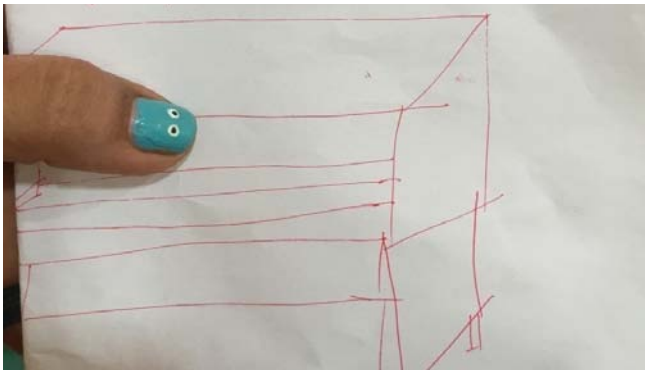
The portable/collapsible smokehouse device, though found functional and cost-efficient, still needs to undergo further modification, testing and evaluation to ensure effective performance and better quality. Since existing data on testing were primarily based on qualitative observation of the users, it is therefore recommended that the initial findings and observations be supported by more concrete measures and statistical procedures.

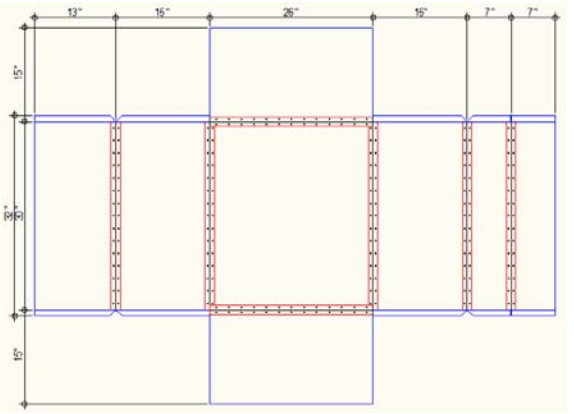
This undertaking also sets opportunities to address the device's current limitations. Other useful features could be added to enhance the capacity of its grills, so they can hold even the smaller-sized types of fish. To increase the ease of transport, the device's stand and firebox may be made foldable. A travel case or carry-on case may also be developed so that the device's parts remain secured and intact when not in use and during transport.

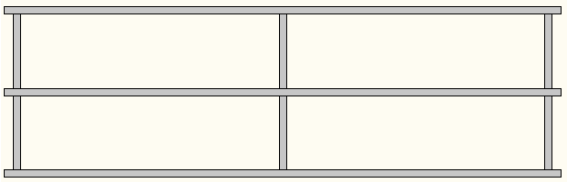
APPENDIX: PROJECT BLUEPRINT

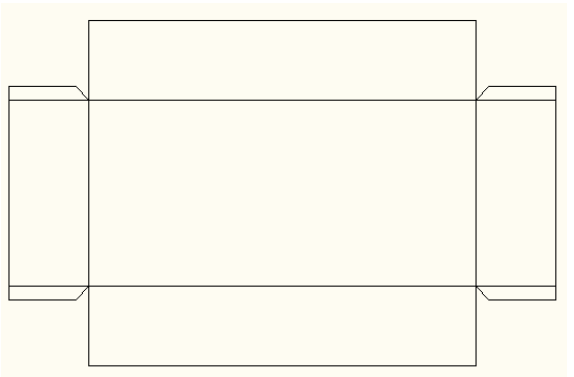
Ms. Solomon, the lead trainer of Food Processing NC II came up with an "idea" to solve difficulties in the use of smoking equipment in community-based trainings. Together with Mr. Socrates, she proposed a portable smokehouse that can be used in CBTs.

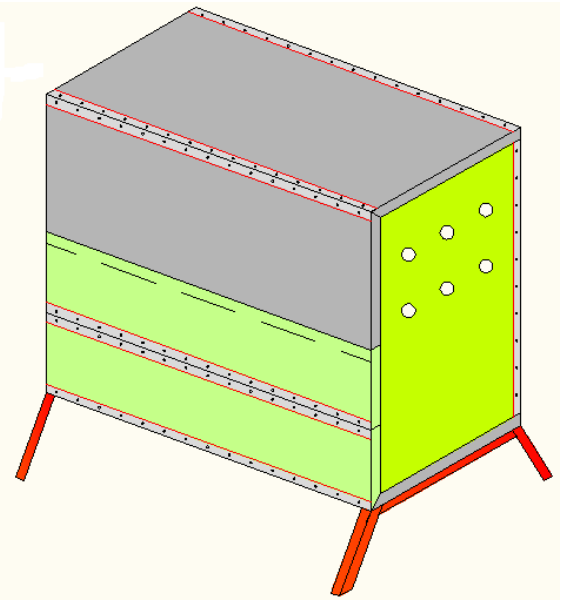
Below are the illustrations of project plans and drawings.



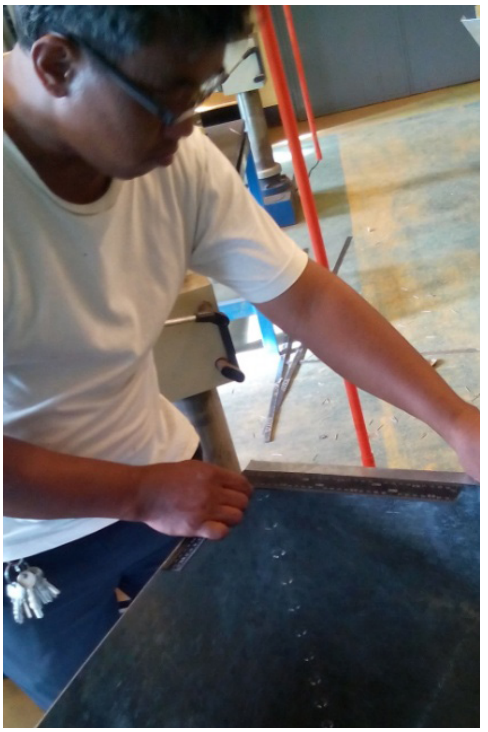








Mr. Rene J. Socrates, the lead trainer of Machining NC II creating a prototype for testing.



After seeking initial feedback from users, Mr. Socrates started fabricating the portable smokehouse.

Trainers and experts testing the innovation. Mr. Socrates discussing the parts of the collapsible smokehouse.

Smokehouse in its transportable state

Trainees of Food Processing using the smokehouse.

Non-Verbal Language for Effective Teamwork in the Ship Engine Room

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Abstract

The study focused on the development of hand gestures that can be used by crew members of a ship. This does not use any specific language becuase it aims to minimize wokplace miscommunication that may lead to further accidens.

Ninety (90) Maritime Engineering students from the Technological Institute of the Philippines answered whether the new hand signals are efective. Their response show that the introduced gesture system is very good and they are satisfied with the initiative.

In conclusion, the study found out that the use of non-verbal communications can be easier than verbal because it relies on the arms and hands to get the information accross. It was also found out that using gestures is much helpful and easier to apply than the conventional rules of ship communication.

Introduction

The Maritime industry is the broad overarching subject that includes fishing, sea exploration, maritime economics and trade, navigation and etc. According to the International Maritime Organization (IMO), maritime transport is essential to the world's economy as over 90% of the world's trade is carried by sea and it is, by far, the most cost-effective way to move en masse goods and raw materials around the world.

The job demands qualities such as teamwork and initiative in order to facilitate an efficient and accident-free routine. Teamwork can be also expressed through communication, which is a purposeful activity of exchanging information and meaning across space and time using technical or natural means, whichever is preferred or available. Good communication will bind all crew members most especially when there is no barrier on the communication. Because of that, jobs and duties will become easier, reliable and accurate.

More often, marine engineers work in a very noisy working environment and exposed to risks such as heights due to their work in loading and unloading of cargoes. These work scenarios onboard have a common problem with regards to communication. In order to facilitate this, members often use a standard code called SMCP (Standard

Marine Communication Phrases) which is an internationally recognized language of the sea. Also it is supported by the international community for use at sea and developed by the International Maritime Organization (IMO). This system is important to facilitate a smooth flow of instructions or updates from one crew member to another given the noisy work place for the engineers and the distance problem for the deck people.

However, this system is sometimes beset with different challenges. One of the challenge noted is the absence or lack of standard engine room communication signals. There's also the presence of noise that can potentially hinder conventional communication process. Additionally, culture and belief differences of various nationalities show different ways of communication and one gesture or word may mean differently to another, leading to more conflicts or disagreements.

This research study was made and conceptualized to help the maritime student of Technological Institute of the Philippines (TIP) cope to some of these challenges and prevent conflicts on their soon-to-be job descriptions with their fellow crew members on-board particularly in communication.

Objectives of the Study

The general objective of this study is to create a universal body language that include hand gestures that will be implemented in the maritime industry to avoid miscommunication, misunderstanding and further human error that might lead to accident.

In addition, this study also aims to cultivate the areas of engine room management teamwork. Through effective non-verbal communication in a workplace it offers everyone the ability to become more familiar with each other and learn how to work together harmoniously. Understanding good instructions and conveying orders in spite of earsplitting noise is a big step geared toward encouraging team growth in the workplace.

Specifically, this research study aims to achieve the following:

1. Create a new universal body language and hand signals for the entire maritime professionals with different nationalities of different beliefs to promote teamwork;

2. Propose simple and accurate body languages and hand gestures that will convey commands and orders easily;

3. Teach marine students in the Technological Institute of the Philippines on how to prevent communication problems onboard.

Significance of the Study

The study will be beneficial to the following:

Students: These body language and hand gestures will serve as their foundation for them to be familiarized and learn basic knowledge.

Professionals: As this study was conceptualized, it will be easier for them to apply this suggested body language and hand gestures to avoid miscommunication.

Curriculum planners: can include topics on "Communication with hand gestures and Body Language" in the syllabi.

Scope and Delimitations of the Study

The content of the proposed Maritime non-verbal communications is only limited for the Maritime Departments of Technological Institute of the Philippines (TIP-QC) and also for the Maritime Professional. The research is only intended for interpersonal communication which by the definition means the process by which people exchange information, feelings, and meaning through verbal and most especially non-verbal messages: it is face-to-face communication Interpersonal communication is not just about what is actually said - the language used - but how it is said and the non-verbal messages sent through tone of voice, facial expressions, gestures and body language.

Methodology and Operational Framework

The study adopted the following framework to effectively illustrate the research process. This is illustrated in the below:

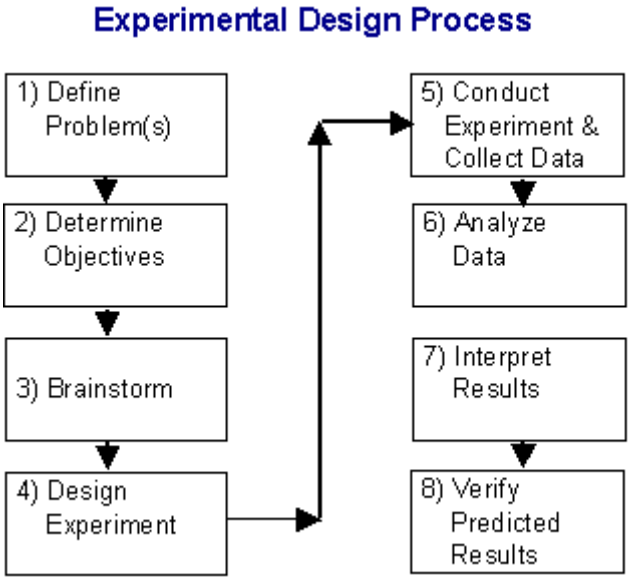


Figure 1: Research Process of the Non-Verbal Language Study for Effective Teamwork The Ship Engine Room

Design

The study adopted a descriptive-analytic research design. This is a kind of research wherein the respondents were made to act the desired intervention, in this case the the hand gestures and body language signals, to collect relevant data and information about the topic.

Respondents

The respondents chosen in this study are the Marine Engineering Department students of Technological Institute of the Philippines, Quezon City. They were chosen by means of random sampling that consists of two hundred (200) Marine Engineering Department Students. The Marine Engineering students will attest and prove how effective the created body language and hand gestures as they conduct actual exercises.

Research Instrument

The main tool used in this study was a researcher- designed questionnaire. The instrument required the respondents to perform an actual operation of a specific machinery using body language and hand gestures. After their performance, selected students were interviewed and asked regarding their opinions on how to effectively use body language and hand gestures in these types of operation.

Hand and Body Gestures

The following pages are the sample body language and hand gestures created to communicate messages onboard a vessel with a noisy environment like the Engine Room, Boiler, Main Engine, etc.

1. Start
Cross Left and Right fingers touching opposite palm repeatedly.

2. Open

Both hand in partially close fist position moving the arm and hand in opposite outward pulling motion.

3. Close

Done by jabbing your left hand over your close fist right hand, consecutively

4.Heave Up

Raising your Left Arm in close fist position repeatedly raising it, from bottom to top.

5. Heave Down

Raising your Right Arm in close fist position repeatedly pulling it, from top to bottom motion.

6. Stop

Raising your Right Hand while holding your mouth using the Left Hand means Stop.

7. Move Slowly

Move in side walking position and slowly mimic a walking motion.

8. Swing Left

Swing your body to the Left pointing both index fingers to the left side.

9. Swing Right

Swing your body to the right pointing both index fingers to the Right Side.

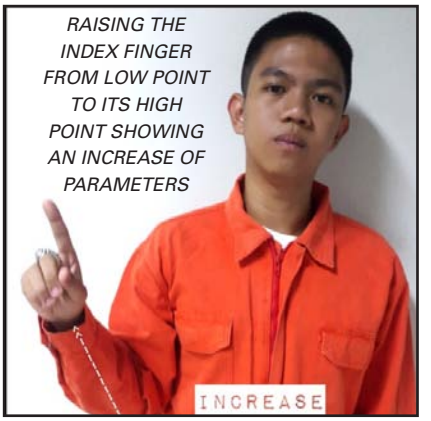
10. Rotate

ROTATE TO THE RIGHT- Done by simply rotating your head in clockwise direction.

ROTATE TO THE LEFT- Done by simply rotating your head in counter-clockwise direction.

11. All

Raising the Right Arm, pointing your index finger and rotating it in clockwise position gradually.



12. Increase

Raising the Index finger from low point to its high point.

13. Decrease

Lowering the Index finger from high point to its low point.

14. Done

Raising the Right thumb, indicating that work its done.

15. Finish

Raising Both Left and Right Thumb means work is completely finished.

Results and Discussions

The data presented the effectiveness of the hand gestures and body signals as assessed by the Marine Engineering students of the Technological Institute of the Philippines. The breakdown of the respondents are presented below.

Table 1: Year level of the Respondents

Respondent	N Frequency	Percentage
1st Year	80	40%
2nd Year	30	15%
3rd Year	90	45%
TOTAL	**200**	**100%**

The pie-chart and the table below assessed whether these hand gestures and body language is an effective system of communication.

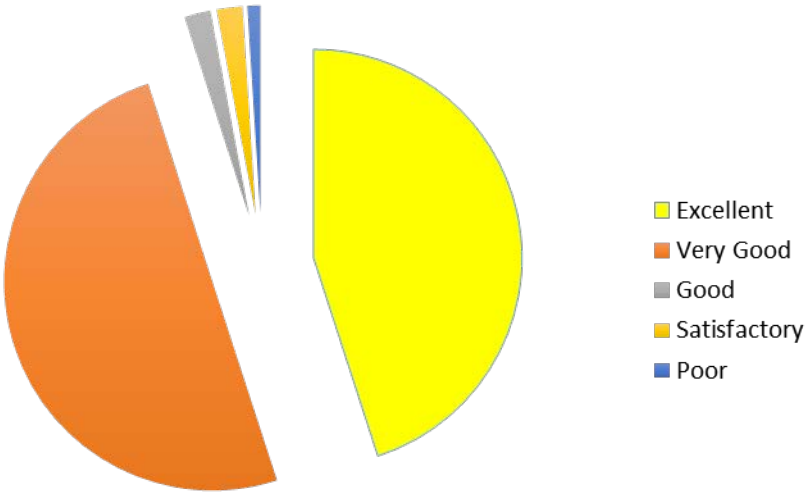


Figure 2: Effectiveness of the Hand Gesture System as Indicated by the Participants

The breakdown of the responses per year level is indicated below:

Table 2: Respondents' assessment of the Hand Gesture System as Sorted by year Level

Respondent	Excellent	Very Good	Good	Satisfactory	Poor	Total
1st Year	18	60	3	2	0	80
2nd Year	12	10	5	0	0	30
3rd Year	60	30	0	0	0	90

After the tabulation of the survey results, table 2 shows that out of 200 students surveyed by this study, a total of 90 rated these hand gestures as excellent; 100 rated it as very good while 8 of them rated it as good and 2 of them rated it satisfactory.

According to the respondents say that this newly created body language and hand gestures of this study can be applied onboard so that all maritime personnel will only have a single system of communication. It aims to become a universal body language and gestures to make working conditions in the ships better and prevent, or even lessen, maritime all over the world for us to prevent and lessen the possible accidents caused by misunderstanding and miscommunication through the language and other cultural barriers.

In the diagram above, more than 50% of the students found these hand gesture and body language system to be very good. 45% of the students said that the system is excellent. As almost 95% of the respondents are expressing their positive feedback regarding its effectiveness, the researchers can say that these system is viable and appropriate to be used as an official international signaling system in the maritime industry.

Conclusion

From the findings it is concluded that the use of non-verbal communication with the use of body language and hand gestures are helpful and much easier to apply. Instructions and orders have been much reliable and accurate because of the simple body language and hand gestures. In addition, Students were also much comfortable, even working in a deafening and rough environment if these gestures are used.

It is envisioned that this system will be able to be recognized as an internationally-accepted standard for communicating with one another inside oversized and noisy ships. The newly developed hand gestures and body language have proven to be a feasible and promising alternative to the present signaling systems used on international shipboard operations.

Recommendations

This research study recommends the further development of this system to align it with the requirements of international shipping and maritime industry. It is also recommended that the maritime industry should consider this system as a viable alternative for communication because it is easy to use, memorize and organize.

This non-verbal communication should be extended not only for one-way communication but can also be used in two or more complex groups of people. Therefore, further research especially on achieving feedback can be embarked and additional research on communication dynamics can be considered.

List of Acronyms

APACC	Asia-Pacific Accreditation and Certification Commission
CEDEFOP	Centre Européen pour le Dévelopement de la Formation Professionnelle (French: European Centre for the Development of Vocational Training)
CIIE	Center for Innovation, Incubation and Entrepreneurship
COC	Certificate of Competency
ERP	Enterprise Resource Planning
ESD	Education for Sustainable Development
ENQA-VET	European Network on Quality Assurance in Vocational Education and Training
EU	European Union
f2f	Face-to-face
GUI	Graphical users interface
HR	Human resource
IIM-A	Indian Institute of Management- Ahmedabad
IT	Institutes of Technology
LMS	Learning Management System
NVQS	National Vocational Qualifications System
SDG	Sustainable Development Goals
TQ	Total Quality
TQM	Total Quality Management
TTI	Technical Training Institutes
UART	Universal Asynchronous Receiver/Transmitter
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEVOC	International Centre for Technical and Vocational Education and Training
VLE	Virtual Learning Environment
WHO	World Health Organization
WLP	Women Leadership Program

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