

# Industry Centric Instructional System for 'BEEE' with Measurement Design — A Structural Functionalism Emphasis

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**Abstract**—Continued from combinatorial decision analysis for BEEE, economic leadership calls for reforms of sorts and among the forefront is instructional system for tertiary educational that can seamlessly transit graduates into industries. This paper suggests an industry centric instructional system developed out of constructivism towards structural functionalism by tri-parties collaborative learning; a continuous industry CRM appraisal process of college facilitation and interns on a yearlong work-integrated-dissertation-environment to practice the fundamental analysis aspect of the BEEE paradigm. In essence, a structural functional instructional model designed from six uncontested principles can collectively agree to a pedagogic step up process. Four time-tested systems from the automotive assembly, SSADM, training and quality industries with a common denominator of four levels demonstrate the development of an instructional system that skews CRM constructivism towards structural functionalism for industrializing economies. Compositing Bayesian approach onto Pareto distribution weight and onward with harmonic means, the index for training effectiveness is established.

**Index Terms**—Structural-functionalism, internship, SOP, CRM, repeated-measure, effectiveness.

## I. INTRODUCTION

The dialogue on spirit of higher education [1] prompted this paper's continuation from a previous paper [2], that a nation's ability to produce more effective graduates makes one tertiary instructional system more superior over another. Some developed nations rose from the ruins to provide methods and technologies having transited human capitals reliability with continuous education instructional system betterment process to reach their current wealth [3]. On the contrary, the mismatch between universities graduates and industries demand for appropriate skills suggested there seems to be some retrograding [4]. Wasn't there supposed to be collaborative dialogue between industries and universities to bridge the gap of mismatch? For that alone, transactional analysis is client relationship management, CRM [5] for universities to listen to the voice of the market to effect an instructional system capable of producing effective graduates. BRIC as emerging global economics leaderships makes it imminent for tertiary education reform to parallel escalation of demand for effective human capital that can be better met by collaborative CRM consultation with industries on reckoning tertiary education exists to move these nations

forward with internship relevancy, the practices of which is still common in the USA [6]. The following sections infer four best practices from four industries, demonstrates a multidisciplinary approach possibility to adapt these best practices to formulate an industry centric instructional system for work integrated dissertation environment interns (widern) that consider structural functionalism [7] in progressing BRIC's tertiary education reform.

## II. LEARNING THEORIES

An exam-oriented education builds on behaviourist theories reliance on external control of 'reinforcement' [8] as supposed to empowerment [9]. It means that widernship design still require formal evaluation to gauge widerns' ability. These prior studies explained that self-motivation, instead of extrinsic motivation, is at the centre of imagination, dependability, constructive manners, as well as long-lasting transformation. Together with self-determination, it facilitate motivational environmental supports for an individual's inherent needs for autonomy by providing choice and minimizing the use of controls, meaning that extrinsic may not necessary be the full cause of producing learning because reforming tertiary education through industry centricity instructional system, widerns must be able to continue advancing their ability after exam. Despite many criticism of exam-oriented system, there still is a behaviourist belief of external control that can be looked at from two angles of motivation; reward or reprimand.

Constructivists argue that knowledge is derived from experiences and ideas. Cohen [10] suggests that the constructivism model whereby the facilitator becomes the bouncing board prompting causal effects flow; a core principle in work flow and system flow theory causing one single key element in widerns' learning which is to stay engaged [11]. Piaget's [12] assumption that learning is an active process of construction over rote learning, concludes that widerns should be encouraged to condition a culture of raising queries through 'trial and error' to related better to the real world as in using case teaching methods [13]. Vyotsky's [14] emphasis on 'activities' and 'socializing' as more important factor in psychological development with bridge the individual's actual development as supposed to collaborative learning within his peer group because these two emphasis cause one to learn unknowingly as opposed to discovery learning [15] which depended on existing constructivist theories to discover learning models in which the facilitator's role is limited to prompting curiosity in exploring the unknown on pre-existing knowledge within

peer group, sensing their acceptance of his/her views and together advance knowledge from that point. Bloom's taxonomy [16] enhanced model of knowledge structures represents the cognitive domain development from the low-order skill to the high-order skill; with basic requirements from remembering information and understanding the knowledge. These constructivism theories provide a general framework in designing an instructional system for tertiary education but not enough to challenge BRIC's reformation despite usage of pre-existing knowledge are encouraged to bridge the gap between old and new knowledge to produce new meanings

Behaviourist learning theory highlights knowledge as key objective because they exist. Theoretically, constructivism may be popular because it values a widern's individual, direct experience. Is registering new meaning the best way to obtain knowledge or are there other learning models? Another major concern on constructivist is evaluation. Without proper criteria, it is challenging to measure the learning outcomes. Since constructivism is problem-oriented, there has to be a mean to ensure that widernship design can relate to a series of questions. Constructivism can perform better when it partly co-exist with behaviorism in the sense that everyone knows there is an evaluation. While evaluation is debated as external control, continuous evaluation can be perceived as intrinsic in the sense that there are opportunities to make over if one falters in current evaluation.

### III. CONSTRUCTIVE STRUCTURAL FUNCTIONAL BASIS

Because societies' functionalism varies broadly according to their fundamental differences in culture, norms, languages, religious beliefs, motivators and influencers to modify behavior, constructivism may achieve greater result if they are structurally localized [17], confirming to certain extent behaviorism and constructivism theorists cannot be taken out of western context into BRIC while keeping widerns engage remains key to learning. What then could a low risk fundamental platform for organizing the development of learning and training knowing that the fundamental of engagement rest largely in ability to build upon pre-exist knowledge because only when new information matches some of the old schemes can new meaning register. In the widerns' environment, there are more social factors to consider that meets individual needs within the group and sometimes requirement to conform to social norm. When widern groups are formed by the facilitator according to certain criteria, polarity dilution can minimize when constructive structural functionalism is considered to produce ethos when internship is purposive to register new meaningful learning than just the objective of knowledge. Widernship within structural functionalism is ethos when widerns work in ways that are more effective that result in higher learning outcomes because the facilitator has to find a right way to sustain engagement and the medium of engagement is involvement by means of some connectivity to draw attention [18]. The composition of such constructive structural functionalism approach requires experience and skills which suggested the element of collaboration between widerns and facilitator to improve the engagement process so as to produce effective learning to bring out the ethos of the

whole thing. In all fairness to widernship, some form of holistic total quality management approach is embraced for the widerns to feel a sense of worth about the program, thinking methods, mental development, as well as emotion and behaviours; in totality an environment that produces effectiveness.

An industry centric model would emphasize that for learning to be internally driven, learning must happened in a cooperative environment because knowledge construction is wholesomely involving from the widern who wants to learn and contribute to the widernship, the facilitator who wants to depart knowledge, improve upon it, and industries that encourages building the particular body of knowledge. But, the reality of widernship is that module development, training methods, learning methods, organization, management and leadership are all intertwined. Another reality is that industry stake holders may not participate in tandem with the improvement process. Therefore to analyse the possible solution from various perspectives, it will also draw on few things like what are the challenges ahead of fundamental training, organizational behaviour and culture and some successful experiences to make some comparison and then suggest how it will move forward in specific training such as financial economics. In organizational behaviour and culture, it will be brought to light, thinkers whose theories remained not only unchallenged as supposed to thinkers whose theories are yet to be widely accepted; all with regards to training widerns in different settings, yet touching all bases. The ethos of widernship is created through an interaction between the formal processes governing behaviour, attitudes, relationships and the module alongside the informal messages given out via displays, documentation, use of resources and space, pulling all things together to cause positive co-existences between widerns and their facilitators [19].

### IV. RISK AVERSION APPROACH

With refuted learning theories including ELT [20] and more critics claiming inappropriate matching of learning style to individuals, what would be a lower risk instructional method acceptable by BRIC cultures that can be safely adopted to shift onto higher value economics, now made more challenging by the internet age? If localization is among key success criteria in designing instructional system, cultural influence would play a significant role in defining lifestyle behavior attitudes learning [21], [22].

Localization [23] being a variable capable of modifying widerns' expectation in receiving learning content according to different geography and social policy that may explain some cause for delayed self-motivation to learn. Widerns as new adults tend to entertains many matters in their mind, therefore making it more challenging to keep him continuously engaged [24]. As widernship offers the opportunity to practice knowledge on a specific job, it differs from an actual employment in the sense that the widern contributes to the company's revenue while learning and being monitored at all times about his/her progress. It benefits the company in cost savings in recruiting other than to have an experience supervisor's time mentoring the widern's work progress, attitude, and reliability for

responsibilities [25]. The risk may be a promising widern's desired for mobility after the widernship or dissatisfaction by ambitious widern desiring diversity [26]. Understanding several unchallenged theories and philosophy give a significant backdrop in modeling an appropriate instructional system that is industry centric with constructive structural functionalism capable of escalating training of widerns in a way that more learning can be achieved with less [27] because widernship is purposive in embodying all bases of learning through consolidating knowledge and practices to formulate attributes of incidental, accidental and experimental learning along with industry's advocate for best practices found in six uncontested principles [28]. Notwithstanding, status quo gap between industry and academia, the forces of supply and demand are the best indicator of requirement for widernship as a pre-requisite to actual employment [29]. Again, a low risk and effective method is desirable to set a fundamental approach in designing instructional method that produces more effective and timely tertiary graduates for BRIC.

## V. SIX UNCONTESTED PRINCIPLES FOR INDUSTRY CENTRIC

Sustainability being the criteria, six uncontested principles was selected to formulate a CAI/L system [30]. Figure 1 shows six principles interlinking industries through the CRM process into Gaishanshiye, a Kaizen of continuous improvement process to monitor the widernship program. Within IBM 1500's development philosophy was embedded Socrates's dialogue reasoning logic for lateral learning method of backward chaining, reflection, and inference when a case present itself for resolve by the scenario assessment of thought capabilities built into the IBM 1500 [31]. Some level of pre-exist knowledge is key to engaging widerns into new knowledge, capture their interests onto a new plane for the next learning module. Herreid suggests engagement with case base teaching [32]-[34] to connect all senses of learning.

Liken to BOM, being logical sequencing represents pedagogic step up process of pre-exist knowledge into causal incidental learning and this way to continuously engage widerns with routine PDCA practices to involve all senses of learning, assist by concept maps to enhance capacity management [35],[36]. Meant for quality control circle, PDCA requires touching all bases by thinking, doing, checking and acting, it remained responsible for escalating Japanese production quality throughputs [37]. That PDCA laid the foundation for advancement into quality system and that BOM being an uncontested concept facilitates the step up process is also a significant pedagogical inter-link in the formulation of continuous engagement, much part of Heijunka aspects in effective car assembly sequence efficiency. Concept map constructs meaning making knowledge, compress information much alike to CAD layering function onto one base page with waterfall effect capabilities characterized in structured systems analysis and design methodologies, SSADMs.

## VI. FOUR LEVELS OF SOP FOR FORMULATION BASIS

If markets are the best judges of popularity, that Toyota being top automotive producer is no coincidence but mostly attributed to its quality JIT assembly instructional process, based on best combinatorial practices in Heijunka, Kanban, Pokayoke and Kaizen [38],[39]. Level 1 of an automobile assembly line would illustrate a section view of the line which consists of a collation of Level 2 SOP diagrams in Fig 3; a sample of a Level 2 illustrates inclusion of level 3 and 4 within one level 2 SOP page.

An event circa 2003 had it that after Renault took over Nissan; a group of young French automotive engineer went on a study tour to observe a Nissan C22 low volume assembly line that produces about 500 units a month. Trained in the latest CIM technology to produce high volume, the young engineers were puzzled at how low volume assembly could be profitably produced with remarkably high quality. Manual SOP and measuring jigs for QA with effective JIT measure were the answers that puzzled their generation who were not taught the fundamental that manual assemblers knew better. BRIC may not necessarily be high volume producers to be profitability so long as instructional systems are intact to guide, even if they are manual.

The time-tested success in automotive 4 levels SOP applies to the SSADM industry wherein IBM [40] mentioned Gane Sarson as among the popular SSADM industry sustaining vis-à-vis Yourdon and De Marco since 1979 practically with negligible enhancement. These four levels in a DFD schema represent functional waterfall effect top-down demarcating boundary as level 1, procedures within each boundary as level 2, the type of direct access to information as level 3 and data attributes in data store of level 4 which is accessible by level 3, depicted in Fig 2 [41].

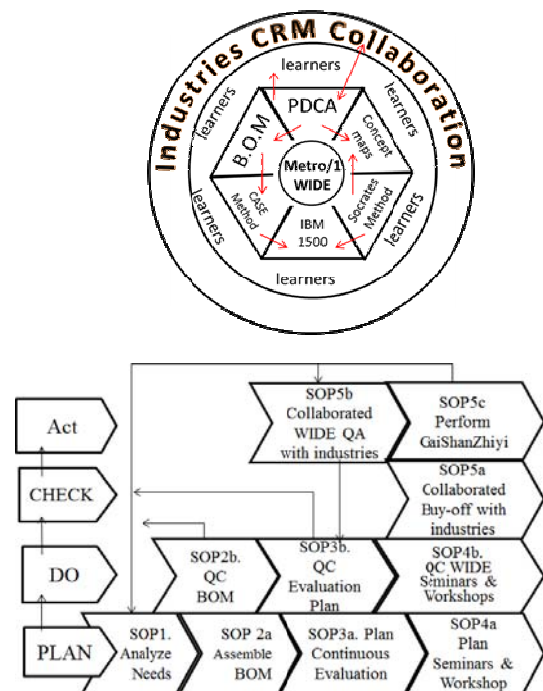


Fig. 1. High level instructional system objective [42].

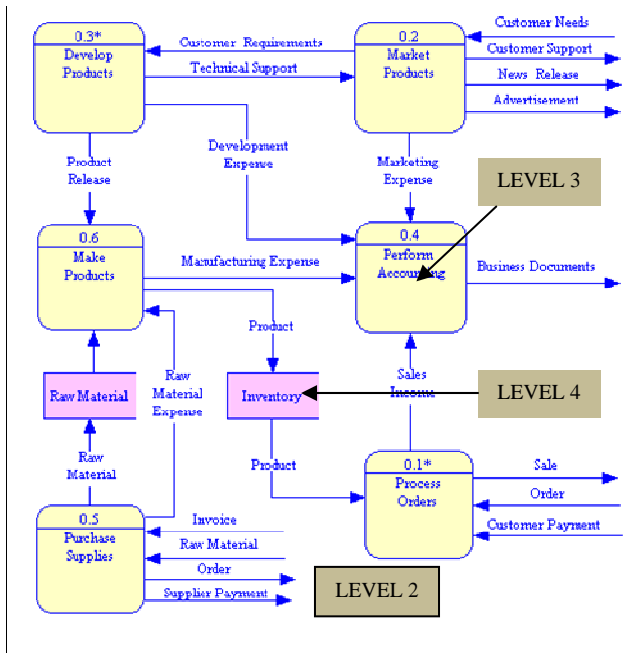


Fig. 2. Level 2 of a Gane Sarson sample with level 3 and 4 [43].

In Kirkpatrick's model, Level 1 would be descriptive of widerns reaction to the learning process, Level 2 would describe the extent of widerns' improvement in knowledge, skills and attitude as a result of the training, level 3 would refer to the extent of widerns' capability in improving their performance related to practicing skills learned while at their widernship company as a result of the training. Level 4 would describe the degree of positive (or negative) benefits resulting from the training. Kirkpatrick's model offers a simple administration and analysis than say the popular balanced scorecard [44] or the Six Disciplines of Breakthrough Learning [45] because they consider much more at various impacts of financial, customer, internal processes and organizational change. The fact that Kirkpatrick's model had been popular sustained the times is an indication of its acceptability in many applications which require a training assessment method that is not difficult to administer and effective for analysis. Kirkpatrick had advance his model into continuous evaluation wherein current assessment is added upon previous assessment in the same control group as a form of measure of effectiveness from previous learning upon new environment [46] and therefore extending application with repeated measurement.

Japan's manufacturing industries remember Edwards Deming for making the simple and effective quality circle philosophy part of their manufacturing lives with just 4 levels; Plan, Do, Check, Act. [47]. Manufacturers practice these fundamental principles of quality which require them to touch all bases. Only lately did Kolb admit that learning must touch all 4 bases [48]. Deming's Circle PDCA requires touching all bases by thinking, doing, checking and acting and is already considered a standard requirement for GMP [49]. There is virtually no significant difference between producing anything; be it products or services, and producing learning is just another form of production. As it is, the Deming's Circle is perhaps the only sustainable and widely acceptable learning model as well as his control charts application in error correction [50]. In level 1, 'PLAN', the Harvard Case Teaching and Learning method adopted by

increasing American universities [51] supports PDCA as its nature resembles Socrates prompting method of engaging by constructivism within peer collaboration and also the trainer's role as facilitator. Prompting widern in thinking and same time the uses of concept maps engage their listening to follow the logic being drawn. Level 2, 'DO' refers to 'try out' or practice before implementation; another requirement in GMP. No manufacturer jumps into production right away without a 'try line' to discover unforeseeable corrections that might have missed before actual production. In the context of training the tool that engages trying out scenario plans for possible best out-comes. Level 3, 'CHECK' reviews if work was performed accurately. To verify, it involves more thinking than doing and if something went wrong, then back to DO instead of to ACT stage, on confidence of correctness, the Act stage refers to real actual. Collaborative review of widerns' learning is a form of checking together. The final level 4, 'ACT' is where nothing should go wrong but in reality things sometimes do go wrong due to unforeseen circumstances or negligence perhaps at previous stage. Errors are identified, analysed and then determined which are to be solved by Pareto [52] principles which states that often most of the problems are caused by a few key process; solve the key cause, the rest will resolved by themselves. In the context of training, this is the post-test evaluation.

These four systems' successes are not without challenges. Unsaid, there must be some form of transactional CRM that followed their sustainability process to this day [53]. A good instructional system should give a balanced metrics in four structural levels information explosion managed along with value add [54],[55] to widerns because all bases are touched through the interlinking elements that are instructive, discovery and accidental learning from doing rather than taught lessons [56]. Allowing criticism and popular acceptability sort out the best among themselves to produce the best practices that can be pulled into to form a low risk foundation to formulate an industry centric instructional system for emerging BRIC tertiary education and also suitability for efficient widernship assessment [57],[58] based on four levels of SOP illustrated in Table 1 for a widernship program.

## VII. SOP INFERENCES FOR SYSTEM DEVELOPMENT

A walk through of '5.Tertiary education' in Table 1 which correspond to remaining tables and figures, illustrate the intended industry centric instructional model's SOP from

Level 0 to Level 4 for a widernship wherein widerns with pre-exist knowledge identified in Table 2 are assigned to prepare a comparative report of two industries over a yearlong widernship program during which learning support are enriched with seminars and workshops to enhance their analytical abilities. The widernship equivalence to these four systems is a process flow schema of each sub-module stepping up into another. Level 1 being a first stage of the waterfall effect zooms into each sub-module. Within each sub module are training plan SOPs. Widernship's equivalence is found in Table 2, supported by Fig 2 and Fig 3. With intentional questions permuting questions, Table 2 illustrates a decision table that permute from a base of three high value questions into another level with another three

sets of high value prompts. This decision tree is to develop lateral thinking with backward chaining reflections, is a core fundamental borrowed from IBM 1500 in order to begat quality volume in dissertation writing.

TABLE I: 4 LEVELS, 4 BEST PRACTICES, 4 INDUSTRIES.

Industry	1. Automotive assembly	2. SSADM	3. Training	4. Quality	5. Tertiary education	Reference in this paper
Practices	Toyota Production System	Gane Sarson	Kirkpatrick	Deming's circle	WIDERN-SHIP	
Objectives	Instructional Quality throughput	Structural integration and processing	Produce learning	Defect reduction	Industry centric instructional system	
Level 0:	Plant View	Context to application	Training context	Product quality context	Pedagogy Schematic	Fig. 2
Level 1	Assembly line view	Data Flow Diagram	React	Plan	Modules	Fig. 3
Level 2	SOP of each station in a line	Pseudo English	Learn	Do (try out)	Module SOP	Table 3
Level 3	Work instructions in each SOP	Data Immediate Access Diagram	Perform	Check (error correction)	Training instructions in an SOP	Table 3

TABLE II: LEVEL-2: FINANCIAL ECONOMICS FACTORS AFFECTING BREAK-EVEN-ECONOMICS-EQUILIBRIUM

Fiscal	Jobs	Skills Training Mechanization	<div>LEVEL 2</div> <div><p><math display="block">x1 = \frac{y2}{\left(\frac{y5}{x2}\right) - \left(\frac{y4 - y2}{x2}\right)}</math></p><p><math display="block">Eyx = \frac{\% \Delta(y5 - y4)}{\% \Delta(x2 - x1)}</math></p><p><math>y2 - y1 = \text{cost of units unsold (over production)}</math> <math>y1 = \text{Total fixed costs}</math> <math>y3 - y2 = \text{Total variable costs}</math> <math>y4 - y3 = \text{Cost of products manufactured}</math> <math>y5 = \text{sales}</math> <math>y5 - y4 = \text{profit}</math> <math>x1 = S \cap y3 = \text{units to break even}</math> <math>x2 = D \cap S = \text{total units sold}</math></p></div>	
	Inflation	Cost Sources Alternatives		
	Growth	Demand Mgmt. Supply Mgmt. Life Cycle Mgmt.		
Equilibrium	Cash flow	Inflow Mgmt. Outflow Mgmt. Working Capital Mgmt. Revenue		
	PL	Operating Expense Profit & Break Even Analysis		
	BS	Asset Mgmt. Liability Mgmt. Shareholders / Dividend Mgmt.		
	WACC	Capital structure Loan Creditor		
	ROE	Earnings Shareholder Dividend		
	Bank	M&A Investment Prudence		
LEVEL 3				Level-3: SOP subsystem Sub-module learning outcome is the formulation of a combinatorial concept map for determining simulation effects of Break Even – Economics Equilibrium
T-1.1.1				Use above decision table, review pre-exist knowledge in business economics scan
T-1.1.2				Extend concept map with incorporation of and management accounting going into understanding the Eyx equation.
T-1.1.3				Explain financial budgetary model templates towards determining working capital
T-1.1.4				Extend above into income statement with working capital back flush
LEVEL 4				Level 4: Knowledge base



K-1.1 (Common knowledge)	incl. projection from empirical, demand sensitivity investigation, substitution, complementary / security exchanges / indirect business intelligence reports / ROE target / capital maintenance / hedging / cycle time-cost / import export documentation / cost allocation / capital structure / WACC / governance / tax regime changes / netting center / off-shore impute cost absorption / currency policy / risk diversification tax governance
K-1.1.1	Break Even – Economics Equilibrium, Cost Quality Service Delivery, Political Economics Social Technology, Strength Weakness Opportunity Treats,
K-1.1.2	Pre-exits text used before widerns year.
K-1.1.3	For financial modeling by creating and simulating commodity demand by and in individual BRIC over a period
K-1.1.4	Explain keywords relationship in matrix
K-1.1.5	WIDERNSHIP partner company
K-1.1.6	Visits to consulate or embassy

Table 2 illustrate a first level on three high value questions from fiscal, equilibrium and monetary aspect of an economy to begin a widern's revision in scanning pre-exist economics knowledge. Example, the job of a government is JIG i.e. jobs creation, inflation control and growth simulation, what then would be the prompting onto one's company in terms that affect the company's ROE raised across onto monetary section. High value questions which demonstrate prompt ability to translate learning into practice impresses companies. In this behaviorist aspect, it coexist constructive positivism in drawing matrix thinking abilities sustainable with concept mapping habits [59] to enhance information capacity management. For instance, frequent financial economics

issues are related to decision on entrance and exit point; hence the ability to communicate essentials through illustration impresses an idea across more effectively as with skills in diagraming four frequent curves within 2 points in break-even-economics-equilibrium, BEEE in Table 2. The 4 industries' best practices of SOP structural functionalism demonstrated action orientation and much less lengthy descriptive training and lesson plans. Their SOPs with a final contextual diagram in sight pulls learning towards that achievement and all learning senses in between as a wholesome basis for the formulation of an instructional system objective and its system development intent.

Company Logo		STANDARD OPERATING PROCEDURE 2.7						
LEVEL 2		WORK INSTRUCTION 2.7.1						
MODEL	VARIANT	OPERATION NAME	OPERATION NO. :		STATION :			
C22	N/A	Install Wiring Front Harness	WI0213-020-01		High Stand			
ILLUSTRATION		WORK DESCRIPTION	PROCESS TIME	CHECK POINT	EQUIPMENT TOOL			
		1 Grasp a Set of Wiring and put it to the position	7"	Make sure that the setting of wire should not be twisted or tangle	Hand			
		PART DESCRIPTION		PART NO	SPEC	QTY	RECORD	RESP.
		Wiring Front		0291-000470-E		1		
NO	DATE	REV. NO	REV. DES.	PREPARED BY		CHECKED BY		
4	1/8/2000	3	Change Part No. Due To ECN No:DD/LOR/047/00 (from B to C)	Process Engineer 2		QA Enginner 4		
5	11/9/2000	4	Change Part No. Due To ECN No:DD/LOR/047/00 (from C to D)	Process Engineer 2		QA Enginner 4		
6	5/9/2001	5	Merging Station (Change Operation No. SOP #011)	Process Engineer 2		QA Enginner 4		

Fig. 3. Sample of an automotive assembly line SOP Level 2, 3 and 4.

### VIII. DESIGNING MEASUREMENT OF EFFECTIVENESS

On an unpublished survey (for trade secret reason), the sustainable notion that as professional training providers, we are only as good as the industries say we are, therefore in the

wide field of measurement estimation, a good bag of assessment tools, agreed by Delphi method would be a set of most acceptable methods that can be implemented with ease while optimizing learning outcomes instead of one that over produces statistics. From this notion, by Delphi method, a

mix of the popular Bayesian approach [60] and repeated measures design were accepted to assess the value of survey information to assist in the decision analysis process in fine tuning the original probability estimate for necessary improvements after discovering additional information on completing each treatment, agreed with Bayesian analysis that when events are mutually and collectively exclusive, posterior probabilities  $P(A_i|B)$  can be found by:  $P(A_i|B) = \frac{P(B|A_i) P(A_i)}{P(B|A_1) P(A_1) + P(B|A_2) P(A_2) + \dots + P(B|A_n) P(A_n)}$ . The choice of repeated measure design has been popularly used to assess the same group of samples and therefore suitable with each posteriors result being the base for the next training treatment when samples are homogenous and the longitudinal study is over a reasonable period of repetition while mindful of the risk of concern about statistical power [61], [62]. For this validity, widens underwent three common treatments period ( $k$ ) to assessed changes over time.

The variables to measure the effectiveness of the total training were deliberated by Delphi method among a team from Metro's center for professional development and trainers with consideration of their best sustainability to guide error correction in future training. The dependent variable, effectiveness of training module represents a composite wholesome of three pedagogic elements; knowledge base accessibility, instructional methods system and widenship, and senses that influence widens' ability of widens through two high level independent variables in behavioral and constructivism of Level 2 in Table 3 which respectively constitutes 16 and 52 sub-variables in Level 3 of Table 3 [63]. Liken to Gane Sarson's data dictionary of Level 4 in Fig 2, Level 4 of Table 3 bears raw scores of between 1-10, 10 being total agreement, producing harmonic means values collation in Table 5 for computation preparation of Table 6 and onto computing training effectiveness index in Table 7. A 20% Pareto distribution factor in Table 5 was skewed in favor of constructivism aligning to China and in particularly structural functionalism in Shanghai. Essentially the measurement in-sight assesses widens' functional understanding of the BEEE elasticity factor against their companies' separately assessment of widens' abilities in Table 4.

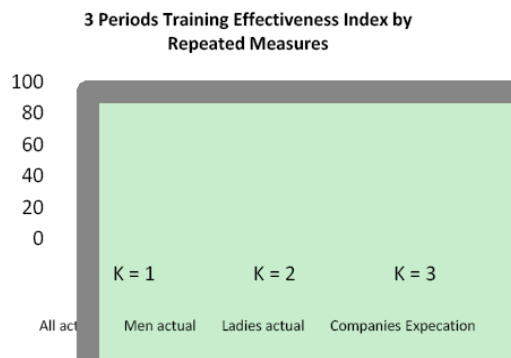


Fig. 4. Result summary of Training Effectiveness Index.

Fig 4 suggest thatt companies are in agreement with widens' progressive learning and capacity to retain essential knowledge in consolidating pre-exist knowledge with new learning to create skills for their structural functionalism

society. Together with exploratory data analysis graphics, the main characteristics of determinants are discoverable without being over statistical or formulating hypothesis as descriptive elements are sufficient for decision analysis in non-parametric widenship circumstances [64]. Whether these result can form empirical basis to continue training with similar practice would depend on correct responsiveness onto different set of controlled variables.

TABLE V: RAW DATA COLLATION

Period $k = 1, 2, 3$	All		Men		Ladies		Comp anies
	B	C	B	C	B	C	
Harmonic Mean = $H^{kt}$	5.71	5.42	5.62	5.57	5.75	5.31	5.54
	6.03	6.05	5.96	5.94	6.07	6.09	6.11
	6.47	6.67	6.56	6.73	6.40	6.63	6.36
Pareto distribution	0.2	0.8	0.2	0.8	0.2	0.8	1.0
Probability distribution (assigned) $P^{kt}$	0.07	0.27	0.07	0.27	0.07	0.27	0.33
	0.07	0.27	0.07	0.27	0.07	0.27	0.33
	0.07	0.27	0.07	0.27	0.07	0.27	0.33
Joint Probability $H^{kt} \cdot P^{kt}$	0.38	1.45	0.37	1.48	0.38	1.42	18
	0.40	1.61	0.40	1.59	0.40	1.62	2.0
	0.43	1.78	0.44	1.79	0.43	1.77	2.1

TABLE VI: INDEX COMPUTATION PREPARATION

Effectiveness Expected Value of Joint Probability $\hat{E}$			
$\hat{E}^{kt}$	All (B+C)	Men (B+C)	Ladies (B+C)
	1.83	1.86	1.80
	2.01	1.98	2.03
	2.21	2.23	2.20
Improve over last assessment $H_p^{n=25, kt}$	Harmonic Mean Discounted		
	0.64	0.69	0.60
	0.63	0.63	0.63
	0.78	0.76	0.79
$\hat{E}^{kt} \cdot H_p^{kt}$	Effectiveness Adjusted Value $\bar{E}$		
	1.16	1.28	1.08
	1.27	1.25	1.27
	1.72	1.70	1.73

TABLE VII: INDEX COMPUTATION

$\bar{E}^{kt} / (H^{kt} \cdot P^{kt})$	Cumulative Training Effectiveness, CTF			
	All	Men	Ladies	Comp anies
	0.63	0.69	0.58	1.00
	1.25	1.31	1.21	2.00
$[CTF^{kt} / CTF^{3,4}] * 100$	2.06	2.11	2.02	3.00
	Training Effectiveness Index			
	21	23	19	33
	42	44	40	67
	69	70	67	100

## IX. FORWARD INTO NEXT

The science of decision analysis can provide some insight into constructing a framework to make decisions on training effectiveness subject to widens' profile and make necessary adjustment onto selective determinants to manipulate effectiveness in training such as facilitation, training methods, concepts, ethos, and the variables of behavioral and constructivism according to widens' profiles. A follow up article will provide analysis of determinants and optimum time estimation to manage skill gaps.

TABLE III: WIDERN'S DEPENDENT VARIABLES AT LEVEL 2, 3 AND 4

I want a career in Accountancy	1	BC	1	B = Behavioral where $n=1-25, j=1-6, k=3$	LEVEL 2	C = Constructionism where $n=1-25, j=52, k=3$
I want a career in Finance	2	BC	2			
I want a career in Economics	3	BC	3			
I want a career that combines Finance and Economics	4	BC	4			
I want a career in Marketing	5	BC	5			
I am not sure what career I want to be after I graduate	6	BC	6			
A Career that has more income is more important than	7	BC	7			
I want to immigrate	8	BM	8			
I eat rice more than noodles (confidence level)	9	BP	9			
I spent an average of 4 hours a day reading	10	BP	10			
My family depends on me to support them in future	11	BP	11			
I spent an average of 2 hours a day chatting on line (less	12	BP	12			
Shanghai needs more people with financial economics	13	SL	13			
Shanghai has more career scope for graduates in	14	SL	14			
My country will need more people with financial	15	SN	15			
In China, financial economics skill is more important	16	SN	16			
The decision tree thinking method help me to realize	17	CD	17			
The decision tree thinking method is useful is	18	CD	18			
I like the decision tree thinking method.	19	CD	19			
The decision tree thinking method helps my career.	20	CD	20			
The decision tree thinking method helps me to perform	21	CD	21			
The decision tree thinking was clearly taught.	22	CD	22			
The facilitator varies his training methods according to	23	CF	23			
The facilitator communicated regularly on electronic	24	CF	24			
Whenever I am not clear of what I read on the	25	CF	25			
The facilitator is always prompt to reply all widerns'	26	CF	26			
I communicate with the facilitator often.	27	CF	27			
I read the bulletin board daily.	28	CF	28			
All assessment about the training are well informed.	29	CF	29			
The procedure of where to get the knowledge for BEEE	30	CK	30			
I always access the direction given to get the knowledge	31	CK	31			
I always access other direction for knowledge	32	CK	32			
I always share direction of where to get the knowledge	33	CK	33			
The concept mapping techniques were useful to pull pre-	34	CM	34			
The concept mapping techniques help me store	35	CM	35			
The concept mapping techniques helps me organize my	36	CM	36			
The concept mapping techniques helps me retain my	37	CM	37			
The concept mapping techniques helps me describe	38	CM	38			
The concept mapping techniques helps me to perform	39	CM	39			
The concept mapping techniques helps me to retrieve	40	CM	40			
I have enough opportunity to apply the concept	41	CM	41			
The procedure in mapping concept was clearly taught.	42	CM	42			
The principles of concept mapping help me to develop	43	CM	43			
I will use the concept mapping techniques for the rest of	44	CM	44			
I like concept mapping techniques.	45	CM	45			
The concept mapping techniques will help my career	46	CM	46			
The concept mapping techniques saves a lot of thinking	47	CM	47			
Seminar on new learning were clear	48	CS	48			
I have opportunities to participate in seminar and I	49	CS	49			
I have opportunities to participate in all seminars but I	50	CS	50			
Many examples were given to cause understanding of	51	CS	51			
The pace of the seminar is just right	52	CS	52			
The workshops help me to apply knowledge	53	CW	53			
The workshops cause me to think	54	CW	54			
Discussion in workshops is useful for sharing learning	55	CW	55			
I had plenty of chance to ask question in the workshops	56	CW	56			
The discussions in workshop were relevant and helpful	57	CW	57			
The facilitator prompted many questions that help in	58	CW	58			
My assignments at widernship are relevant to my	59	WA	59			
My assignments at widernship contribute lot to my	60	WA	60			
The Widernship is relevant to my learning.	61	WM	61			
The Widernship is relevant to my career intention.	62	WM	62			
I am aware of CPD's strict criteria in linking me to a	63	WM	63			
I always meet CPD's criteria and suggestion to obtain a	64	WM	64			
I am not interested in a widernship.	65	WM	65			
The widernship company is pleasure to work in	66	WR	66			
I enjoy the friendship at my widernship company	67	WR	67			
My immediate supervisor at the widernship company	68	WR	68			

TABLE IV: COMPANIES DEPENDENT VARIABLES AT LEVEL 2, 3 AND 4.

The widern was self-motivated during widernship	1	WZ	1	Widernship performance weighting	Widern Company Weightage ratio =
The widern displayed enthusiasm and interest in doing good job	2	WZ	2		
The widern demonstrated a positive attitude during their employment	3	WZ	3		
The widern displayed a strong sense of professionalism	4	WZ	4		
The overall quality of work produced by the widern was adequate	5	WZ	5		
The level of the technical ability displayed by the widern was adequate	6	WZ	6		
The widern displayed cooperation and ability to work with others was effective	7	WZ	7		
The widern worked independently with minimal supervision	8	WZ	8		
The widern was able to handle and accept direction and criticism	9	WZ	9		
The widern has prospects of regular employment with the company after the widernship.	10	WZ	10		
The widerns twice a month write up accurately match the company's activities to the report objectives	11	WY	11		
The intern's dissertation twice a month report was interesting, practical and demonstrates applying of	12	WY	12		
The widern offered creative input or suggestions onto the report	13	WY	13		

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