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A COST EFFECTIVE ANALYSIS OF TECHNICAL TRAINING IN POWER SUPPLY COMPANY

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ABSTRACT

The application of business concepts and practices to training outcomes and other human resource development interventions requires the use of methods to determine the value of the intervention. The current research undertook to measure the cost effectiveness of technical training of a power company (Supply of Electricity) emanating from the training commitment exhibited by consistent funding towards training and the continued operation of the training school. The researchers intended to measure the cost effectiveness of the training done from the technical aspect of the company, it been an engineering company. The researchers undertook to determine the changes in training of technical employees and if there are any savings attributable to training at the company. Finally, the researchers undertook to establish the benefits realised from the consistent continuous expenditure on technical training. The research was based on the neoclassic theory and developed a conceptual framework based on the cost effective ratio which means that the cost effective function produces a curve that slopes downwards whereas the ineffective function produces an upward sloping curve. The researcher used secondary data as the main data set obtained from the company operational and financial reports and this was triangulated by primary data which involved sampling 210 employees and 40 managers. The secondary data was collected from 2010 to 2014 reports which revealed mainly the training costs, number of employees trained and savings realised. The research revealed that the company was gradually increasing the number of technical employees attending technical training and that the company was making savings from overtime and subsistence allowances. However, the cost effective ratio revealed that trainings at the company were not effective when related to the identified savings.

KEYWORDS
cost, effective, analysis, training.

INTRODUCTION

Until recently there has been a general resistance to investment in training in the public service because of the belief that "employees hired under a merit system must be presumed to be qualified, that they were already trained for their jobs, and that if this was not so it was evidence that initial selection of personnel was at fault." (Stahl, 1976; 2012). This assumption has been jettisoned as the need for training became obvious both in the private and the public sectors. Many organisations have come to recognize that training offers a way of "developing skills, enhancing productivity and quality of work, and building worker loyalty to the firm." Indeed, the importance of training has become more obvious given the growing complexity of the work environment, the rapid change in organizations and technological advancement which further necessitates the need for training and development of personnel to meet the challenges.

Training and development helps to ensure that organisational members possess the knowledge and skills they need to perform their jobs effectively, take on new responsibilities, and adapt to changing conditions (Jones, George and Hill, 2000). It is further argued that training "helps improve quality, customer satisfaction, productivity, morale, management succession, business development and profitability.

The greatest single impetus to the growth of interest in training undoubtedly came from the manpower planning movement which gathered strength in the late 1950s. Originally this took the form of forecasts of the incremental need for high level manpower derived from detailed employer Survey More specifically, a detailed comparison of the metal trades in Germany and the U.K., Daly, Hitchens and Wagner (1985), ascribes the higher productivity in German firms to the superior level of the training of shop floor workers, particularly that of the foremen, who in Germany would typically have an advanced craft qualification, unlike their British counterparts. They found that this had two effects which are bound together. It enables the German workforce to use any given type of equipment more productively—the technical capabilities of machines were more fully exploited, abuses were less likely to occur, faults were more likely to be diagnosed correctly and rectified in-house. The second effect was that as a consequence management was willing to install more advanced equipment.

Most evaluations of the cost-effectiveness of training focus on its labour-market effectiveness. In more general evaluations of the effectiveness of training, recognition is given to the importance of other outcomes: the affective aspects, including the attitudes of the trainees to the training programme, its role in bringing them to terms with employment prospects, its effect on their self-esteem, its effect on job satisfaction, and its effect on social values; and the impact on social mobility, equity and sex stereotyping (Dougherty, 1989). However, there is no attempt to weigh the benefits of these aspects, or losses associated with them, with the more narrowly-defined economic aspects, even when they are susceptible to measurement (Dougherty, 1989).

THE NEED FOR TRAINING AT THE COMPANY

In the early and late 1990s, the power company used to spend an average of 5% of its total budget on training and employees were outstanding in their individual efforts and collectively produced beyond expectation. Performance assessments recommended promotion and increase in notches for many employees and the company experienced growth in profits and infrastructure

However, in early 2000s, the company experienced an upswing in the demand for power from both domestic and industry consumers and this phenomenon prompted the company to change the way it responded to performance operations.

The company rolled out a prepaid meter installation project because domestic demand for power suddenly increased mainly because of the euphoria in construction in brown fields and upgrade and demarcation of existing housing units due to increase in population per housing unit.

Therefore, the company business model changed from push to pull and this situation demanded a shift in the way of managing employee skills thus the trigger for a consented efforts in training.

The company received an average of 1,117,413 faults from the technical side of the business from 2005 to 2008 which indicated a 62% efficiency of service (Company Annual Report, 2010). This result fell by 2% between 2009 and 2013 to 60% (Company Annual Report, 2013). However, analysis of performance from the support side of the business indicated an average of 67% efficiency of performance from the employees between 2005 and 2008 whereas the 2014 report indicated 59 % exhibiting a drop by 8% (Company Annual Report, 2014). A combination of the assessments from the two arms of the business indicated an average of 60% performance rate by the employees in the company hence the need for more training.

Further, following the 2010 report on low employee performance in the company, an independent trainer, MAC Training of South Africa, was engaged to provide training in interpersonal relations and management effectiveness from which the training company observed a medium emotional intelligence of managers

measured from a self-assessment questionnaire triangulated by an intelligence test. The 60% performance level in 2005 which showed a steady increase in 2006 and 2007 before a sharp drop with the worst performance in 2010. However, the performance showed an improvement in 2011 and 2012 before another sharp fall in 2013. This situation is against the fact that the company continuously spends huge sums of money on training.

Therefore, the current research is significant because it would highlight the significant benefits realized for the average of $600,000 annual expenditure on training. Further, the cost effective curve would be exposed in order to establish is the company is cost effective or not.

STUDY OBJECTIVES

The fact that the enterprise bears the cost of the training, including the opportunity cost of the trainee's time, provides it with powerful incentives to design the training effectively, keep its duration to a minimum and eliminate unnecessary expenditure. Decisions to authorize the training are well-informed, the objectives are well-defined, and the decision maker has detailed knowledge of the context. Consequently, the current study undertook to ascertain the benefits associated with technical training and if technical training has been effective at the power company.

LITERATURE REVIEW

INTRODUCTION

There is documented evidence that training activities have a positive impact on the performance of individuals and teams. Training activities can also be beneficial regarding other outcomes at both the individual and team level (e.g. attitudes, motivation, and empowerment).

BENEFITS ATTRIBUTABLE TO TRAINING

Training-related changes should result in improved job performance and other positive changes e.g., acquisition of new skills (Hill and Lent, 2006, Satterfield and Hughes 2007) that serve as antecedents of job performance (Kraiger 2002). Reassuringly, Arthur et al. (2003) conducted a meta-analysis of 1152 effect sizes from 165 sources and ascertained that in comparison with no-training or pre-training states, training had an overall positive effect on job-related behaviours or performance (mean effect size or d = 0.62).

Garc´ıa (2005) conducted a study including 78 Spanish firms with more than 100 employees. This study related organizations' training policies (e.g., functions assumed by the training unit, goals of the training unit, nature of training, and how training is evaluated) with four types of organizational-level benefits: employee satisfaction, customer satisfaction, owner/shareholder satisfaction, and workforce productivity (i.e., sales per employee). Results suggested that training programs oriented toward human capital development were directly related to employee, customer, and owner/shareholder satisfaction as well as an objective measure of business performance (i.e., sales per employee).

Because of the paucity of primary-level studies examining the benefits of training at the organizational level, the meta-analytic reviews published to date include only a small number of studies. In the meta-analysis by Arthur et al. (2003), the researchers also examined the impact of training on organizational-level results. Only 26 studies (N = 1748) examined the benefits of training at the organizational level. Results showed that the benefits of training vary depending on the type of training delivery method, the skill or task being trained, and the measure used to assess effectiveness. However, the mean (d) for organizational results was 0.62, precisely the same effect size found for the impact of training on job-related behaviours and performance at the individual level of analysis. Similarly, the Collins and Holton (2004) meta-analysis of managerial leadership development programs included only seven studies (of 83) that included information regarding the relationship between training and tangible organizational-level benefits (e.g., reduced costs, improved quality and quantity).The total sample size in these seven studies was 418 and the overall mean (d) was 0.39, favouring training compared to control groups.

TRAINING EFFECT ON WORKERS AND PERFORMANCE

Training effects on performance may be subtle (though measurable). In a qualitative study involving mechanics in Northern India, Barber (2004) found that on-the-job training led to greater innovation and tacit skills. Additionally, Davis and Yi (2004) conducted two experiments with nearly 300 participants using behavior-modeling training and were able to improve computer skills substantially. Although behavior-modeling training has a rich history of success (Decker and Nathan 1985, Robertson, 1990), a unique aspect of this research was that training was found to affect changes in worker skills through a change in trainees' knowledge structures or mental models (Marks et al. 2002). In addition, training may enable consistency in performance across conditions. For example, Driskell et al. (2001) conducted a study including 79 U.S. Navy technical school trainees who performed a computer-based task. Trainees participated in a stress-exposure training session. This training exposes trainees to information regarding stressors (e.g., noise, time urgency), to the stressors, and how these stressors are likely to affect performance. Results showed that training was beneficial in that trainees performed well under a novel stressor and when performing a novel task

CATEGORIES OF COST ANALYSIS IN TRAINING

Cost analysis falls into two broad categories: Cost Benefit Analysis (CBA) and Cost Effectiveness Analysis (CEA). A third approach, cost-utility analysis, is often implemented as an extension of CEA. All methods presuppose a well specified intervention and a no-intervention condition, or control group, against which the intervention is compared (McEwan, 2012). In the academic literature, CEA is almost exclusively ex post, with the objective of identifying which of at least two interventions, improved a specific outcome at least cost. In applied decision settings, the CEA is often ex ante (World Bank, 2010). It is used to judge whether a hypothetical intervention should receive investments instead of other candidates

CONCEPT DESCRIPTION

The present paper argues that part of the problem in understanding and tackling deficiencies in employer training lies in the inadequacy of the largely neoclassical, conceptual framework used to analyse this issue. While the standard neoclassical theory of investment in education from the individual perspective has dominated the conceptual and empirical work adopted over the last 50 years, this approach has been less than adequate in understanding other areas of investment, such as enterprise training. It has also shielded economists from needing to go inside the "black box", which has been treated as a purely financial consideration.

The neoclassical solution, with the optimal outcome occurring where the marginal costs of training are equal to the marginal benefits has always caused problems for disciplines outside of economics. In the "neoclassical model", to maximise profits, the firm expands training as long as the marginal benefit of training exceeds the marginal cost. The general presumption is that, if the individual receives the benefits, then the onus is on the individual to pay and, if the employer receives the benefits, the onus is on the employer to pay (Becker, 1964). In the traditional neoclassical model, the extent to which the employer can capture these benefits depends upon the "specificity" of the training, in other words, the extent to which the skills developed are of use to that employer and not to other employers.

Cost-benefit analysis is very widely used whose purpose is to provide a consistent procedure for evaluating decisions in terms of their consequences. Both cost - benefit analysis (CBA) and cost – effectiveness analysis (CEA) are useful tools for program evaluation. Cost - effectiveness analysis is a technique that relates the costs of a program to its key outcomes or benefits. Cost - benefit analysis takes that process one step further, attempting to compare costs with the dollar value of all (or most) of a program ' s many benefits. These seemingly straightforward analyses can be applied anytime before, after, or during a program implementation, and they can greatly assist decision makers in assessing a program's efficiency (Cellini and Kee, 2010).

Cost - effectiveness analysis seeks to identify and place dollars on the costs of a program. It then relates these costs to specific measures of program effectiveness. Analysts can obtain a program's cost - effectiveness (CE) ratio by dividing costs units of effectiveness:

Cost effectiveness ratio (CER) = (total cost (TC))/(units of effectiveness (E))

CER=TC/E.....equation 1

Where; total cost (TC) = costs spent on the training

units of effectiveness (E) = Units of effectiveness are simply a measure of any quantifiable outcome.

METHODOLOGY

INTRODUCTION

This chapter describes in detail how the research was conducted. It is simply a framework or plan of the study. It outlines the procedures and tools used in collecting, analyzing and interpreting the data. This chapter is used as a guide in collecting and analyzing data. It describes the nature of the data that was used to analyse the cost effectiveness of training at the power company.

RESEARCH DESIGN AND DATA COLLECTION

To achieve the objectives of the research, a descriptive research was appropriate and therefore adopted limiting it to the power company as a case study. During this research, the main data set which was secondary data on training cost was collected from company reports and budgets determined and committed to financial years from 2010 to 2014 which was triangulated by primary data

The relevant population for primary data in this study comprises of technical training section at the power company. The study involved a population of technical employees at the power company's head office from 2010 to 2014. This data was collected using self and email administered questionnaires to technical managers, training and human resource managers as well as employees. The total population of workers was 850 from which the researcher attempted to sample using Yamanes' formula determined as follows:

n=N/(1+N〖(e)〗^2)

Where n is the sample size, N is the population size, and e is the level of precision which was set at 5% with a confidence level of 95%.

Applying the formula to derive the sample size gives the following;

n=850/(1+850〖(0.05)〗^2)=272

Therefore, n = 272 were sampled according to proportion contribution to the population per section. The researchers administered questionnaires at random until the required number was reached

However, the population for managers (40) was small enough not to sample but large enough to be within the statistical rule of atleast 29 data points for any statistical testing.

RESULTS AND DISCUSSION

Physical inspection of training records from 2010 to 2014 revealed that technical training accounted for a significantly large number of beneficiaries as shown in table 1.

Technical training at the company showed a steady increase in beneficiaries over the five year review period determined in the following way:

Annual percent change (APC) = 100 x ((Current year-previous year))/(Previous year)……..equation 2

TABLE 1: NUMBER OF TRAINED EMPLOYEES AGAINST TOTAL NUMBER OF EMPLOYEES

YEAR	Total Number of Technical Employees trained	Total Number of Technical Employees at Station
2010	436	678
2011	598	745
2012	664	780
2013	712	750
2014	753	800

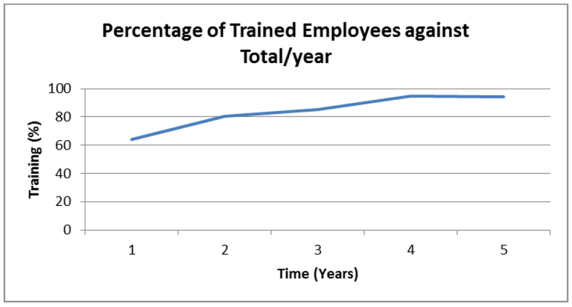
If Annual percent change = APC

Current year = X, Previous year = Y then equation 2 can be rewritten as:

APC = 100 x (X-Y)/Y……..equation 3

The figure 1 below shows an increasing percentage of technical training beneficiaries with the lowest percent of 64 in 2010 (shown as year 1) to the highest in percent of 95 in 2013 (shown as year 4). The average technical training over the period of review was 84 percent while the average number of trained employees in the period under review was 633 compared to an average number of employees of 751. This represents 84% of the total employees benefiting from training.

FIGURE 1: ANNUAL PERCENT CHANGE IN TECHNICAL TRAINING



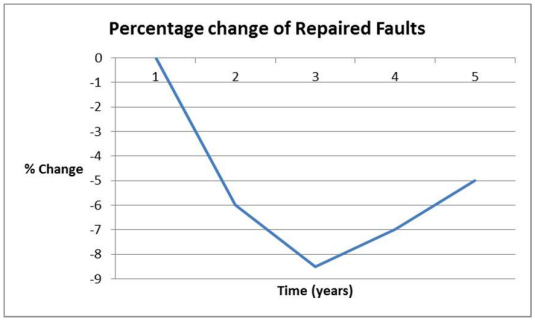
RESPONSE TO FAULTS

Statistics obtained from the company national call centre indicated that maximum faults resolution depended on the gravity of the fault, with the maximum period being 24 hours regardless of how grave the fault was. Customers are supposed to be back on supply with the option of giving them alternative supply lines within the shortest possible time of thirty (30) minutes to 6 minutes unless during load management activities

During the period under review, the company was able to save and earn some revenue due to quick resolution of faults which improved each year as the number of trained technical personnel offloaded into operations and maintenance departments increased.

Trained technical staff exhibited high professionalism and technical knowhow as evidenced by the increase in the number of faults resolved on a daily basis. This in monetary terms translated into savings on overtime claims for technical staff and other staff incentives like subsistence allowances when staff were required to backup others in other stations. Training technical staff and positioning them appropriately also saves money in terms of having to send those with the knowhow to do the jobs in various places. This information is illustrated by figure 2

FIGURE 2: PERCENTAGE CHANGE IN FAULT REPAIRS

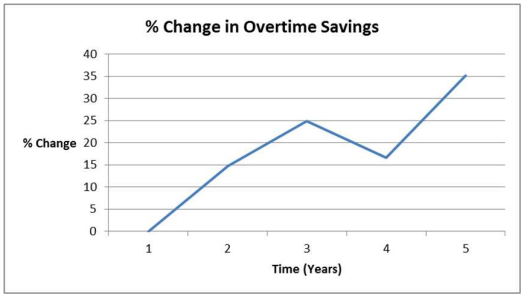


However, the trend is downward sloping from 2010 to 2012 and then it begins to shoot up towards zero from 2013 to 2014. This means that more savings were due between 2010 and 2012 but 2013 and 2014 exhibits a reduced performance in terms of number of faults reported and repaired. An economic perspective is where the reports keeps reducing to zero which would be the ideal situation.

SAVINGS FROM OVERTIME ALLOWANCES

There was an average saving from overtime allowance of K17, 201,000 (about $1,563,000) due to work performance within normal time. The savings gradually improved from 2010 to 2012, reduced in 2013 but sharply increased in 2014. This is a good positive indicator of gains from training. This trend is illustrated by figure 3.

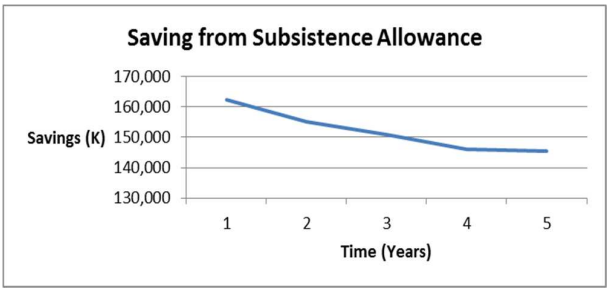
FIGURE 3: CHANGES IN SAVINGS DUE TO OVERTIME ALLOWANCES



SAVINGS FROM SUBSISTENCE ALLOWANCES

The company has over the years made savings from subsistence allowance because of not engaging workers on works requiring the allowance because all works were done within normal time. This resulted in an average saving of K152,001,000 (about $13,818,272) although the trend is downward sloping from 2010 to 2014 indicating a reduction in this type of saving as shown by figure 4.

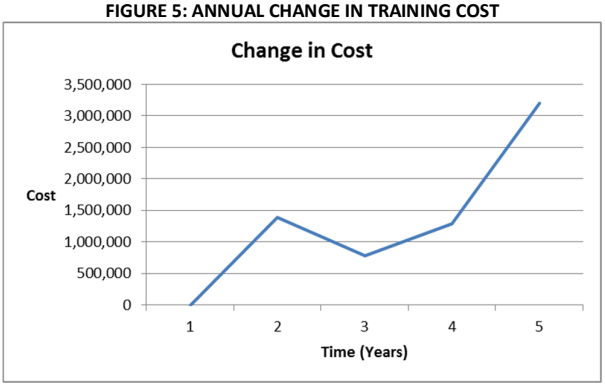
FIGURE 4: SAVINGS FROM SUBSISTENCE ALLOWANCE PER YEAR



COST OF TRAINING AT THE COMPANY

Training cost at the power company had been on the increase in the period under review at an average rate of K1,334,000 (about $121,272) representing 28% change per year.

FIGURE 5: ANNUAL CHANGE IN TRAINING COST



The figure 5 shows an escalating cost of training from the first year to the fifth year with only one drop in the third year. The theory of cost benefit and cost effectiveness produces effectiveness when benefits increases more than costs or when costs are stable or static. This increasing trend in cost is a negative indicator of effectiveness

COST EFFECTIVE ANALYSIS OF TECHNICAL TRAINING

This ratio is computed as follows:

Cost effectiveness ratio (CER) = 100*(total cost (TC))/(units of effectiveness (E))

CER=100*TC/E.....equation.....4

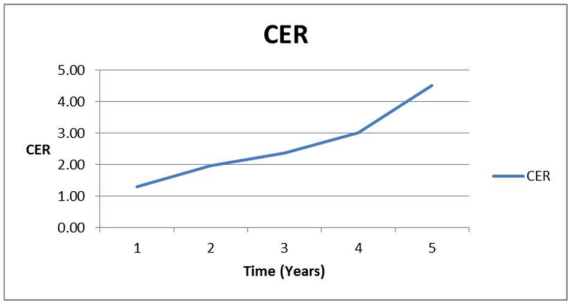
Where; total cost (TC) = costs spent on the training units of effectiveness (E) = Units of effectiveness are simply a measure of any quantifiable outcome central to the programme's objectives.

The interpretation of the ratio is that the benefit from an activity must be larger than the cost to yield a very low ratio towards infinity. Therefore, a result far less than zero (0) means that the company or investment is generating more benefits from training and the training is cost effective whereas a number greater than zero means that the investment is yielding less benefits from training.

Analysis of costs and benefits were computed in MS Excel using equation 1 and shows an average saving of K220,366,400 (about $20,033,309) against an average cost of K5,741,757 (about $521,977) yielding an average cost effective ratio (CER) of 3.0. The trend from 2010 to 2014 shows increasing cost year to year and reducing savings year to year as compared to the two savings items.

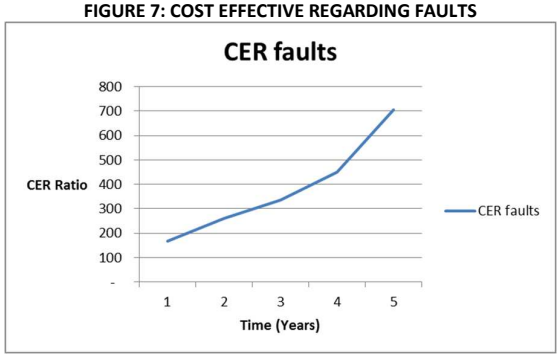
An overlay of costs and savings produces the cost effective ratio which is upward slopping. The ideal cost effective ratio is supposed to produce a downward slopping curve to infinite. This is because the benefits realized in terms of savings of units of gain per investment must be higher than the training cost. This reduces the loss from opportunity cost

FIGURE 6: COST EFFECTIVE OF TECHNICAL TRAINING



The figure 6 above shows technical training been cost effective in 2010 and losing cost effectiveness over the years when compared to the two benefit items of overtime and subsistence allowance savings. The desired cost effective ratio must be below one (1.0). Further, analysis of cost effectiveness per fault repaired exhibits an increasing ratio from K167 per fault in 2010 to K707 per fault in 2014. This ratio exhibits cost ineffectiveness as shown in figure 7

FIGURE 7: COST EFFECTIVE REGARDING FAULTS



A correlation analysis of cost and savings was performed which revealed that training savings and costs related strongly at 87.2% signifying that one unit increase in training cost results in a one unit reduction in savings. Table 2 shows the correlation output.

TABLE 2: CORRELATION OUTPUT

Correlations			
		Cost	Saving
Cost	Pearson Correlation	1	-.872
	Sig. (2-tailed)		.054
	N	5	5
Saving	Pearson Correlation	-.872	1
	Sig. (2-tailed)	.054	
	N	5	5

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