A Meta – analysis of e- learning effectiveness antecedent

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ABSTRACT: The academic research on e-learning effectiveness becomes one of the current themes. In this perspective, many efforts have been made to give more comprehension to learning effectiveness determinants. In fact, researchers focus frequently on the variables that maximize the reaction, learning and behaviour changes of trainees. Despite these efforts that aim at giving more comprehension to learning effectiveness determinants, researchers have not reached a consensus on the "nomological network" of learning results, ruling distinctness over how to explain them and queries as how could they make training experience more effective and interesting in education and corporation area as well. These divergent perspectives suggest that a conceptual and quantitative review of nomological network of learning outcomes antecedents is justified and necessary.

The present study addresses the limitation of understanding regarding learning outcomes antecedents by reviewing the empirical results of literature. In this case, a review and Meta –analytic summarizes of studies assessing learning outcomes such as declarative knowledge, skill acquisition, its antecedents, and its relationships with learning transfer are presented. First, the present report provides a narrative review of conceptual framework, focusing only on variables that are linked to learning outcomes and the relationship between learning outcomes and learning transfer. Second, Meta –analysis conducts to derive the average effect size value (r_{avg}), average fisher's Z (z_{avg}) and to address the degree of homogeneity of each relationship. The findings are discussed in terms of their theoretical implication and the limitations of this study are shown.

KEYWORDS: Trainee characteristics, training effectiveness, meta-analysis.

1 INTRODUCTION

Learning researchers focus frequently on the variables that maximize the reaction, learning and behaviour changes of trainees [8]. Recently, the academic research and reviews has increased. The scientific conferences publish e-learning studies to understand the impact of learning across different types of delivery on the employees' performance on the one hand and the competitiveness of organization on the other hand. Baldwin and Ford (1988) define learning effectiveness as the quantity of knowledge, skills and behaviour learned in a training session and their effective application by trainees on their job. Empirical research on learning effectiveness focuses on the predictor of learning performance and examining their relationships with transfer performance (e.g. [24], [43] – [52]). Learning refers to the learners' skills and knowledge acquired during training experience [84]. Transfer refers to the learners' change of their behaviour on the job because of training experience [84].

Despite these efforts that aim at giving more comprehension to learning effectiveness determinants, Researchers have not reached a consensus on the "nomological network" [70] of learning results, ruling distinctness over how to explain them and queries as how could they make training experience more effective and interesting in education and corporation area as well. For example, some researchers have stated that training motivation, self efficacy, learning delivery, anxiety are unrelated to learning outcomes (e.g. [17], [68], [52] – [18]).Others have asserted that training motivation, self efficacy,

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learning delivery, anxiety influence learning outcomes (e.g. [38], [76], [41], [74], [33]- [16]). And others have suggested that learning strategy and feedback influence learning outcomes (e.g. [15] – [48]) .These divergent perspectives suggest that a conceptual and quantitative review of nomological network of learning outcomes antecedents is justified and necessary.

The present study addresses the limitation of understanding regarding learning outcomes antecedents by reviewing the empirical results of literature. First, the present report provides a narrative review of conceptual framework, focusing only on variables that are linked to learning outcomes and the relationship between learning outcomes and learning transfer. Second, Meta –analysis conducts to derive the average effect size value (r_{avg}), average fisher's Z (z_{avg}) and to address the degree of homogeneity of each relationship.

The study considers four research questions regarding learning effectiveness. (1) To what degree do trainee characteristics predict learning outcomes? (2) To what degree do situational characteristics predict learning outcomes? (3) To what degree is learning outcomes related to learning transfer? (4) Do moderators influence these relationships?

2 META –ANALYSIS OBJECTIVES

Meta- analysis can serve a variety of purpose. Thus, meta- analysis permits to synthesise quantitative results from several researches to observe effect sizes through those papers on the phenomenon under review [63]. Meta analysis offers a way to gain a large understanding of related studies reports, in order to generalize results. Hence, Meta- analysis overcomes the weaknesses of a single research across combining numerical researches results from a few or many studies [63]. Thus, Meta analysis goes beyond traditional research in that they focus on the direction and magnitude of the effects across researches [67].

3 CONCEPTUAL FRAMEWORK

The training and learning literature generally recognize that learning outcomes can be influenced by both individual and contextual characteristics (e.g. [43] – [52]). According to this, the present review examines only the variables that are linked directly to learning outcomes (performance), and the relationship between learning outcomes and transfer. The present study includes variables examined across several studies in a training, learning and online learning context. Only those factors are included in a quantitative review of this research. On the basis of these criteria, the following individual and contextual characteristics are reviewed: motivation to learn, self efficacy, anxiety, learning strategy, learning delivery, feedback. Indeed, the role that learning outcomes play in learning transfer is mentioned.

3.1 PERSONNEL INFUENCES

A learner's characteristics influence learning performance; that is, one of the more important predictor is individual's motivation to achieve learning program (e.g. [43] – [52]).

3.1.1 MOTIVATION

Many researchers (e.g. [54]) define motivation as the degree to which trainees is willing to make efforts to enhance his or her performance of learning and work. Training motivation refers to the intention to invest high levels of consistent effort in a particular training program [76]. Various motivation constructs are examined in training or learning research, including pre - training motivation, post-training motivation and motivation to learn. Previous researches demonstrate that the motivation to learn predict learning outcomes and is influenced by both individual and situational factors (e.g. [54], [50], [51], [48], [62] – [8]).Several studies associate the motivation to learn to the training effectiveness. Mathieu et al. (1992) suggest that emotional response to the program moderate the relation between motivation to learn and learning. In fact, more trainees express more positive emotional responses, more the relation between motivation to learn and learning will be strong.

Quinone (1995) shows that motivation to learn is a variable key linking pre-training characteristics and training outcomes. Thus, trainees with higher training motivation would believe that participation in the training program and learn new knowledge and skills will influence training effectiveness [54].Tai (2006) demonstrates that individuals should expend effort to achieve a particular behaviour.

3.1.2   SELF EFFICACY

Self efficacy is shown to influence the behaviours of individuals towards the execution of actions. Thus, self efficacy is an individual's belief about his or her capacity to mobilize the resources requisite for successful task performance [5]. According to social cognitive theory [5], self efficacy is postulated to influence performance in interpersonal skills training [30], in military training programs (e.g. [19] – [73]), in computer software training [29], and home page design training course [14]. Self efficacy judgements vary along three dimensions that have robust performance implications: magnitude, strength and generality [7]. Magnitude refers to the level of task difficulty and complexity (low, moderate, high). Individuals with high magnitude judge themselves to be capable of performing more difficult activities and tasks than those with lower magnitudes. Strength refers to one's confidence in his or her capabilities to execute activities and tasks. Generality refers to the extent to which personnel efficacy is generalized across similar activity domains [39]. Past researches examine the relationship between self efficacy and learning performance. For example, Hill, Smith, and Mann (1987) examine the relationship between self efficacy and the readiness to use computers. This finding Results indicate that efficacy beliefs predicting the behavioural intentions are related to learning about computers. The investigation of Martocchio (1992) reports contradicting results. He finds that computer self efficacy is negatively related to learning performance in computer training.

Mathieu et al. (1993) found that individual antecedents of self efficacy (initial performance, achievement motivation and choice) influence self efficacy development. In this context, the authors find that self efficacy influence trainee reactions and performance improvement during training.

3.1.3   ANXIETY

According to literature, researchers generally agree that anxiety plays an important role in learning performance (e.g. [46] – [15]). Chou (2001) informs that anxiety influences learning performance. Colquitt et al. (2000) Meta – analysis shows that, anxiety produces negative correlations with every training outcome.

3.2   ENVIRONMENTAL INFLUENCES

Various training methods exist and play important role in learning program. The training research focuses on many methods: exploration, instructor – led lectures, and behaviour modelling. Behaviour modelling considers a combination of instructor-led training and exploration – based training [69]. Gist, Schewoever, and Rosen (1989) compare behaviour modelling trainees to computer – based tutorial trainees with respect to software self efficacy, performance, working style, affective response, and satisfaction. Behaviour modelling trainees attain higher mean scores on all measures than did computer – based tutorial trainees. Compeau and Higgins (1995, p132) compare behaviour modelling and lecture – based program. In this study, all trainees are first given a 40 –minute lecture on computing concepts, and then a 90 – minute software demonstration. Then, modelling trainees watch a 30 – minute modelling videotape and lecture trainees are given lecture notes to read which is followed by a two- hour practice session for both groups. The researchers find that participants in the modelling condition develop higher self efficacy and demonstrate higher training performance than those in the lecture based program. Simon and Werner (1996) compare behaviour modelling to exploration and instruction training. They find out that behaviour modelling trainees learn more than the other trainees, they do best at demonstrating the skills taught in training in a hand – on test, and they are satisfied with the computer system four weeks after training.

3.2.1   FEEDBACK

Training research suggest the importance of a feedback as a source of information that helps trainees to improve learning achievement (e.g. [48]). According to Bandura (1989), on the basis of social cognitive theory, feedback provides information about prior performance and serves as a basis for evaluating one's capability to perform successfully on subsequent tasks.

The research shows that feedback depends on the level of trainees' performance. Thus, when trainees' receive positive feedback, they are likely to achieve their learning successfully. On the other hand, trainees' who receive negative feedback may display lower performance. Feedback can be a source for both individual and group goal [53]. The authors examine the effects of feedback sign on task performance. In this study, participants are exposed to either positive or negative feedback after completing the task. The finding results suggest that, although groups receiving negative feedback are less satisfied, these groups set higher goals, develop more strategies and perform at higher levels than groups receiving positive feedback.

Martocchio and Webster (1992) examine the impact of performance feedback on software efficacy perceptions and on a variety of affective outcomes, including satisfaction with feedback, satisfaction with training and positive mood. The finding

results demonstrate that positive feedback generally results in higher test performance and more positive affective outcomes than does negative feedback. Feedback also can be an important source to supervisors to motivate individuals to show high performance. In this setting, Chakrabarty, Oubre, and Brown (2008) examine the effects of supervisor feedback on salesperson performance. The results indicate that positive feedback has a strong positive effect on salesperson performance, whereas negative feedback is unrelated to salesperson performance.

Feedback presents three most significant functions indicating a source of behavioural cues reduces uncertainty and motivates trainees [12]. The sources of feedback include the organization, immediate behaviour, co-workers, self and task [12].

3.3   BEHAVIORAL OUTCOMES

The individual and contextual characteristics reviewed above are often linked to training outcomes. Past researches show several criteria to measure learning outcomes. Kirkpatrick's model suggests four levels to evaluate learning program (reactions, learning, behaviour to change, and results) [1]. Thus, these criteria are linked in a positive and causal manner [8]. Alliger et al. (1997) point out the importance of reaction measure because trainees can be viewed as customers of learning program. Recent research demonstrates that trainees react to the learning program they receive in multiple ways. Warr and Bunce (1995) suggest three distinct reaction factors: reported enjoyment of the training experience, perceived usefulness of the training, and perceived difficulty of the training material. Alliger et al. (1997) conceptualize reactions as including both affective and utility components. Additional findings regarding reactions level are provided by Colquitt et al. (2000). The authors use meta- analysis to summarize the past 20 years of research in this area; they report little support for associations between reactions and learning. Similarly, small linkages are found between reactions and job behaviours. Mathieu et al. (1992) report further evidence of the influence of trainee reactions by analysing both linear and non linear relationships among training outcomes. They demonstrate that reactions moderate the relationship between training motivation and learning, and mediate the influences of training motivation and training assignment method on post test learning scores. To emphasize learning criteria, Kirkpatrick taxonomy focuses on skill acquisition. Kraiger et al. (1993), in recognizing this fact, argue that learning can take three categories of learning outcomes: cognitive (declarative knowledge), skill – based (skill acquisition), and affective (self efficacy).The authors suggest that a suitable evaluation of training effectiveness is made by measuring the relationships between learning goals achievement and behaviour change on the job [37]. As well, the integration of training program within an organization must improve the performance of this last. Trainees in charge must perform training program and transfer new knowledge, skills and behaviour learned during training [43].

Baldwin and Ford (1988) elaborate an integrated model on the process of learning and transfer [43]. They propose two conditions of transfer: maintenance and generalization. Maintenance refers to the length of time that trained skills continue to be used on the job. Generalization refers to the extent to which knowledge and skills acquired during training are applied to different tasks on the job [4]. According to them, trainees must understand, achieve and remember what was taught during training, and consequently incorporate their newly knowledge and behaviour learned on the job. Thus, learning performance (learning and retention) affects transfer performance (maintenance and generalization). Many researchers (e.g. [37]) suggest that retention score or the maintenance of training content is a good measure of learning performance. Alliger et al. (1997) argue that learning performance has a significant impact on transfer performance. Colquitt et al. (2000) inform that learning outcomes (e.g., knowledge acquisition, reactions) affect directly knowledge transfer into daily routines.

3.4   METHOD

Meta –analysis is a technique of statistical procedures that allows empirical findings from single studies to be collected and reckoned for the target of synthesizing and integrating these researches to ameliorate relationships estimation. A Meta – analysis is conducted to examine learning performance antecedents. The major goal of this Meta – analysis is to provide a precise summary of the overall factors used severally in the literature and that make sense to learning effectiveness. This method permits to generate new hypotheses and then allow us to draw the conceptual framework.

3.4.1   LITERATURE RESEARCH

Literature search involves using electronic reviews of available materials. To meet the search criteria, some combination of the keywords: web, online, or internet, and evaluate, learn, transfer, behavior, performance, effectiveness, knowledge, skills, achieve, or outcomes, had to be present. Studies had to meet several criteria to be included in the present review: a) the article is written in English or French; b) the article reports results that allowed the calculation of r statistic (e.g., t - test, r correlation, unvaried F – test, p value, p level) [63].

The search process is conducted using several online databases (Psych Info, Psyc ARTICLES, EBSCO, and Doctoral Dissertation Database).The present search covers the period from 1984 to 2009 and includes the following journals*: Journal of Applied Psychology, Personnel Psychology, Journal of organizational Behaviour, Human Resource Development Quarterly, J. of Acc .Ed, Journal of European Industrial Training, The American Journal of Distance Education, Information Systems Education Journal, Journal of Agricultural Education, Institute of Behavioural and Applied Management, Academy of Educational Leadership Journal, International Journal of Human Computer Studies, International Journal of Selection and Assessment, Personnel review, Computers in Human Behaviour, MIS Quarterly, Decision Sciences Journal of Innovative Education, Journal of Business Psychology, Group & Organization Management, Industrial Marketing Management, The Journal of Psychology, Learning and Instruction, International Journal of Information Management, .*

The initial computer search results in a list of 5,640 possible reports; a review of titles and abstracts reduces to list of 270 reports potentially containing relevant information. Reading the reports identifies 60 relevant studies. Unpublished studies are also searched. A request is sent to authors (Kurt Kraiger; Kenneth Brown; Colquitt Jason). They are asked to provide leads to unpublished work, as well as any manuscripts they may have.

3.4.2 INCLUSION CRITERIA

The goal of the literature research is to identify all research reports where employees or students are performing learning program to prepare them to reproduce and generalize knowledge and skills acquired on class tasks or job tasks. Researches that report gain scores, learning achievement, training performance are also gathered.

3.4.3 INDEPENDENT ASSUMPTION

When multiple learning outcomes dimensions are present in a study, each possible relationship between the independent factors (e.g., Motivation to learn, anxiety, self efficacy) and the dimensions is treated separately.
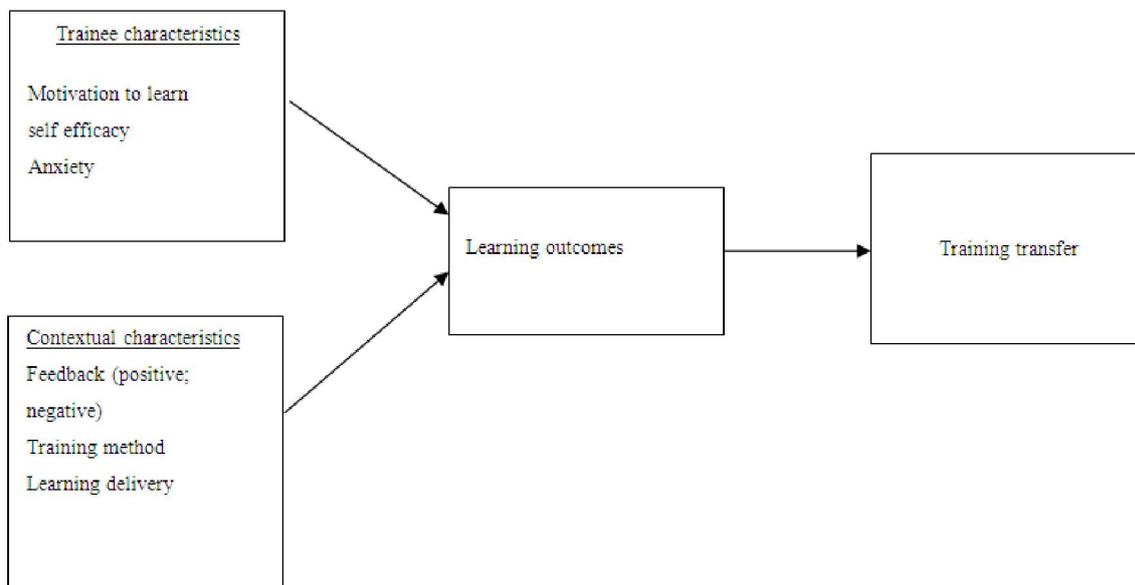
Fig.1.   E-learning effectiveness antecedents

4   META –ANALYTIC METHOD

Effect sizes are reckoned by using the guidelines produced by Rosenthal and DiMatteo (2001). In fact, effect sizes (r) are important to estimate the magnitude and the strength between the relationships. Also, average effect sizes (r_{avg}) and average fisher's Z (Z_{avg}) were calculated.

4.1 EFFECT SIZE

The effect size essentially encodes the results of the selected papers finding into a numeric value [57]. There are two principle types of effect sizes: those based on mean differences (commonly called d) and those based on correlations (commonly called r).

Effect sizes based on mean differences (d) look to compare the average on a particular variable to two groups or between two time frames [57]. The standardized mean difference (d) can be calculated by inputting means and standard deviations; t – values, F- values, or p – values [63].

Cohen's (1992) suggests the following guidelines of interpreting the meaningfulness of the magnitude of the observed standardized mean difference effect size, if d ≤ 0.20 the effect is small, if d = 0.50 the effect is medium, if d ≥ 0.80 the effect is significant.

Effect sizes based on correlations compare the relative strength of the association between two variables [57]. The effect size for the relation between two variables can be calculated through t- test; F- values, p – value, or Cohen's d. These equations can be written (Rosenthal and DiMatteo, 2001, p. 71):

$$r = \sqrt{t^2/_{t+df}} \qquad \text{or} \qquad r = \sqrt{F/_{F+df}}$$

Correlation coefficient effect sizes range in magnitude between 0 and 1, With 1 being an exact relation between the variables, and 0 denoting no relation at all. Cohen's (1992) suggests the following correlation coefficient: if r ≤ 0.1 the effect is small, if r = 0.30 the effect is medium, if r≥ 0.5 the effect is large.

The effect size chosen for this research is the effect size based on correlation (r). In order to normalize the distribution, we calculate the standard normal deviate scores (Z_r) (Rosenthal and DiMatteo, 2001). The guidelines of Rosenthal and DiMatteo (2001) are utilized to calculate the fisher's Z and effect size r.

To calculate the average r and the average Z_r the software named Meta. EXE. Version III" is used.

Finally, the degree of heterogeneity is measured using X^2 distribution with k – 1 degree of freedom. When X^2_{k-1} is not significant, the effect is considered homogenous (no moderators effect). Whereas, when X^2_{k-1} value is very large, the effect is considered heterogeneous. To calculate Chi –square the same software Meta. EXE. Version III is employed.

5 RESULTS

The finding results of the Meta –analysis are presented below in table 2 to table 8. These tables include the results of 8 relationships that are consistent in the domain of training and learning research. In general, the number of studies considered in this Meta – analysis is the number of relationships that is 100. The contents of tables are analysed and discussed according to the relationships between motivation to learn, self efficacy, learning delivery, Training method, anxiety, feedback with learning outcomes and finally the relationship between learning outcomes and learning transfer.

➢ *Antecedents of learning outcomes*

In general, these results suggest that motivation to learn has a moderate relationship with learning outcomes. The average effect size is medium (r = 0.36), with the sign indicating that people motivated to learn tend to display important level of knowledge and skills performance.

Self efficacy has a small relationship with learning outcomes. The average effect size is small (r = 0.16). Anxiety has a significant relationship with learning outcomes. The average effect size is roughly large (r = 0.48). Training method has an important relationship with learning outcomes. The average effect size is large (r = 0.70). Learning delivery has a small relationship with learning outcomes. The average effect size is small (r = 0.14). Feedback has a strong relationship with learning outcomes. The average effect size is large (r = 0.64).

➢ *Relationships among outcomes*

Learning outcomes is positively related to transfer. Specifically, the average effect size is approximately medium (r = 0.29). It's important to emphasize that the correlations among learning outcomes and transfer support the results find in many researches (e.g. [8] – [43]).

6   ANALYSIS

This section provides the meta-analysis results on various relationships investigated in this research. Thus, this procedure presents information on how important and how significant these relationships are and also present information on the degree of the heterogeneity among Z_r scores and effect sizes.

Motivation to learn ⟶ Learning outcomes

Meta-analysis results regarding the relationship between motivation to learn and learning outcomes. 22 studies measure the effect of motivation to learn on learning outcomes. The average normal standard deviate of these studies is $Z_r = 9.40$. The average effect size is r =0.36 a medium effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 55.25$.

Self efficacy ⟶ learning outcomes

Meta-analysis reflects results regarding the relationship between computer self efficacy and learning outcomes. 28 studies measure the effect of self efficacy on learning outcomes. The average normal standard deviate of these studies is $Z_r = 4.45$. The average effect size is r = 0.16, a small effect size according to Cohen's (1992). The Z_r score is found to be heterogeneous to a significant degree, $X^2_{k-1} = 164.75$. This suggests the existence of possible factors that moderate the relationships between self efficacy and learning outcomes.

Anxiety ⟶ learning outcomes

Meta-analysis results regarding the relationship between computer anxieties and learning outcomes. 6 studies measure the effect of anxiety on learning outcomes. The average normal standard deviate of these studies is $Z_r = 2.99$. The average effect size is r = .48 a medium effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 3.86$.

Learning delivery ⟶ learning outcomes

Meta-analysis results regarding the relationship between learning delivery and learning outcomes. 21 studies measure the effect of learning delivery on learning outcomes. The average normal standard deviate of these studies is $Z_r = 4.48$. The average effect size is r = .14 a small effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 64.89$.

Training method ⟶ learning outcomes

Meta-analysis results regarding the relationship between training method and learning outcomes. 10 studies measure the effect of training method on learning performance. The average normal standard deviate of these studies is $Z_r = 7.98$. The average effect size is r = 0.70 a large effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 7.78$.

Feedback ⟶ learning outcomes

Meta-analysis results regarding the relationship between feedbacks and learning outcomes. 6 studies measure the effect of feedback on learning outcomes. The average normal standard deviate of these studies is $Z_r = 4.04$. The average effect size is r = 0.64, a large effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 2.27$.

Learning outcomes ⟶ learning transfer

Meta-analysis results regarding the relationship between learning outcomes and learning transfer. 4 studies measure the effect of learning performance on learning transfer. The average normal standard deviate of these studies is $Z_r = 2.69$. The average effect size is r = 0.29 a large effect size according to Cohen's (1992). The Z_r score is not found to be heterogeneous to a significant degree, $X^2_{k-1} = 9.16$.

7   DISCUSSION

The target of the present narrative and Meta – analytic review is to shed light on the learning effectiveness antecedents in an effort to determine the role of individual characteristics and situational one in training effectiveness. Thus, the present report looks at the degree to which individual and contextual characteristics predict learning outcomes and the degree to which learning outcomes predict changes in learning transfer. Theoretical implications of the finding results as well as limitations and directions for future research are discussed.

7.1 THEORETICAL IMPLICATIONS

The results of the Meta –analysis show that learning outcomes primary capture trainees' characteristics (e.g., Motivation to learn, anxiety, and self efficacy) and trainees' perceptions of the training environment (e.g., feedback, training method, and learning delivery). Across 56 studies and 11,326 trainees, motivation to learn (r_{avg} = 0.36) and anxiety (r_{avg} = 0.48) has most important effect on learning outcomes, whereas trainees' self efficacy (r_{avg} = 0.16) were smaller but still important predictor of learning effectiveness. Thus, the importance of this factor is supported by several researchers (e.g. [18], [22] - [30]), whose find self efficacy to be a strong and significant predictor of learning outcomes. Computer anxiety, roughly largest predictor, accounted for 43% of the variance in learning outcomes above other trainees' characteristics.

Contextual characteristics are also shown to be consistent. In fact, across 37 studies 8863 trainees, training method (r_{avg} = 0.70) and feedback (r_{avg} = 0.64) has the strongest effect on learning outcomes, whereas learning delivery is weaker (r_{avg} = 0.14).

Meta – analysis results indicate that learning delivery demonstrates a small relationship with learning outcomes. The results across studies are found to be statistically small. According to the literature, there are instances in which distance learning group outperformed the traditional instruction group, and there are instances in which the opposite occurred. However, the importance of this factor is supported by several researches (e.g. [26], [66] – [78]). Training method, the significant predictor, accounted for 33% of the variance in learning outcomes. However, some of those results are based on few studies.

The narrative review shows that learning outcomes distinguish between cognitive outcomes (e.g., declarative knowledge, behavioural knowledge) and affective knowledge (e.g., self efficacy, reactions, and satisfaction). Hence, the results of the Meta –analysis show that variables studied in the literature correlate with several dimensions of learning results.

Finally, the Meta analysis results indicate that learning outcomes is moderately related to learning transfer. However, the results across studies are consistent and are found to be statistically significant. Recent researches show a strong correlation between learning performance and learning transfer (e.g.[43] – [52]).

7.2 LIMITATION AND DIRECTIONS FOR FUTURE RESEARCH

As with any research, this Meta – analysis has some limitations that should be indicated. First, this research is based on studies that have directly examined training, learning, or online learning therefore subject to error. Second, some studies are based on small sample sizes. Third, this report focuses on the analysis of the variables that have been directly correlated to learning performance. Additionally, the possible moderators between self efficacy and learning outcomes are not examined. Further researches should focus on the extraction of these moderators.

Further research is necessary to focus on trainees' reaction as a primary measure of learning effectiveness. Specifically, we suggest considering trainees' reaction as an antecedents of learning outcomes. Additional research is needed to examine how learning delivery moderate the relationship between trainees' reaction and learning outcomes. Thus, we have examined that across narrative review, single effect sizes are small.

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