

TRAINING TRANSFER EFFECTIVENESS AMONG TECHNICAL EMPLOYEES: EVIDENCE FROM AN ENGINEERING COMPANY

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Abstract. This study investigates the factors influencing transfer of training among technical staff in an engineering organization, based on Baldwin and Ford's (1988) model. It examines three key determinants: trainee characteristics, training design, and work environment. Data were collected from 238 technical employees using a structured questionnaire, and correlation analysis was applied. The results show that all three factors are significantly and positively related to transfer of training. Training design is the most influential factor ($r = 0.814$), indicating that well-structured programs with practical relevance, active learning, and feedback enhance skill application. Trainee characteristics ($r = 0.758$), such as motivation and self-efficacy, also strongly support training transfer. Work environment ($r = 0.717$), including supervisory support and opportunities to apply skills, further contributes to effective transfer. Overall, the findings highlight the importance of integrating effective training design, individual readiness, and organizational support to improve training outcomes. The study reinforces Baldwin and Ford's framework and emphasizes its relevance in engineering contexts where skill application is critical for performance and efficiency.

Keywords: *transfer of training, training design, trainee characteristic, work environment*

Introduction

In an increasingly competitive and uncertain business environment, organizations invest substantially in employee training to enhance skills, adaptability and performance. However, the extent to which employees are able to apply what they have learned to their work is yet to be determines the effectiveness of such investments. Training transfer refers to the degree to which knowledge, skills and attitudes acquired during training are applied in the workplace and continuously over time. Despite continuous efforts and significant financial investment in training initiatives, empirical evidence indicates that a considerable proportion of learned competencies is not effectively transferred to job performance, leading to underutilization of resources and suboptimal organizational outcomes (Kim, 2022). This challenge is particularly critical in engineering and technical environments, where job performance, operational efficiency and workplace safety depend on the correct and consistent application of technical knowledge and skills. In such contexts, failure to transfer training effectively may result not only in reduced productivity but also in increased operational risks and errors. Recent studies emphasize that enhancing training transfer in technical settings requires a systematic understanding of the factors that facilitate or hinder the application of learning in real work situations (Bhurtel and Bhattarai, 2023; Sarfraz et al., 2021).

According to the seminal framework proposed by Baldwin and Ford (1988), three primary factors influence training transfer: trainee characteristics, training design, and the work environment. Contemporary research continues to validate and extend this framework by highlighting the dynamic interaction among these factors. Trainee characteristics such as motivation to transfer, self-efficacy, and learning readiness have

been shown to significantly influence the willingness and ability of employees to apply learned competencies (Gautam et al., 2023). Similarly, training design elements which include active learning strategies, realistic simulations and feedback from manager play a crucial role in enhancing knowledge retention and applicability (Kim, 2022). Furthermore, work environment factors such as supervisory support, peer encouragement, transfer climate, and opportunities to perform are consistently identified as key enablers of successful training transfer (Kerins et al., 2021; Sarfraz et al., 2021). Therefore, the purpose of this study is to determine the most important element affecting training transfer and investigate the connections between these factors with training transfer among technical staff employees in an engineering company.

Literature review

Transfer of training

Transfer of training refers to the extent to which trainees effectively and continuously apply the knowledge, skills and behaviors acquired during training to their jobs (Noe, 2020). According to Noe (2020), transfer of training consists of two important conditions, namely generalization of training and maintenance of training. Generalization of training refers to the ability of trainees to apply learned competencies to their actual job tasks, while maintenance of training refers to the continued use of those competencies over a period of time. These two conditions remain central in determining whether training efforts lead to meaningful workplace performance improvements (Baldwin and Ford, 1988). In order for transfer of training to occur, a learning process must first take place during training. Employees participate in training programs to acquire new competencies, improve knowledge, and develop job-related skills relevant to their work roles. Once learning occurs, these competencies are expected to be transferred and applied in the workplace, which subsequently enhances individual and organizational performance. Recent studies continue to support the view that effective training transfer contributes positively to employee proficiency, adaptability and overall job performance (Giuliano et al., 2022; Kim, 2022). Despite substantial organizational investment in employee training and development, successful transfer of training remains a significant challenge. Contemporary research indicates that only a limited portion of learned knowledge and skills is consistently applied in the workplace due to factors such as trainee characteristics, training design, and work environment support (Suhaimy et al., 2023; Sarfraz et al., 2021). Although these estimates have been debated, more recent research continues to indicate that transfer does not occur automatically and often declines over time without sufficient reinforcement and support. This decline suggests that newly acquired knowledge and skills may not be sustained if trainees lack motivation, opportunity or support from the work environment.

Training design

Training design focuses on developing training programs that are aligned with organizational objectives and enable employees to effectively apply newly acquired knowledge and skills in the workplace. Recent studies emphasize that effective training design includes elements such as instructional design, active participation, realistic practice, feedback mechanisms and opportunities for workplace application to enhance learning transfer and job performance (Kim, 2022; Zulkifly, 2022). Furthermore,

contemporary research suggests that training programs designed with participatory learning approaches, practical exercises and supportive transfer mechanisms are more likely to improve employee engagement and facilitate successful transfer of training to the work environment (Bhat et al., 2022). Recent literature also highlights that transfer-oriented training design, including technology-enhanced learning and learner-centered approaches will significantly improve retention and transfer effectiveness. Well-designed training programs therefore not only enhance learning outcomes but also strengthen employees' confidence and readiness to apply acquired competencies at work.

Trainee characteristics

Trainee characteristics such as self-efficacy, motivation to transfer and learning readiness play a significant role in determining training transfer outcomes. Employees with higher confidence in their capabilities and stronger motivation are more likely to apply and sustain newly acquired skills in the workplace. Recent studies stated that self-efficacy acts as a mediating mechanism that strengthens the relationship between training experiences and transfer behavior. Likewise, intrinsic motivation and adaptability have been identified as important predictors of transfer effectiveness in contemporary workplace learning contexts.

Work environment

Work environment factors including supervisory support, peer support, transfer climate and opportunities to perform, continue to be recognized as important determinants of training transfer. Recent studies suggest that employees are more likely to apply newly acquired knowledge and skills when they receive encouragement from supervisors and colleagues, experience a supportive organizational climate and are provided with adequate opportunities to use learned competencies in the workplace (Bhurtel and Bhattarai, 2023; Sarfraz et al., 2021). A supportive work environment encourages employees to practice and reinforce newly acquired skills, whereas limited support or lack of opportunity may inhibit transfer even when training quality is high. Leadership support, collaborative workplace climates and organizational justice further strengthen transfer intentions and sustain transfer outcomes over time.

Relationship training design, among trainee characteristics, work environment and transfer of training

Effective training design enables trainees to understand the relevance of training content, practice job-related tasks, and develop confidence in applying learned competencies at work. More recent evidence also indicates that training design may exert a stronger influence on transfer than trainee characteristics alone. Rebecca and Sangarandeniya (2023), found training design to be one of the most significant predictors of transfer of training as training design interacts with trainee characteristics and work environment factors. Even highly motivated employees may struggle to transfer learning when training lacks relevance or practical application. Similarly, a supportive work environment may not fully compensate for poor training design. Bhat et al. (2022) emphasized that instructional design and environmental factors required in facilitating successful transfer, suggesting an interdependent relationship among these variables.

Based on Baldwin and Ford (1988) transfer model, trainee characteristics, training design and work environment function as interrelated training inputs that influence learning, retention, and ultimately transfer of training. While each factor has an independent effect on transfer outcomes, recent literature suggests these variables interact and reinforce one another rather than operate in isolation (Bhat et al., 2022; Rebecca and Sangarandeniya, 2023). Employees with strong motivation and self-efficacy are more likely to benefit from effective training design, while supportive work environments create opportunities for those competencies to be practiced and sustained. Rebecca and Sangarandeniya (2023) found that work environment had the strongest impact on transfer compared with trainee characteristics and training design. According to Sarfraz et al. (2021), supportive transfer climates and organizational justice strengthen employees' intentions to transfer learning, while Fauth and González-Martínez (2023) found social and supervisory support to be critical facilitators of transfer maintenance. The work environment also appears to moderate the effects of trainee characteristics and training design on transfer. Employees may possess motivation and receive quality training, yet transfer may fail when opportunities to apply learning are absent. Conversely, supportive supervisors and peers can reinforce training application and compensate for weaker individual readiness. This suggests that work environment not only directly influences transfer of training but also strengthens or weakens the effects of another antecedent (*Figure 1*).

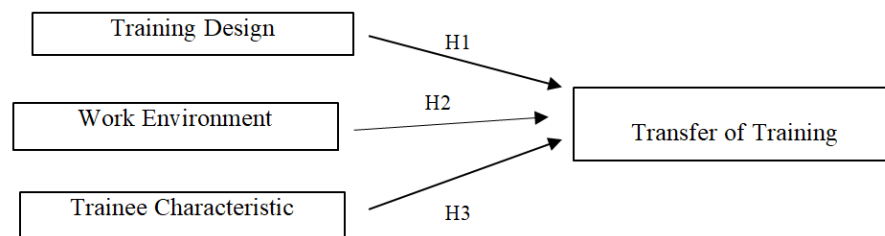


Figure 1. Research framework of training design, trainee characteristics, work environment influence transfer of training
 Source: Baldwin and Ford (1988).

Materials and Methods

This study adopted a quantitative, descriptive research design to examine the relationships between trainee characteristics, training design, work environment, and transfer of training among technical employees. The target population comprised technical employees in an engineering company located in Selangor, with a sample of 238 respondents selected for participation. Data were collected using a self-administered structured questionnaire adapted from established instruments validated in prior studies. The questionnaire was divided into four sections representing the study constructs: trainee characteristics, training design, work environment, and transfer of training. All items were measured using a five-point Likert scale, ranging from strongly disagree = 1 to strongly agree = 5. To ensure the reliability of the measurement scales, Cronbach's alpha reliability analysis was conducted. Data were analysed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequencies, means, and standard deviations, were used to describe respondents' profiles

and the variables under study. In addition, Pearson correlation analysis was employed to examine the relationships among the variables and test the proposed hypotheses.

Results and Discussion

Table 1 shows the the demographic table of respondents. Based on the data, 132 male respondents (55.5%) and 106 female respondents (44.5%) made up the sample of 238 respondents. The respondent's age group was divided into three groups, which between age 20 to 30 years old with frequency of 112 (47.1%) followed by the age between 31 to 40 years old with the frequency of 92 (38.7%) and lastly 41-50 years old with the frequency of 34 or 14.3% of the total respondents. Based on the data presented also, it can be observed that, highest proposition of the respondents found in this survey was working with the company for 2-5 years which are 94 in frequency and 39.5%. Then, it followed by the respondents that were work for 6-10 years (frequency of 67 and 28.2%), respondents that work under 1 year (61 respondents and 25.6%) and lastly the respondents that work for more than 10 years which the frequency 18 and 6.7% from overall respondents.

Table 1. Demographic profile of respondents.

Category	Frequency (N)	Percentage (%)
Gender		
Male	132	55.5%
Female	106	44.5%
Age		
20-30 years old	112	47.1%
31-40 years old	92	38.7%
41-50 years old	34	14.3%
Yeans of service		
Under 1 year	61	25.6%
2-5 years	94	39.5%
6-10 years	67	28.2%
Over 10 years	16	6.7%

Reliability test

All constructs demonstrated acceptable to good reliability, with Cronbach's alpha values ranging from 0.736 to 0.819, indicating satisfactory internal consistency. The mean scores for trainee characteristics, training design, and work environment were moderate, suggesting average perceptions among respondents (Table 2).

Table 2. Reliability test.

Variables	Number of items	Cronbach Alpha
Trainee Characteristic	5	.767
Training Design	4	.800
Work Environment	4	.736
Transfer of Training	5	.819

Correlation analysis

Transfer of training also recorded a moderate mean score. Correlation analysis showed that all independent variables were positively and significantly related to transfer of training. Based on the findings of the correlation above, the highest correlation value obtained from training design with correlation value of ($r = .814$, $n = 238$, $p < .01$). This value shows that there is strong relationship between training design and transfer of training. Other than that, this variable has a significant positive

correlation with transfer of training which the significance level is .000. Then, it followed by trainee characteristic where its value of correlation is ($r = .758$, $n = 238$, $p < 0.1$) where it indicated a high correlation and strong relationship between trainee characteristic and transfer of training. It also shows the significant positive correlation between trainee characteristic with transfer of training. The significance level is .000. Work environment also has positive high correlation with transfer of training which the value of correlation is ($r = .717$, $n = 238$, $p < 0.1$). This variable also shows the strong relationship between work environment and transfer of training and it has a significant positive correlation which the significance level is .000.

Table 3. Correlation test.

Variables	Trainee Characteristic	Training Design	Work Environment	Transfer of Training
Transfer of training				
Pearson Correlation	.758**	.814**	.717**	1
Sig. (1-tailed)	.000	.000	.000	-
N	238	238	238	238

Conclusion

The findings confirm Baldwin and Ford (1988) model by demonstrating that trainee characteristics, training design, and work environment significantly influence transfer of training. Among these, training design emerged as the most critical factor, highlighting the importance of aligning training content and methods with actual job requirements. The study concludes that organizations, particularly in engineering and technical sectors, should focus on designing realistic, job-relevant training programs, enhancing employee motivation and self-efficacy, and fostering supportive work environments. These efforts can improve both the generalization and maintenance of learned skills, ensuring that training investments translate into meaningful performance outcomes.

The most significant factors that influence the transfer of training

For the first research objectives which is to investigate the most significant factor that influence the transfer of training, the correlation analysis shows that, the most significant factor is training design with correlation value of ($r = .814$, $n = 238$, $p < .01$). Meaning to say that, training design is highly influence the transfer of training compared to trainee characteristic and work environment. This result is supported by Hughes et al. (2020) highlights that training design is a critical predictor of transfer of training, where structured and well-aligned training content significantly enhances the application of learned knowledge in the workplace.

The relationship between trainee characteristic and transfer of training

For the second research objective which is to determine the relationship between trainee's characteristic and transfer of training. From the data analysis of the independent variables, it shows in the correlation analysis that trainee characteristic has a strong positive relationship towards the transfer of training. The value of correlation is ($r = .758$, $n = 238$, $p < 0.1$). Recent studies also shown that trainee characteristics significantly influence the effectiveness of transfer of training (Rahman and Bockarie, 2023).

The relationship between training design and transfer of training

Meanwhile, the third research objective is to determine the relationship between training design and transfer of training. From the correlation analysis data where correlation value of training design is ($r = .814$, $n = 238$, $p < .01$), it shows in the training design also has a strong positive relationship towards the transfer of training. Thus, as supported by Nafukho et al. (2023), the findings reinforce that organizations should ensure that training content, activities, examples, and exercises are closely aligned with workplace applications, as training design significantly influences the transfer of learning and employee performance in organizational settings.

The relationship between work environment and transfer of training

In the last research objective that is to determine the relationship between work environment and transfer of training. From the correlation analysis data, it shows that the work environment has a significant positive relationship to the transfer of training and the value of correlation is ($r = .717$, $n = 238$, $p < 0.1$). However, work environment has the least positive relationship among all three variables. However, work environment demonstrated the weakest positive relationship among the three variables. This finding is consistent with the study by Hughes et.al (2020), which found that although supervisor and organizational support positively influence transfer of training, their contribution may be less substantial compared to other individual and motivational factors affecting training transfer. Therefore, the training design will help the employees in widening the skill and ability in performing job. Nevertheless, the other two variables are also important because they have a strong positive relationship as well towards the dependent variables. The hypotheses testing for all the independent variables are accepted which is H1, H2 and H3. It is been proven by the data that has been analyzed through the hypotheses testing. So, it shows that this study will be accepted.

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Conflict of interest

The authors declare no conflict of interest for this study.

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