

## EFFECTIVENESS OF LEARNING TRANSFER IN THE NATIONAL DUAL TRAINING SYSTEM (NDTS) IN MALAYSIA

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### ABSTRACT

*Learning transfer is the ultimate goal of any training programme. The new Malaysian skills training is based on the dual learning principle in which trainees alternate between attending theoretical classes in the skills training institute and receiving on-the-job training at worksite. This new paradigm of skills training is better known as National Dual Training System (NDTS). The main problem is that there were complaints from the employers that the competencies of the output of the skills training in Malaysia are of poor quality. This was due to low absorption of learning transfer performance from training places to workplace. Apart from that there were little studies related to the effectiveness of learning transfer due to there is no acceptable way and mean to measure the learning transfer. The aim of this study was to ascertain on whether the effectiveness of learning transfer did occurred in the automotive mechatronics of NDTS programme. The research focus area is the Mechatronics Automotive course. A longitudinal study method was employed as the research methodology. The participants of this research were the trainees and coaches from NDTS Mechatronics Automotive course. The study utilized the self-administered questionnaire, semi-structured interview, focus group and case study. Measuring 16 factors of the Learning Transfer System Inventory (LTSI) plus 3 factors derived from literature review and expert group discussion enable researcher to determine the relationship between the learning transfer factors. It was apparent that NDTS training programme appears to had facilitated the positive transfer and near transfer from training situation to workplace environment. The findings suggest that the most influential dimensions of the effectiveness of learning transfer in NDTS were revealed as the course content, training delivery and working tasks. Result indicated that the effectiveness of learning transfer in NDTS had occurred by the overall framework accuracy percentage of 79.2%. Therefore, the emerging effectiveness of learning transfer framework of NDTS in Malaysia is proposed.*

**Keyword(s):** *Effectiveness, learning transfer, positive transfer, near transfer.*

### Introduction

Higher education and training institutes has been under severe critics to improve the quality of their graduates. This is may be due to the fact that the graduates from these skills training institutes are said to be incompetence and do not posses the required skills as required by their future employers. Thus, higher education and training institutions have no other choice but to embark on programmes to improve the educational and training knowledge creation process, which include the delivery aspects of it (Loose & Juri 2008).

By its very nature, vocational training is incomplete without the industrial experience that can only be acquired through workplace training (Knemeyer & Murphy 2002). However, up till now, the answer is still remain largely unknown on the effectiveness of learning transfer in the extent of trainees apply their knowledge, skills attitude and values gained in the training context to the actual workplace.

### Statement of Problem

Much training has been deemed too theoretical with the knowledge and skills learned not being transferable to the workplace (Loh, 2004). Devos et al. (2007) estimate less than 20 per cent of the knowledge and skills acquired in training are used on the job. In addition, Awonyi, Griego, & Morgan (2002) estimate that only about 10 per cent of the skills and knowledge gained from training and education programmes actually are transferred into workplace practice. Meanwhile, Intergovernmental Studies Program Primer (2006) estimated that as little as 10 to 20 per cent of the knowledge or skills taught in training programmes are effectively transferred to the workplace. This was due to what being taught at skills training institution

curriculum does not match as per what being practiced in industry. In the other hands, the existing curriculum cannot sustained the phenomenon of the steadily increasing complexity at the industry workplace and the accelerated pace of technological change. All in all, the study focus is to determine the effectiveness of learning transfer among the automotive mechatronics course trainees of NDTS training programme. In the other words, the focus of this study is to identify and empirically test the learning transfer factors associated with NDTS programme.

### **Research Questions**

The central research question is to measure the effectiveness of the learning transfer by comparing the result collected from the automotive mechatronics trainees of NDTS during and after training course. Specifically, this study will provide relevant information to answer the following research questions:

1. What are the dimensions of the effectiveness of learning transfer?

In exploring the effectiveness of learning transfer in NDTS context, this study is focus on the existing literatures to underpin all the relevant dimensions regarding the effectiveness of learning transfer. Finding the dimensions that facilitate the learning transfer is considered as the first step to understand NDTS programmes learning transfer phenomena.

2. How is the effectiveness of the learning transfer from NDTS automotive mechatronics course to the workplace?

Researcher determined the effectiveness of learning transfer by comparing the result collected from NDTS automotive mechatronics trainees during and after the training. Then, researcher is interested in finding the answer with regard to what type of learning transfer occurred in NDTS.

3. What are the most influential dimensions contributing towards the effectiveness of learning transfer framework in NDTS automotive course?

By determining all the important dimensions subsequently, researcher can ascertain in establishing the emergent framework of the effectiveness of learning transfer in NDTS. The need to set up a framework for NDTS learning transfer is growing more than ever.

### **The aim of study**

The aim of this study was to ascertain on whether the effectiveness of learning transfer did occurred in the automotive mechatronics of NDTS programme. The subjects under studies were the trainees of the NDTS automotive mechatronics course.

### **Objective of the study**

Generally, the objectives of this study were as follows:

- i. To determine the dimensions of the effectiveness of learning transfer
- ii. To measure the effectiveness of learning transfer with an instrument
- iii. To understand the actual status of the effectiveness of learning transfer.
- iv. To propose the framework for effectiveness of learning transfer in NDTS.

### **Literature Review**

The literature has used various terms besides learning transfer, such as “transfer” and “training transfer”, to conceptualize the same meaning. Thus, terms “learning transfer” and “training transfer,” are perceived as interchangeable terms in human resource development field (Khasawneh 2006, p. 183; Khasawneh 2004, p. 8; Chen 2003, p. 47; Leberman 1999, p. 5). Learning transfer also defined as the generalization of the skills acquired during the training phase to the work environment and the maintenance of these acquired skills over time (Nikandrou et al. 2009; Baldwin & Ford, 1998; Elangovan & Karakowsky, 1999; Leberman 1999). In this study researcher have used the term Learning Transfer, because Learning Transfer best represents the desired outcome which is transfer of learning to actual job performance. Specifically, Holton (2000); Broad & Newstrom (1992) define it as: research undertaken in a variety of settings which identified a large number of factors that affect the learning transfer back to the workplace.

## **Definition of learning transfer**

According to Intergovernmental Studies Program Primer (2006, p. 1) the word transfer comes from two Latin terms, *trans* (over or across) and *ferre* (carry). In general terms learning transfer occurs when prior-learned knowledge, skills and attitudes affect the way in which new knowledge, skills and attitudes are learned and performed. Transfer is deemed to be positive if acquisition and performance are facilitated, and negative if they are impeded following an identified period of learning related to an individual's place of work, transfer is the process of applying knowledge, skills and attitudes acquired during a training programme to the work place. Their successful application leads to an improvement in job performance and has a lasting effect. Cormier & Hagman (1987, p. XI) suggest that learning transfer "is one of the most general phenomena of learning and by means of its influence, almost all learned behaviour is interrelated in complex ways".

## **Concept of learning transfer**

The concept of learning transfer is concentrated around transfer and travel which are interrelated. Hence, knowledge and skills have to travel to a new context so that transfer occurred. Learning transfer is a key concept in education and learning theory because most formal education aspires to transfer. In many respect, the concept of learning transfer is vital to educational philosophy because it denotes the degree to which behaviour can be repeated in a new situation (Nielsen 2009). Usually the context of learning e.g. classroom, exercise books, test, and simple streamline tasks differs markedly from the ultimate contexts of application of on the job. Consequently, the outcome of skills training and education is not achieved unless transfer occurs. Learning transfer is all the more important that it cannot be taken for granted. Abundant evidence shows that very often the hoped-for transfer from learning experiences does not occur. Thus, the prospects and conditions of learning transfer are crucial educational issues (Perkins & Salomon, 1992).

## **Theory of learning transfer**

Learning transfer is not usually treated as a theory. Traditional wisdom views the learning transfer a problem to be explained (Carragher & Schliemann, 2002). On contrary, the theory of learning transfer was introduced by Thorndike & Woodworth in year 1901 (Mestre, 2005). They explored how individuals would transfer what they have learned in one context to another context that shared similar characteristics. Their theory implied that learning transfer depends on the learning task and the transfer task being identical, also known as '*Theory of Identical Elements*' (Mestre, 2005, p. xii). According to the behaviourist "theory of identical elements", a transfer is possible if situation A (source) and situation B (target) show identical elements or identical stimulus-response elements (Gessler, 2009, p. 4).

Due to the difficulty of obtaining learning transfer evidence, some theorists (e.g. Lave & Wenger, 1991) have denied its existence and have espoused the theory that all learning is situated specific. Meanwhile, Pedersen & Liu (2002, p. 308) described learning transfer as "the holy grail of educators, an ultimate goal that thus far proved elusive." They viewed learning transfer as the ability to participate effectively in a novel context based on previous participation. This theorising fails to meet the commonsense test of experience, which indicates that even young children can observed consistently trying to apply previously learned things to new situations. Hence, this is the evidence of close relationship between learning transfer and problem solving, since learning transfer generally occurs when previous knowledge and skill is applied to solve a problem in new situation. In addition, Yamnill & McLean (2001) review three sets of theories that support the learning transfer namely motivation to transfer, transfer design, and transfer climate to help human resource professionals better understand the factors supporting learning transfer. Therefore, learning transfer occurs when learning in one context or with one set of materials impacts on performance in another context or with other related materials (Perkins & Salomon, 1992).

Taylor et al. (2009); Mestre (2005) described learning transfer as the experience or performance on one task that influences on some subsequent task. Transfer can take three forms (Intergovernmental Studies Program Primer, 2006) that are: (i) Positive transfer in which performance on one task aids a second task; (ii) Negative transfer when one performance inhibits the other; and, (iii) Zero transfer in which no effect occurs. Mestre (2005) also discussed near transfer occurs when the learners apply the knowledge and skills in situations or contexts that are very similar or identical to those in which the learning occurred.

According to Intergovernmental Studies Program Primer (2006) near transfer is the application of learned behaviour, content knowledge, concept, or skills in a situation that is similar to the original circumstances. Meanwhile, far transfer occurs when a skill is performed in a context that is very different from the context in

which the skill was learned. Perkins & Salomon (1992) elaborate different types of learning transfer; describing the concept and the differences between positive and negative transfer, as well as what is called “near” and “far” transfer (Barnard 2005, p.138). Near transfer is definitely the most popular training objective. It is also more likely to be effective than far transfer. Therefore, the distinction between near and far transfer is not dichotomous, it is only a matter of distance (Intergovernmental Studies Program Primer, 2006).

### **Types of learning transfer**

In this study, understanding of the differences in the types of learning transfer is important as to see whether learning transfer occurs, and which forms does the transfer take. The ten types of learning transfer identified by Barnard (2005, p. 274) were:

1. Positive transfer: The extent to which trainees acquired knowledge, skills and attitudes which can be applied effectively in work practice;
2. Negative transfer: The extent to which trainees faced undesired effect after they attended a training course;
3. Far transfer: Transfer when the initial learning task and the subsequent task to be learned differ substantially;
4. Near transfer: Transfer when the initial learning task and the subsequent task to be learned differ only slightly or not at all;
5. Low-road transfer: Transfer based on intensive and varied training, and occurring by means of automatic use of knowledge and skills in a new context;
6. High-road transfer: Transfer based on consciously abstracting of already acquired knowledge and skills from one context to another;
7. General transfer: The trainee acquired certain working methods, knowledge, and skills, which can be used in tasks other than the original learning task;
8. Specific transfer: Learning tasks are so specific that no tasks transfer is expected;
9. Horizontal transfer: Transfer from one task to another; and
10. Vertical transfer: Transfer within a certain task, with growing expertise.

### **Research Methodology**

The instrumentation relied on a questionnaire to generate quantitative data for analysis. Participants were asked voluntarily to complete the LTSI at two different time phases; during and after the NDTs training duration (during employment). The construct-validated instrument (Holton et al. 2000), consists of a pool of 89 items designed to measure 16 factors affecting learning transfer. Scales developed to measure these 16 constructs yielded exceptionally clean loadings interpretable factors. It is also said to be one of the robust transfer system assessment instrument ever developed (Ruona et al, 2000 p.222). Furthermore, Khasawneh (2004), Chen (2003); Yamnill and McLean (2002) have validated it in their research studies in Jordan, Chinese Taiwan; and Thailand respectively.

#### **Population and sample**

The total population of trainees that currently undergoing the NDTs programme are 55 people. Meanwhile, the population of trainers involved in NDTs implementation are 31 peoples. Based on the simplified sample size decisions table (Krejcie & Morgan, 1970, as cited in Sekaran 2003 p.293) the recommended target sample size of the questionnaire survey should be at least of 48 trainees. In addition, the sampling design for the trainees was a double sampling method where the same sample is studied twice, thus offers more detailed information on the effectiveness of learning transfer from learning environment to the workplace. On the other hands, the initial interview sessions with the trainers were the purposive sampling and involved sample size of 15 trainers.

#### **Reliability**

The reliability of the questionnaire items is determined from the interpretation of the Cronbach Alpha coefficient. If the Cronbach Alpha coefficient is 0.7 and above or near to the highest value of 1.0, thus indicate that reliability of the questionnaire items is very high and if the coefficient value of it is less than 0.6 it is said that the reliability is low. The cronbach alpha (reliability coefficient) for this study was found to be **0.829** which is considered very high (refer table 1).

### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.829	.885	4

Table 1: Reliability coefficient of the four independent variables

#### Data collection and Analysis

Data collection was in term of longitudinal-study surveys approach that is during the training and after the training (approximately 3 months after completion of NDTS/during employment). The primary data was gathered directly from the survey subject. Meanwhile, for the secondary data the researcher gathered it from the literature study, journal articles, books, reports etc. Then, the data collected was analyzed by appropriate test from Statistical Package for Social Science (SPSS) and NVivo softwares.

### Result

#### Demographic result

The total of 48 trainees from the total of 55 NDTS first cohort has participated in the questionnaire session. Thus, the overall responded rate is 87.27%. This respondent consists of trainees from three NDTS automotive mechatronics course companies. Where, the three main players of NDTS automotive mechatronics course were; (i) Mercedes Benz (M), (ii) Tractors (M) and (iii) NAZA Manufacturing. The demographics breakdown result is as per table 2.

Table 2: Respondent demographic result

Ref. Code	Factor	Time 1: N= 48	Time 2: N= 48
		Range/Percent/Qty	Range/Percent/Qty
A	How old are you?	17-23: 89.58% (43) 24-30: 10.42% (5)	17-23: 91.67% (44) 24-30: 8.33% (4)
B	Are you Male or Female?	Male: 100 % (48) Female: 0 %	Male: 100 % (48) Female: 0 %
C	What is your highest academic qualification?	SPM/SPVM: 68.75% (33)	SPM/SPVM: 77.08% (37)
C1	Other qualification?	STPM: 12.5% (6) Skills Cert: 10.42% (5) SRP: 4.17% (2), Diploma: 4.17% (2)	STPM: 8.33% (4) Skills Cert: 10.42% (5) Diploma: 4.17% (2)
D1	Have you ever work in the industry before?	YES: 25.0% (12) NO: 75.0% (36)	YES: 20.83% (10) NO: 79.17% (38)

D2	If yes please specify number of years in industry	1 yr: 91.66% (44) 2 yr: 4.16% (2) 3 yr:4.17% (2)	1 yr: 85.42% (41) 2 yr: 6.25% (3) 3 yr: 8.33% (4)
E1	Which training course you are train for?	Automotive Mechatronics	Automotive Mechatronics
E2	Which NDTs training course you are trained for (other)?	NA	NA
F	Location of basic training attended?	ILP, Jitra (12), Daimler Training Centre (18) & Tractors Training Centre (18)	ILP, Jitra (12), Daimler Training Centre (18) & Tractors Training Centre (18)
F1	Public training institute	25% (12)	25% (12)
F2	Workplace Training (company / in-house)	75% (36)	75% (36)
G	Mode of your NDTs training?	Block Release	Block Release

Remark: NA = Not Applicable

**The research question 1: What are the dimensions of the effectiveness of learning transfer?**

The initial findings of the study revealed that exploring the effectiveness of learning transfer in NDTs context has focused on the existing literatures to underpin all the relevant factors regarding the effectiveness of learning transfer shown in figure 1.

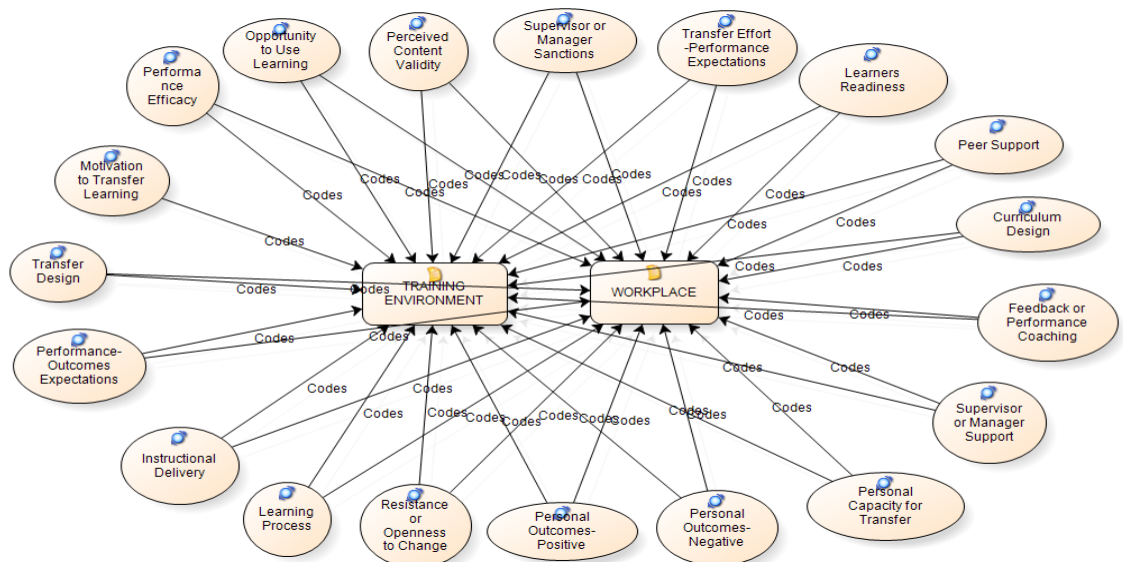


Figure 1: Relevant factors regarding the effectiveness of learning transfer

The research question 2: How is the effectiveness of the learning transfer during and after NDTs automotive mechatronics course?

Basically the question the researcher is interested in finding the answer is what type of learning transfer occurred in NDTS

***Transfer types found were positive and near***

The following finding is related with regard to does learning transfer occur and in what form does the transfer take place in NDTS programme. Based on feedbacks given by NDTS trainees, it was quite clear that much learning transfer occurred even though the actual amount of transfer could not be determined precisely. Based on the findings of this study as per table 3, the researcher claimed that for most trainees and trainers, the two types of transfer that occurred were positive transfer and near transfers.

***(1) Positive transfer:*** The first type of transfer examined here is positive transfer. Positive transfer can be described as the extent to which trainees acquired knowledge (cognitive domain), skills (psychomotor domain) and attitudes (affective domain) or KSA which can be applied effectively in work practice. Effective use of KSA is the key trait of the positive transfer. For most NDTS trainees, there were ample opportunities to use the KSA learned and so it is quite safe to rule in the existence of effective use and thus conclude that positive transfer did occurred.

***(2) Near Transfer:*** The fourth type of transfer is near transfer or the type of transfer that occur when the initial learning task and the subsequent task to learn differ only slightly or not at all. It is quite obvious that initial learning task and subsequent task did closely resemble one another (during and after NDTS training) and thus, it can be concluded that near transfer did occurred in NDTS automotive mechatronics course.

Table 3: Type of learning transfer with evidence

Learning transfer type	Found learning transfer evidence?	
	Yes	No
<b>Positive transfer</b>	✓	
Negative transfer		✗
Far transfer		✗
<b>Near transfer</b>	✓	
Low-road transfer		✗
High-road transfer		✗
General transfer		✗
Specific transfer		✗
Horizontal transfer		✗
Vertical transfer		✗

**The research question 3: What are the most influential dimensions contributing towards the effectiveness of learning transfer framework of automotive mechatronic course?**

Based on all the aforementioned findings, researcher had derived a new framework that connected learning transfer from NDTS (automotive mechatronics course) training and that is learning environment to workplace environment. Hence, to create a framework that is less complex and easier to understand or even implement than the previous theory-driven framework, researcher had grouped similar learning transfer factors into common dimension categories. Thus, it was found that the learning transfer constructs researched in this study can be grouped into three pivotal dimension categories that established for the effectiveness of learning transfer framework in NDTS. The three pivotal dimensions found to be significant are; (i) Course content; (ii) Training delivery; and (iii) Working tasks which is shown in the figure 2 below.

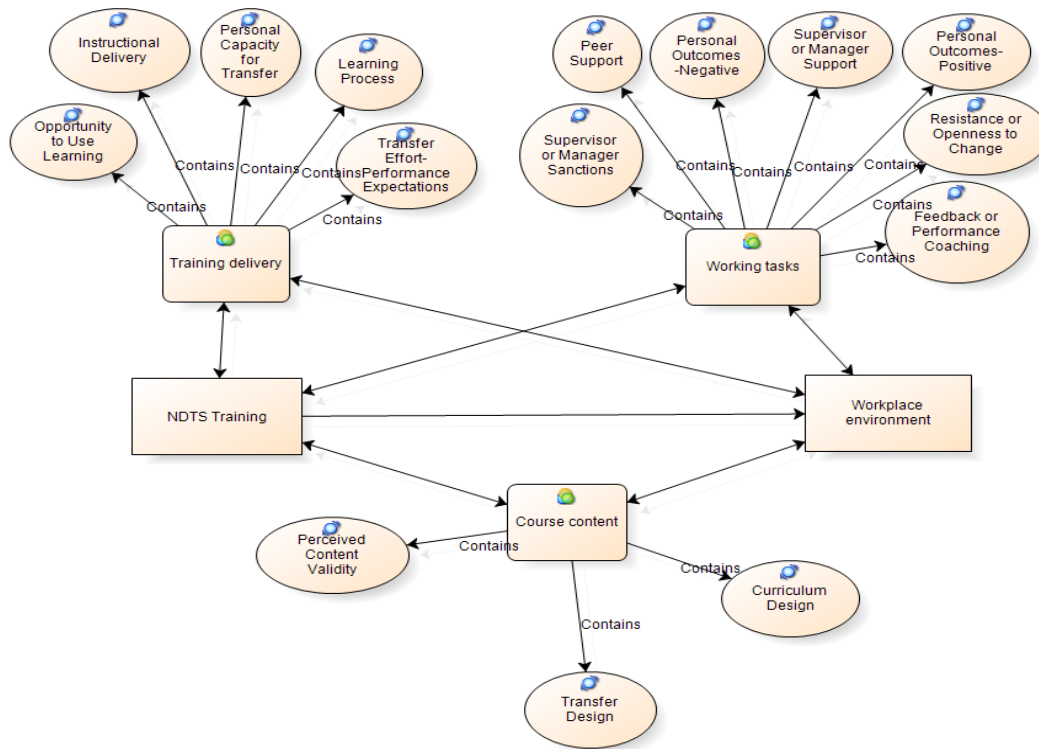


Figure 2: Most influential dimensions contributing towards the effectiveness of learning transfer.

Table 4: Result of the binary logistic regression

**Classification Table**

Observed	Predicted			Percentage Correct
	Effectiveness of Learning Transfer During & After			
	During	After		
Step 1 Effectiveness of Learning Transfer During & After	40	8	83.3	
	12	36	75.0	
Overall Percentage			79.2	

a. The cut value is .500

Result of table 4 above revealed that the Effectiveness of Learning Transfer in NDTs automotive mechatronics did occur for during and after NDTs. The accuracy level of prediction during NDTs training is **83.3%** stating that Effectiveness of Learning Transfer has been predicted to have occurred. Whereas, **75.0%** accuracy level of trainees respondents claimed that the Effectiveness of Learning Transfer has been predicted to have occurred for after NDTs training. Interestingly, there was tendency of a reduction in percentage of the effectiveness of the learning transfer from during NDTs as compared to after NDTs. Nevertheless, in totality, the predicted overall accuracy percentage of the Effectiveness of Learning Transfer for NDTs automotive mechatronics course to have occurred is at **79.2%** which is considered very high.

Binary logistic regression test

In order to ascertain that the linear regression equation is the best ones, thus there is a need for further analysis. This further analysis is needed to assist researcher in making decision involving choosing a limited alternative such as having only two options either 'Yes' or 'No' (Zakaria & Md. Som, 2001, p. 116). This



means that the dependent variable can only represent two values that is '1' is for 'Yes' (Effectiveness of Learning transfer phenomena has occurred) and '2' represent 'No' (Effectiveness of Learning Transfer phenomena has not occurred). Hence, researcher had decided to conduct a Binary Logistic Regression to cater for this phenomenon so that the best available regression equation could be derived. Specifically, in order to determine on whether the Effectiveness of Learning Transfer has occurred or not at times of during and after the NDTs automotive mechatronics course. In other words, an assumption was made that the dependent variable is in form of nominal data characteristic that is 'Yes' (represent if the Effectiveness of Learning Transfer has occurred) and 'No' (represent if the Effectiveness of Learning Transfer has not occurred).

Table 5: Result of the binary logistic regression

		Variables in the Equation					
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	Course_Contents	2.059	.820	6.302	1	.012	7.835
	Training_Delivery	2.779	1.136	5.983	1	.014	16.101
	Working_Tasks	-7.517	1.577	22.715	1	.000	.001
	Constant	9.175	4.348	4.453	1	.035	9651.940

a. Variable(s) entered on step 1: Course\_Contents, Training\_Delivery, Working\_Tasks.

Result of the general regression equation is as follows:

$$Y \text{ (Effectiveness of Learning Transfer)} = \beta + x_1 \text{ (Working tasks)} + x_2 \text{ (Course content)} + x_3 \text{ (Training delivery)} \quad (4.1)$$

Therefore, the ultimate Binary Logistic Regression equation as depicted in table 5 can be re-written as follows:

$$Y \text{ (Effectiveness of Learning Transfer)} = 9.175 - 7.517 \text{ (Working tasks)} + 2.059 \text{ (Course content)} + 2.779 \text{ (Training delivery)} \quad (4.2)$$

Finally, the framework for effectiveness of learning transfer is proposed as per figure 3 below.

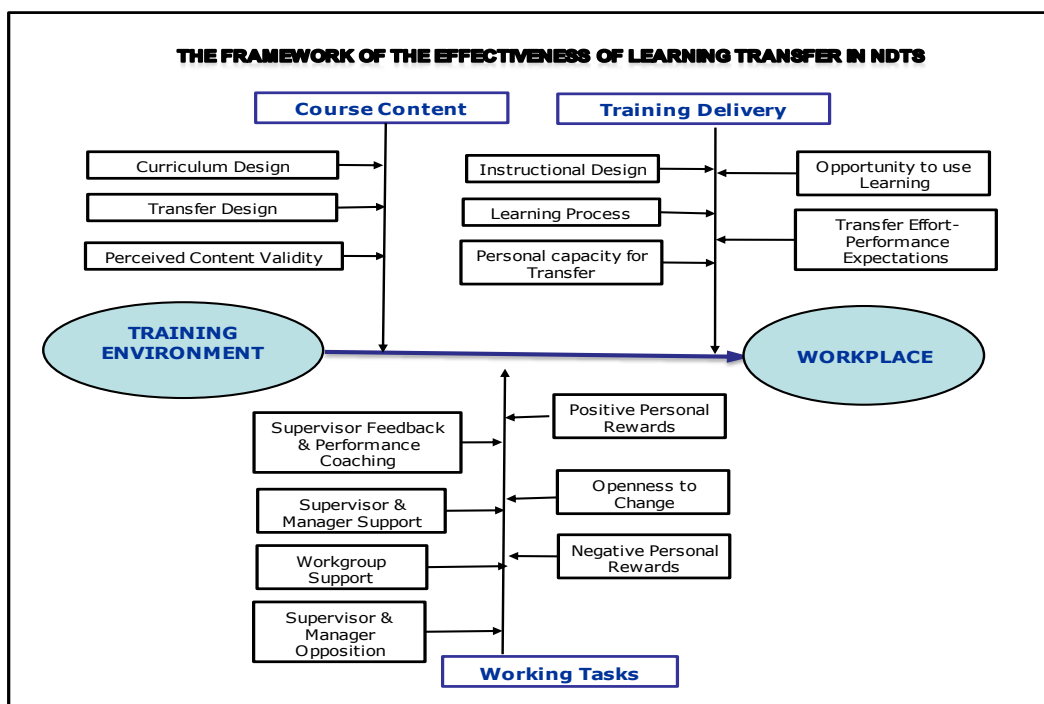


Figure 3: The proposed framework for effectiveness of learning transfer in NDTs.

## Conclusion

In overall, it was found that the most important dimensions for the effectiveness of learning transfer in NDTS event happened depends on the course content, training delivery and working tasks. As suggest by this research finding that showed all (100 %) the first cohort of NDTS trainees (56 graduates) were all being employed by their respective companies under study. Hence, findings of this study seem to suggest that, NDTS training has act as a very successful pre-employment preparation programmes. In other words, the effectiveness of learning transfer in NDTS programme in Malaysia has lead to greater employment and employability prospects of the trainees or graduates. This mean that the acceptance of the three main companies under study towards the NDTS graduates were very overwhelming. Therefore, 'train and place' (Master Plan of The Malaysian Occupational Skills Development and Training 2008-2020, 2008) expectation from NDTS programmes were considered very successful.

Furthermore, the government has also developed a series of strategies to include more Malaysian to attend skills development programme as the current shortage of skilled workers cannot be covered by inviting new foreign labour into the country. The calls to upgrade the capability of the current workforce through NDTS programme is indeed timely, as the nation is putting extra efforts in equipping and catering the growing needs of old and new emerging industries. In addition, the most recent New Economic Model (NEM) developed by the National Economic Action Council (NEAC) highlighted the need to develop a quality workforce and reduce the nation's dependency on foreign labour, by targeting at increasing the local talent pool, re-skill the existing labour force, retain and access global talent, remove labour market distortions that are constraining productivity and wage growth and to reduce the reliance on foreign labour (Malaysian SME Paper, May, 2010). Therefore, researcher concluded that employability is the main strength of the NDTS programme traits that could be enhanced as one of the tool to strengthen our national skills training system in order to achieve the NEM inspiration.

In summary, the industry specific practices of work processes offered by NDTS training programme has been seen as catalyst that facilitate positive and near learning transfer at both stages during and after training so that graduates could easily being absorbed into employment. Alike the German Dual System, the objective of the NDTS programmes is occupation-specific employability (*Berufsfähigkeit*). This is very similar with the Germany Dual System characteristic that enhanced graduates employment rate. For instance, around 90% of 1.6 million of German Dual System apprentices were in employment one year after their final exam (Prof. Dr. Ing. Horst Erich Rikeit, personal communication, March 28, 2008). Therefore, the mobility of graduates into labour market via NDTS training scheme has helped a smooth transition from training place to work place settings

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