Key Strategies Predicting Industrial Participation in the Malaysian Apprenticeship Programme

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Abstract

The National Dual Training System (NDTS), which is a Malaysian apprenticeship programme, is highlighted as the top national agenda in producing skilful workers for industrial requirements. Since 70% to 80% of apprentices' practical training takes place in a real-world workplace, industries involvement are important to the programme's success. Nonetheless, the participation rate decreases over the years despite numerous incentives being provided. The current study aims to statistically investigate the most effective strategies for the government to increase industry participation in the NDTS, which was not explored by previous studies. Specifically, the relationship between the five strategies, namely financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion on industry participation, was examined. A set of questionnaires was distributed to NDTS manufacturing companies, and the collected data were analysed via Partial Least Square-Structural Equation Modelling (PLS-SEM). The structural model relationship analysis revealed that only three strategies, namely financial incentives, flexible implementation, and efficient promotion, demonstrated significant, positive, and direct relationships with industry participation. Digital administration and productive collaboration required efficient promotion as the mediator to demonstrate indirect positive relationships with industry participation. Further analysis of Importance-Performance Analysis (IPMA) matrix corroborated that the government should focus on flexible implementation and efficient promotion through digital administration to enhance industrial participation in the NDTS. The current study provides a practical solution for the policymakers to improve efficiency in governmental decision-making and public-service delivery to improve industrial trust and confidence in governmental programmes. The present study could be expanded to improve delivery in other skill training programmes in future.

1. Introduction

The apprenticeship training programme is a modification of vocational education, wherein students not only attend full-time classes at the training facility but also undergo most practical training components in the companies. The programme provides actual working experience to apprentices while developing a formal qualification recognised by the national educational system. Both parties benefit from the system, which provides young individuals with a smooth transition to the labour market by being equipped with sufficient work experience and occupational skills. Simultaneously, the industry could improve productivity and overall industrial competitiveness by the apprentices (Šćepanović & Martín Artiles, 2020). Industries also provide students with practical experience through the latest technologies and equipment under experts' supervision assigned by the company, which would not be affordable at vocational institutions (Markowitsch, 2019). Therefore, the concept develops sustainable education-employer partnerships (Hodgson et al., 2019) while reducing economic performance risks due to inadequate skill development (Gambin & Hogarth, 2017).

Engaging employers during apprenticeship is essential to improving the alignment between manpower supply and demand, developing the competence level and curricula that suit the latest labour market, and improving employment prospects and match between education and work due to globalisation and technological transformations (Clarke et al., 2020; Huddleston, 2022; Van et al., 2022). Moreover, apprenticeship ensures sufficient skill development and achieves high-quality experiences (ILO, 2017). An apprenticeship ranges from one to two years depending on the industries or sectors, in which employers possess ample time to develop apprentices according to business needs and provide specific employment skills. Nonetheless, gaining the employer's commitment and willingness to actively participate in the bidirectional training programme is challenging (Hayashi, 2021).

The engagement between the government and the industry remains low and is not supported by effective strategies (Kaprawi et al., 2021; Syauqi, 2022). Employers consider apprenticeship highly expensive, risky, and complex to justify the investment despite being aware of the programme benefits (Chankseliani & Anuar, 2019). Employers also complain about the difficulties in maintaining a high involvement level in apprenticeships due to inadequate learning facilitators, time, resources, and understanding of the mutual relationship in engagement (Fettes et al., 2020). Furthermore, employers are sensitive to the training cost and wish to be assured that the training benefits and relevant investments could be appropriated (Gambin & Hogarth, 2017) to balance the costs and benefits (Davoine & Deitmer, 2020). Certain employers express the lack of information regarding skill training and difficulties in handling administration bureaucracy and transparency, apart from the required amount of implementation documents (Rizwan et al., 2021a; Valk & Kratovitš, 2021; Van et al., 2022).

Industry players assert sufficient capacity and freedom to be provided in training apprentices through established industrial methods and supported by other essential elements, such as effective regulatory frameworks, social partners' involvement, flexible approaches, and mobility (Davoine & Deitmer, 2020; Remington & Yang, 2020). Simultaneously, the government should provide flexible implementation and effective administration to ensure a simple and attractive system (Pozo-Llorente & Poza-Vilches, 2020). Other scholars (Chankseliani, 2017; Chankseliani & Anuar, 2019; Davoine & Deitmer, 2020) also highlighted the importance of financial incentives as a motivation for employers to fully participate in apprenticeship programmes. Existing literature recommends policymakers improve promotion strategies to increase industrial participation (Minghat & Mustakim, 2017).

Hence, more investigations are required to explore different methods implemented by other countries that could improve and enhance employer engagement in apprenticeship programmes with higher participation. More opportunities would also be provided for a country to learn and develop a sustainable apprenticeship model based on the effective strategies of other nations (Wieland, 2015). The actual training practice in certain countries with respective contributing factors could not be entirely generalised across or beyond regions (Matthias Pilz & Wiemann, 2020). A country must explore the most optimal approach for engaging employers to establish a sustainable apprenticeship programme that fulfils national requirements (ILO, 2020b).

Prior research on the Malaysian apprenticeship system, namely the National Dual Training System (NDTS), thoroughly assessed implementation challenges and suggested relevant solutions (Ahmad Othman, 2005; Deros et al., 2012; Kaprawi et al., 2021; Sahak, 2020). Nevertheless, prior studies only provided recommendations without comparing, investigating, and analysing the main factors influencing industrial participation in the NDTS. The current study referred to the current knowledge and sought to bridge the literature gap by statistically determining the most effective and practical strategy to enhance industrial participation in the NDTS. The findings could offer policymakers an effective approach to increasing the effectiveness of governmental decision-making and enhancing industrial confidence to be actively involved in apprenticeship programmes.

Despite the numerous assistance provided by the government to enhance industry involvement in this programme, the number of new companies participate in NDTS programme is still low (Adam & Rasul, 2017; DSD, 2022a; Kaprawi et al., 2021; Sahak, 2020). Report from Departmet of Skills Development in 2022 reveals that, only 17% of participating companies renewed accreditation in 2020 compared to 20% in 2019 and continuously

decreased to 14% in 2022 (DSD, 2022a). The data signify the need of further reserach to identify the key strategies to enhance industry participation in this programme to ensure the programme's sustainability and this research area has largely unexplored. Therefore, the current research aims are to identify the key strategies to enhance industrial participation in NDTS programme by analysing the five critical success factors namely; 1) H1-Financial Incentive; 2) H2-Digital Administration; 3) H3- Productive Collaboration; 4) H4-Flexible Implementation; and 5) H5-Efficient Promotion.

2. Study Background

2.1 The National Dual Training System (NDTS) as Malaysian Apprenticeship Programme

The introduction of the Industrial Master Plan 1986-1995 mandated a skills training programme to train and retrain workers with the latest technological skills for capital-intensive industries. To support the national human capital agenda, the Malaysian government appointed a group of experts from Germany in 1996 to study and evaluate the vocational training system while exploring the German Dual System for adoption in Malaysia to regain the industrial commitment to the apprenticeship programme. The experts completed the pilot study of "Basic Study on Designing a Dual Training Scheme in Malaysia" and proposed the National Dual Training System (NDTS) as the latest Malaysian apprenticeship programme. The Malaysian cabinet reviewed and endorsed the latest system, which was implemented in July 2005. Accordingly, the Training Master Plan and Work Skill Development 2008-2020 was launched to enhance the training delivery and support the NDTS objectives of developing apprentices that fulfilled industrial requirements (Yahaya et al., 2020).

The NDTS implementation policy and coordination are monitored and coordinated by the Department of Skills Development (DSD), Ministry of Human Resources and governed under the National Skills Development Act (NASDA) 652 (Malaysia, 2006). The department is also accountable for developing the accreditation and assessment procedures, coordinating industrial engagement and promotion activities, and issuing the Malaysian Skills Certificate (MSC) upon training completion. The NDTS emphasises the integrated concept of training and learning, wherein 20% to 30% of the theoretical component is acquired at the training centers while the remaining 70% to 80% of the practical component is gained through practical experience in the industries. Industry could choose to send their apprentices for training either on Day-Release method (apprentices spend three to four days at the industry after completing one to two days training at training center) or Block-Release method (apprentices spend one to two months at training centers and three to four months at industry).

Apprentices will have company-appointed coaches as their supervisors during the practical training. To ensure coaches have enough time to supervise apprentices while carrying out their daily tasks, one coach is only allowed to oversee a maximum of five apprentices at a time. After the apprentices complete their practical training, an external industry examiner will oversee their assessment. Apprentices will be awarded with MSC according to their level of competencies.

Companies who want to take part need to register with DSD for accreditation. Participating companies could obtain a double tax deduction under the Tax Reduction Act 1967 by claiming the training levy from the Human Resource Development Fund (HRDF) and receiving monthly allowances according to number of apprentices in their company. However, company must renew their accrediation after three years of implementation in order to keep getting the benefits.

2.2 Industrial Participation in the National Dual Training System (NDTS)

At the begining of this programme in 2005, only four industries were initially involved in the NDTS, namely 1) the electronic industry, 2) production technology, 3) oil and gas (petrochemicals), and 4) automotive. The first enrolment commenced in 2005 with a group of 29 apprentices from Daimler Chrysler Malaysia and 14 apprentices from Naza Automotive Manufacturing Company (Minghat & Mustakim, 2017). Due to industry's confidence that this programme will meet their demands, involvement soared to 642 companies in 2009. The improvement of quality and delivery of NDTS programme are higlighted as the main agenda to enhance human capital development in the 10th and 11th Malaysia Plan. Among the inititives are to expend the curricular to support school dropout and to train more coaches and instructors. Consequently, company involvement grew gradually reaching 985 in 2015 and benefited more than 24,000 apprentices. However, pandemic Covid-19 significantly influence industry participation when the involvement drop to 515 as a result of their reluctance to train apprentices in order to save operating costs. To reduce industry burden and gain back their participation, government increase monthly allowances from RM625 monthly to RM1000 starting from 2021 onwards. And participation began to climb to 772 companies in 2023 as reported in Department of Skills Development, (2024). With the recent introduction of the Academy in Factory initiative under the special NDTS programme in the 12th Malaysia Plan, the government also anticipates increased of industry involvement.

2.3 Strategies to Attract Industrial Participation in the National Dual Training System (NDTS) and Hypothesis Development

Industry engagement is as "two-ways street" to describe deep collaboration between employers and apprenticeship providers in delivering vocational programme that has benefited all parties involves (Irwin, 2020). Relly et al., (2022b) asserted the industry engagement as a mechanism to support, to safeguard and to achieve the final outcomes of apprenticeship programme based on high levels of trust. Therefore, robust engagement ensures that the apprenticeship system remains relevant and practical. However, industries might be motivated to participate in the engagement based on self-interest, which might change over time (Avis, 2023). Therefore, it is essential to implement well-coordinated strategies to engage industries and maximise the impact of apprenticeship programme. The higher industry participation, the more value is created (Percy et al., 2020).

2.3.1 Strategy 1: Financial Incentives

The introduction of financial incentives by policymakers is to persuade employers to participate in the apprenticeship programme and motivate employers to become more proactive trainers (Gambin & Hogarth, 2017; Irwin, 2020; Md Deros et al., 2012). Employers with no training budget would not offer training (Durrant, 2015) or provide less training if financial subsidies are not received (Rigby & Sanz, 2016). Thus, financial support is vital to resolving barriers to providing training (Hughes et al., 2006; Kaprawi et al., 2021). Boocock (2017) recommended policymakers provide flexible funding mechanisms consistent with local circumstances to increase the resilience and sustainability of employer engagement (Syauqi, 2022). Furthermore, financial incentives could encourage corporate contribution and increase productivity by training apprentices (Hodgson et al., 2019; Roberts, 2020). The current study posited that:
Hypothesis 1 (H1): Financial incentives has positive direct relationship on industrial participation.

2.3.2 Strategy 2: Digital Administration

The government must provide efficient administration for simple and responsive system implementation to attract corporate involvement in apprenticeship (Liu & Clayton, 2016; Pozo-Llorente & Poza-Vilches, 2020). Digital administration provides a platform for employers to increase access to governmental real-time information, promote interconnectivity between the government and employers, and encourage accountability in public administration (Luciano & Wiedenhöft, 2018). In addition, digital administration offers a customer-oriented approach, which would develop higher public trust in the governance process (Midin et al., 2016). Digitalisation also assists the private sector in communicating with the government with less bureaucracy and paperwork while increasing transparency (Decuypere et al., 2023; Erkut, 2020). This study postulated that:
Hypothesis 2 (H2): Digital administration has positive direct relationship on industrial participation.

2.3.3 Strategy 3: Productive Collaboration

Collaboration is regarded as a process, in which several parties cooperate to discover the most effective solution beyond individual perspectives (Valk & Kratovitš, 2021) with a shared understanding of each partner's commitment (Simms & Building, 2017) supported by vision, mission, and industrial strategy (Syauqi, 2022) to achieve the desired goal. Collaboration requires a formal coordination system (Rizwan et al., 2021b), effective policy (Clarke et al., 2020), clear direction, communication, and commitment (Relly et al., 2022a) between each stakeholder in a specific group. Collaboration in the apprenticeship programme is the broad access to employer participation in micro- and macro-level activities to ensure students' sustainable careers (Fuller et al., 2016). Baxter and Pelletier (2020) associated collaboration with the willingness concept or self-motivation, which could lead to the desired outcome when individuals thoroughly understand the benefits of collaboration. Furthermore, productive collaboration allows employers to be involved in designing and developing the curricular content integrating the workplace environment and classroom learning (Van et al., 2022) through coaching and mentoring by experts in specific fields (Emira & Rahman, 2017). Hence, a high collaboration between the government and employers in the apprenticeship programme is essential (Aspøy & Nyen, 2017; Remington & Yang, 2020). The following hypothesis was developed:
Hypothesis 3 (H3): Productive collaboration has positive direct relationship on industrial participation.

2.3.4 Strategy 4: Flexible Implementation

Industries perceive that the competencies outlined in the apprenticeship curriculum are sufficient to produce skilled workers. Nevertheless, certain modules are not related to business needs, and inculcating the unnecessary modules would provide fewer benefits to the firm (Rageth & Renold, 2019). The training design and curriculum in the apprenticeship programme should be flexible (Relly et al., 2022) to allow employers to select modules relevant to the core business to be educated at the workplace (Talbot et al., 2020; Unwin, 2006). Employers should also be provided with the capacity and freedom to train apprentices via established industrial methods, which cater to the changing industrial requirements (Rizwan et al., 2021). Moreover, policymakers should focus on the 'voice and choice' concept and prioritise corporate needs as 'customers' (Durrant, 2015) owing to employers providing the supporting facilities, competent teachers, learning tools (Syauqi, 2022), and effective learning transfer to apprentices (Rowe et al., 2017). This study hypothesised that:
Hypothesis 4 (H4): Flexible implementation has positive direct relationship on industrial participation.

2.3.5 Strategy 5: Efficient Promotion

A key element of sustaining and embedding any apprenticeship programme is to engage stakeholders via efficient communication (Midin et al., 2016), which could mitigate potential issues of insufficient information during implementation (Valk & Kratovitš, 2021). Communication through promotion could employ traditional methods, such as seminars and brainstorming, and online tools, including websites and social media. Traditional methods could be time-consuming compared to online tools, which are simpler to engage, inform, and interact with stakeholders (Huddleston, 2022). In addition, digital platforms allow employers to participate in decision-making through online interactions, which would promote higher transparency and a more citizen-centred instead of a service-centred approach (Luciano & Wiedenhöft, 2018). Concurrently, the government should invest more resources to promote the programme while ensuring necessary social recognition during implementation (Remington, 2018; Rizwan et al., 2021b). The present study posited that:
Hypothesis 5 (H5): Efficient promotion has positive direct relationship on industrial participation.

The current conceptual framework was developed based on the existing knowledge corpus and hypothesis development, which is illustrated in Fig. 1.
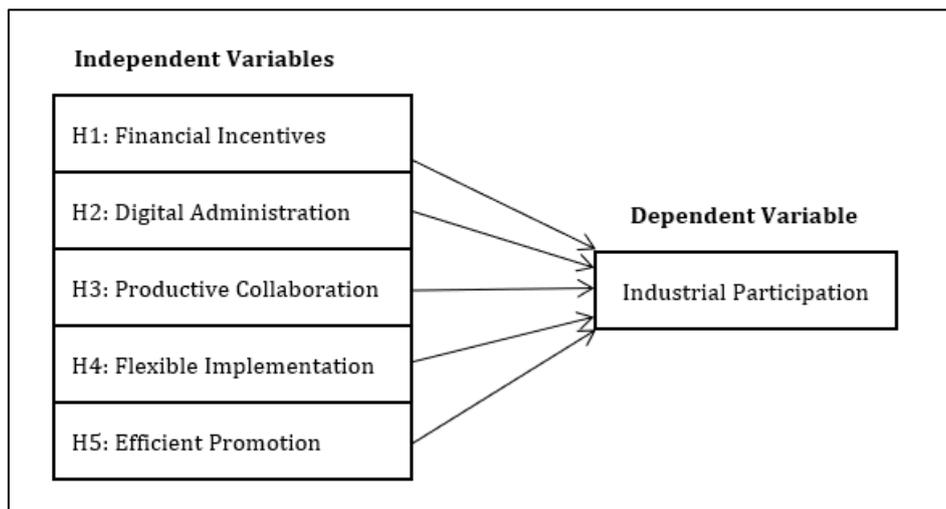

Fig. 1 *Research conceptual framework*

3. Methodology

The data were collected from August to December 2022 with a total of 300 questionnaires distributed to the NDTS manufacturing companies during the industrial engagement seminar organised by the DSD in five regions. The participants were provided with a structured questionnaire and a cover letter explaining the study objectives. The survey instrument employs a five-point Likert scale to acquire well-differentiated answers (Likert, 1932), which ranges from 1 as strongly disagree, 2 as disagree, 3 as not sure, 4 as agree, and 5 as strongly agree. The questionnaire contains three sections, including Section A (Demography), Section B (Reasons for Participation), and Section C (Strategies to Enhance Industrial Engagement).

Different participants attended each seminar and were encouraged to complete the survey on the same day. Nonetheless, only 164 datasets were collected during the seminar and did not fulfil the minimum sample size of S = 175 (Krejcie & Morgan, 1970). More collected data would ensure more accurate and broadly applicable PLS-

SEM estimates (Hair et al., 2021). The DSD officers from the regional offices assisted in distributing the questionnaires during respective visits to the NDTS companies. Personal relationships and support from DSD officers significantly improved the response rate. An additional 43 datasets were collected and contributed to the total of 207 datasets, which exceeded the required minimum sample size. Nevertheless, three datasets were removed after discovering missing values and outliers. Resultantly, a total of 204 valid datasets were finalised for further analysis, which was adequate to explain the population as summarised in Table 1.

Table 1 *Survey respondents*

Medium	Number of Respondents
Industrial Engagement Seminar	164
Company Visits	43
Initial Dataset	207
Removed Datasets after Data Cleaning	3
Total Dataset for Further Analysis	204

4. Results and Analysis

Data was analysed using Partial Least Square-Structural Equation Modelling (PLS-SEM) software. It involves analysis of measurement model to test the items and constructs reliability and structural model for hypotheses testing. Later than, the Importance-Performance Analysis (IPMA) was carried out to identify the key strategies to enhance industry enaggement in NDTS programme. The result of current study are presented as follow;

4.1 Demographic Profile

The majority of the respondents from NDTS Manufacturing companies in Malaysia aged between 31 and 40 years old and were part of the NDTS programme for six to 10 years. The distribution of female and male respondents was 55.4% and 44.6% respectively. The NDTS coordinators and the management department with Malaysia Skill Diplomas (MSD) respectively accounted for 34.3% and 31.9% of the total sample size, which indicated that the majority of seminar attendees were in managerial roles. The NDTS coordinator oversees programme accreditation and evaluation while the management department is accountable for administrative tasks, including incentive payment and apprentices' registration (DSD, 2022b). Both positions did not require skill qualification, although the findings demonstrated that the supervisory component in the NDTS curriculum could aid in acquiring employment (DSD, 2020). Similarly, the NDTS coaches contributed the lowest percentage of the total sample size due to being highly occupied with regular jobs and skill training to participate in this survey. Meanwhile, the top management only responded to the survey when a DSD Officer visited. A total of 41.7% of respondents were from small and medium enterprises (SMEs), which were involved in the apprenticeship system for approximately 10 years. The finding was consistent with the DSD Q-Fact with above 60% of NDTS-accredited companies being SMEs (DSD, 2021). The demographic analysis corroborated that the participants in this study were qualified with relevant experiences and highly associated with the NDTS programme, which optimally represented the target population. Thus, the researchers could achieve the research objective with a deeper understanding of the studied phenomenon. Table 2 depicts the respondents' demographic details.

Table 2 *Respondents' demographic characteristics*

Demographic Characteristics		Frequency	%
Gender	Male	91	44.6
	Female	113	55.4
Age	18 to 30 years old	38	18.6
	31 to 40 years old	77	37.7
	41to 50 years old	63	30.9
	51 years old and above	26	12.7
Skill Qualification	DLKM	34	16.7
	DKM	77	37.7
	SKM3	64	31.4
	SKM2	23	11.3
	SKM1	3	1.5
	None	3	1.5
Company Position	Top Management	37	18.1
	Management Department	65	31.9
	NDTS Coordinator	70	34.3
	NDTS Coach	32	15.7
Work Experience	1 to 5 years	55	27.0
	6 to 10 years	105	51.5
	11 years and above	44	21.6
Company Type	SMEs	85	41.7
	GLCs	75	36.8
	MNCs	40	19.6
	Others	4	2.0
Implementation Years	1 to 5 years	63	30.9
	6 to 10 years	86	42.2
	11 years and above	55	27.0

4.2 Measurement Model

4.2.1 Convergent Validity and Construct Reliability

A convergent validity test determines how closely items measure the same construct and construct reliability assess how consistently items measure the same construct (Hair et al., 2010; Hanafi & Fadilah, 2017). Kline (2005) recommended the assessment must fulfil several criteria, namely 1) an outer loading value above 0.5, 2) Cronbach's alpha value above 0.7, 3) a composite reliability value above 0.7, and 4) an average variance extracted (AVE) value above the standard value 0.5, to ensure the measurement model is valid. The measurement model achieves sufficient convergent validity when the outer loading value on the corresponding construct exceeds 0.7. Six observed items, namely F1, F3, F5, PC2, FT2, and FT5, below the 0.5 outer loading value were removed from the estimation model in this study. The remaining items achieved an acceptable value range from 0.601 to 0.897. The Cronbach's alpha and composite reliability values were significantly higher than the acceptable threshold of 0.7. The AVE value range was from 0.525 to 0.625. Hence, the measurement model achieved adequate convergent validity (see Table 3).

Table 3 *Convergent validity and construct reliability*

Construct	Item Code	Item	Outer Loading	α (> 0.700)	CR (> 0.708)	AVE (> 0.500)
Participation	PAR1	The NDTS aligns with the training needs of my company.	0.781	0.815	0.871	0.576
	PAR2	The NDTS certifies the current employee at my company.	0.838			
	PAR3	The NDTS prepares apprentices for employment.	0.708			
	PAR4	The NDTS lowers the hiring cost at my company.	0.656			
	PAR5	The NDTS increases my company productivity.	0.796			
Financial Incentives	FI2	The initial training cost should be provided by the government to assist new NDTS companies.	0.601	0.789	0.867	0.625
	FI4	Subsidies to cover the basic needs of apprentices upon training should be provided by the government.	0.857			
	FI6	Apprentices are eligible to apply for loans to purchase training tools.	0.775			
	FI7	Extra funding for companies that provide training for apprentices with special needs.	0.896			
Digital Administration	DA1	The NDTS documentations are managed efficiently.	0.701	0.859	0.892	0.583
	DA2	The NDTS documentations are processed according to the stipulated time.	0.673			
	DA3	The NDTS documentation status can be self-checked conveniently.	0.841			
	DA4	Assessable on any devices	0.802			
	DA5	The online payment system is practical.	0.875			
	DA6	Easy access to NDTS information	0.659			
Productive Collaboration	PC1	The DSD sets a clear direction for my company to implement the NDTS.	0.621	0.867	0.894	0.548
	PC3	The DSD schedules periodic meetings with my company to obtain feedback.	0.669			
	PC4	The DSD assists my company in connecting with local skills development agencies	0.766			
	PC5	The DSD coordinates the partnership between my company and connected sectors.	0.766			
	PC6	The DSD organises collaborative meetings between my company and other NDTS stakeholders.	0.733			
	PC7	The DSD provides platforms for my company to disseminate ideas for improvement.	0.817			
	PC8	The DSD involves my company in NDTS curriculum development.	0.788			

Construct	Item Code	Item	Outer Loading	α (> 0.700)	CR (> 0.708)	AVE (> 0.500)
Flexible Implementation	FT1	The modular system provides an option for my company to choose only related competencies to train apprentices.	0.695	0.819	0.868	0.525
	FT3	The NDTS Coach is allowed to enhance their teaching skills according to their experiences.	0.723			
	FT4	My company is permitted to enhance the assessment criteria to meet company requirements.	0.797			
	FT6	The final assessment of apprentices could be based on their training performance rather than the training duration specified in the curriculum.	0.770			
	FT7	My company is permitted to use suitable training equipment other than that specified in the curriculum.	0.716			
	FT8	The NDTS Coach in my company has sufficient time to train apprentices.	0.636			
Effective Promotion	EP1	Interactive social media networks are the latest digital medium to promote NDTS.	0.784	0.908	0.915	0.524
	EP2	Face-to-face consultation services are still needed to obtain NDTS information directly.	0.743			
	EP3	Webinars provide opportunities for NDTS companies to share information on the latest technology.	0.673			
	EP4	The NDTS could be promoted through the job portal platform.	0.826			
	EP5	The NDTS could be promoted during skills competitions.	0.684			
	EP6	The DSD could promote NDTS companies on DSD's official platform.	0.681			
	EP7	The NDTS companies could also promote NDTS on the official platforms of companies.	0.637			
	EP8	The DSD shares NDTS apprentices' success stories on their official platform.	0.550			
	EP9	The DSD could implement dual certification by merging NDTS with the in-house training programme of the company.	0.874			
	EP10	The DSD could collaborate with NDTS companies in running the corporate social responsibility (CSR) programme.	0.730			

Note: α = Cronbach Alpha; CR = Composite Reliability; AVE = Average Variance Extracted

4.2.2 Discriminant Validity

Each pre-determined construct must be independent and not highly correlated to one another (Sarstedt et al., 2016). This study adhered to previous scholars' recommendations (Becker et al., 2023; Fornell & Larcker, 1981; Chin, 1998; Hair et al., 2018) to examine the distinction between constructs by applying three criteria in measuring the discriminant validity namely, 1) the Fornell-Larcker criterion, 2) cross-loadings, and 3) the heterotrait-monotrait (HTMT) ratio. The Fornell-Larcker test the AVE square roots for all latent constructs and the construct must exceed the correlations of other constructs to indicate that each construct in the study is distinct from the others. The discriminant validity is achieved when the cross-loading value of indicators in specific constructs is higher than the other construct. Meanwhile, the means of average correlations across all constructs are satisfactory if all HTMT values do not exceed 0.85. The Fornell-Lacker values are bolded for the on-diagonal AVE square roots of latent constructs in Table 4, which demonstrates higher values than the inter-construct correlation and posits that the current model fulfils the Fornell-Larcker criterion. All indicators in specific constructs were also revealed to be higher than the other construct, which fulfilled the cross-loading threshold value (see Table 5). The HTMT correlations were below 0.85, thus supporting the discriminant validity (see Table 6). All convergent validity, construct reliability, and discriminant validity results satisfied the

measurement model requirements, which demonstrated that the model was valid and reliable for structural model analysis.

Table 4 *Discriminant validity (Fornell-Larcker Criterion)*

Construct	Participation	Financial Incentives	Digital Administration	Productive Collaboration	Flexible Implementation	Efficient Promotion
Participation	0.759					
Financial	0.381	0.790				
Administration	0.296	-0.032	0.763			
Collaboration	0.370	0.073	0.363	0.740		
Implementation	0.701	0.201	0.471	0.614	0.725	
Promotion	0.598	0.354	0.637	0.509	0.588	0.724

Table 5 *Discriminant validity (Cross-loadings)*

Construct	Participation (Par)	Financial Incentives (FI)	Digital Administration (DA)	Productive Collaboration (PC)	Flexible Implementation (FT)	Effective Promotion (EP)
Par1	**0.781**	0.377	0.285	0.307	0.624	0.528
Par2	**0.838**	0.349	0.279	0.353	0.564	0.533
Par3	**0.708**	0.329	0.185	0.150	0.413	0.348
Par4	**0.656**	0.246	0.030	0.176	0.394	0.322
Par5	**0.796**	0.142	0.289	0.370	0.613	0.490
FI2	0.308	**0.601**	0.010	0.196	0.210	0.312
FI4	0.304	**0.857**	-0.056	-0.014	0.139	0.201
FI6	0.278	**0.775**	0.018	0.086	0.158	0.357
FI7	0.301	**0.896**	-0.070	-0.039	0.121	0.242
DA1	0.169	- 0.108	**0.701**	0.361	0.280	0.376
DA2	0.095	- 0.140	**0.673**	0.241	0.227	0.257
DA3	0.245	- 0.041	**0.841**	0.271	0.412	0.504
DA4	0.195	- 0.137	**0.802**	0.222	0.347	0.334
DA5	0.335	0.036	**0.875**	0.366	0.476	0.598
DA6	0.198	0.127	**0.659**	0.179	0.297	0.707
PC1	0.195	0.001	0.559	**0.621**	0.375	0.411
PC3	0.057	-0.155	0.574	**0.669**	0.336	0.350
PC4	0.286	0.233	0.199	**0.766**	0.520	0.415
PC5	0.285	0.001	0.424	**0.766**	0.448	0.343
PC6	0.219	0.147	0.131	**0.733**	0.387	0.385
PC7	0.386	0.052	0.208	**0.817**	0.559	0.385
PC8	0.278	-0.058	0.146	**0.788**	0.448	0.388
FT1	0.572	0.033	0.329	0.391	**0.695**	0.405
FT3	0.400	0.041	0.574	0.607	**0.723**	0.528
FT4	0.551	0.279	0.446	0.655	**0.797**	0.538
FT6	0.404	0.145	0.595	0.561	**0.770**	0.512
FT7	0.578	0.217	0.173	0.240	**0.716**	0.366
FT8	0.465	0.123	0.015	0.271	**0.636**	0.224
EP1	0.490	0.371	0.518	0.474	0.509	**0.784**
EP2	0.725	0.403	0.202	0.455	0.639	**0.730**
EP3	0.317	0.240	0.514	0.209	0.243	**0.673**
EP4	0.422	0.276	0.548	0.469	0.462	**0.826**

Construct	Participation (Par)	Financial Incentives (FI)	Digital Administration (DA)	Productive Collaboration (PC)	Flexible Implementation (FT)	Effective Promotion (EP)
EP5	0.280	0.187	0.591	0.131	0.265	**0.684**
EP6	0.170	0.157	0.634	0.187	0.259	**0.681**
EP7	0.190	0.299	0.506	0.076	0.082	**0.637**
EP8	0.107	-0.036	0.588	0.076	0.082	**0.637**
EP9	0.570	0.248	0.518	0.458	0.520	**0.874**
EP10	0.256	-0.000	0.663	0.443	0.398	**0.784**

Table 6 *Discriminant validity (HTMT ratio)*

Construct	Participation	Financial Incentives	Digital Administration	Productive Collaboration	Flexible Implementation	Efficient Promotion
Participation						
Financial Incentive	0.474					
Digital Administration	0.314	0.200				
Collaboration	0.388	0.246	0.498			
Implementation	0.820	0.258	0.571	0.717		
Promotion	0.549	0.382	0.774	0.568	0.625	

4.3 Structural Model

4.3.1 Collinearity Test

Common method bias (CMB) would occur when the same response method was employed to measure both independent and dependent variables, which would be detrimental to research validity (Kock et al., 2021). Latan and Noonan, (2017) recommended to conduct collinearity test through Variance Inflation Factor (VIF). The satisfactory VIF inner values among the constructs should be below the threshold value of 3.3. The present model was considered free from CMB as the full collinearity test values ranged from 1.389 to 2.569 (see Table 7).

Table 7 *The collinearity test of VIF inner values*

Construct	Participation (Par)	Financial Incentives (FI)	Digital Administration (DA)	Productive Collaboration (PC)	Flexible Implementation (FT)	Efficient Promotion (EP)
Participation	-	1.347	1.989	1.741	1.989	2.703

4.3.2 Hypotheses Testing

The relationships between exogenous (independent) variables and endogenous (dependent) variables were assessed after establishing the measurement model. This study investigated whether exogenous variables, namely financial incentives (H1), digital administration (H2), productive collaboration (H3), flexible implementation (H4), and efficient promotion (H5), significantly impacted industrial participation (endogenous variable) in the NDTS programme.

The path coefficient beta (β) value was measured by bootstrapping 5,000 samples in the PLS-SEM to understand the magnitude of change in the endogenous variables caused by the exogenous factors (Abbasi et al., 2023; Hair et al., 2020; Xie et al., 2022). The hypothesis testing results in terms of the beta (β) value, T-value, and p-value are summarised in Table 8. A path model is significant when the t-value exceeds 1.96 while the p-value is below 0.05 (Hair et al., 2017, 2021). The exogenous variables would demonstrate strong positive relationships with the endogenous variable when the path coefficient value exceeds 0.1. Specifically, the findings discovered that financial incentives ($\beta = 0.127$, t = 2.507, p = 0.012), flexible implementation ($\beta = 0.635$, t = 9.852, p < 0.001), and efficient promotion ($\beta = 0.373$, t = 4.020, p < 0.001) demonstrated significant, direct, and positive relationships with industrial participation, which supported H1, H4, and H5. Contrarily, digital administration ($\beta = - 0.181$, t = 2.194, p = 0.028) and productive collaboration ($\beta = - 0.153$, t = 2.727, p = 0.006) were revealed to be insignificantly associated with industrial participation, thus rejecting H2 and H3.

Table 8 *Direct effects on industrial participation*

Hypothesis	Path	Path Coefficient	T-value	P-value	Result
H1	Financial Incentive → Industrial Participation	0.127	2.507	0.012	Supported
H2	Digital Administration → Industrial Participation	- 0.181	2.194	0.028	Unsupported
H3	Productive Collaboration → Industrial Participation	- 0.153	2.727	0.006	Unsupported
H4	Flexible Implementation → Industrial Participation	0.635	9.852	0.000	Supported
H5	Efficient Promotion → Industrial Participation	0.373	4.020	0.000	Supported

4.4 The Mediator Analysis

Rungtusanatham et al. (2014) recommended the transmittal approach to further understand the relationship of rejected hypotheses (H2 and H3), which requires a single mediating stating to the mediator (M) to mediate the relationship between the independent variable (IV) and the dependent variable (DV) without prior hypotheses (IV to M or M to DV). The transmittal technique in the current study was performed to determine whether digital administration (H2) and productive collaboration (H3) significantly impacted industrial participation when other exogenous variables (H1, H4, and H5) were mediators. Accordingly, two alternative hypotheses, namely H6 and H7, were proposed as delineated in Table 9. The PLS-SEM bootstrapping was conducted to appraise the mediation effects due to the flexibility to test a specific indirect effect at the highest statistical power to detect the significant mediation process (Lau & Cheung, 2012). The results demonstrated that H6 (β = 0.184, t = 2.716, p = 0.007) and H7 (β = 0.072, t = 2.732, p = 0.006) achieved significant, positive, and indirect relationships with industrial participation when H5 served as a mediator. The findings suggested that digital administration and production collaboration could significantly impact industrial participation through effective promotion despite not being directly associated with industrial participation.

Table 9 *Mediator analysis*

Hypothesis	Path	Path Coefficient	T-value	P-value	Result
H1	Financial Incentive → Industrial Participation	0.164	3.105	0.002	Direct Effect
H4	Flexible Implementation → Industrial Participation	0.691	10.694	0.000	Direct Effect
H5	Efficient Promotion → Industrial Participation	0.287	2.911	0.004	Direct Effect
H6	Digital Administration → Efficient Promotion → Industrial Participation	0.640	14.352	0.000	Indirect Effect
H7	Productive Collaboration → Efficient Promotion → Industrial Participation	0.249	3.690	0.000	Indirect Effect

4.5 Explanatory Power and Predictive Power

The validity of the structural model was determined by evaluating the explanatory power (R2) of the proposed model and Stone-Geisser's predictive power (Q2). Chin (1998) stated that R2 values of 0.67, 0.33. and 0.19 indicate substantial, moderate, and weak power respectively. Hair et al. (2017) elucidated that the Q2 value ranges from 0 to 1, with values exceeding 0.00, 0.25, and 0.5 as the small, medium, and large predictive power of the path model respectively. The present study discovered that the R2 values of industrial participation and efficient promotion were 0.583 and 0.606 respectively and substantial. The structural model achieved high predictive power when both industrial participation and efficient promotion achieved Q2 values of 0.521 and 0.589 respectively. Table 10 portrays the coefficient of determination (R2) and predictive power (Q2) in this study. Fig. 2 illustrates the path network of the structural model.

Table 10 *Explanatory power and predictive power*

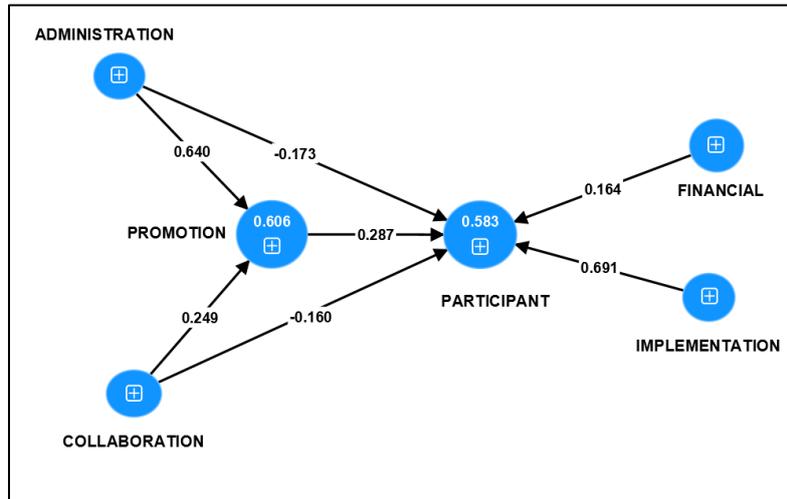| Construct	Coefficient of Determination (R2)	Predictive Power (Q2)
Industrial Participation	0.583	0.521
Effective Promotion	0.606	0.589

Fig. 1 *The path network of the structural model*

4.6 Importance-Performance Analysis (IPMA)

The IPMA is an analysis technique in PLS-SEM to compare the importance of the model to respective performance (Hair et al., 2014). The term importance determines the impact of a latent variable on an endogenous variable (or target) based on the total effect of the structural model. The performance refers to the average value of the latent variables in the form of scores or index values. Hair et al. (2014) recommended the IPMA to identify which constructs in the structural model are relatively crucial or with higher performance. The IPMA in this study was conducted to compare the average latent variables scores of the construct predecessors (financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion) on the target construct (industrial participation).

In addition, the IPMA is designed to identify predecessors with relatively higher importance (strong total effect) to represent potential improvement areas. Contrastingly, constructs with lower importance suggest a lower priority for improvement as focusing on the improvement of a construct with low importance would be illogical due to the slight impact on improving the target construct. Table 11 depicts the importance (total effect) and performance (latent variable index values) scores of the predecessors (financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion). The IPMA results revealed that flexible implementation and efficient promotion ranked high in both importance and performance, whereas productive collaboration and financial incentives ranked lowest in importance and performance respectively. Digital administration ranked low in importance due to the indirect effect on industrial participation despite achieving higher performance.

Table 11 *Importance-Performance Analysis (IPMA)*

Construct	Importance	Performance
Flexible Implementation	0.691	77.110
Efficient Promotion	0.287	80.568
Digital Administration	0.011	79.129
Financial Incentives	0.164	65.883
Productive Collaboration	- 0.089	74.143

5. Discussion

The current study determined the most effective governmental strategies to enhance industrial participation in the Malaysian apprenticeship programme by conducting empirical research at the NDTS manufacturing companies. Specifically, this study assessed whether the five elements of employer engagement strategies highlighted in the previous review, namely the financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion, significantly impacted industrial decisions to participate in the NDTS programme. Prior research confirmed that Smart PLS-SEM serves as an effective technique for understanding the linear relationship between the exogenous variables and the endogenous variable. The measurement model assessing the reliability and validity of items and constructs in the instrument served as the starting point for the evaluation. The structural model assessment was conducted to validate the

research hypotheses by understanding the relationship between exogenous variables and the endogenous variable. Furthermore, the correlations between the indirect effect variables were appraised by scrutinising the transmittal-based mediating effects. The IPMA analysis pinpointed the priority factors that required further attention from the policymaker to gain industrial interest in the NDTS programme. The measurement model in the present study also demonstrated adequate reliability, convergent validity, and discriminant validity when all measures achieved satisfactory criteria, which indicated that the survey instrument was reliable. Therefore, the measurement model was not only solid but also flexible to incorporate and measure the five elements in the structural model.

The research hypotheses in the structural model investigated the relationships between predictor variables (financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion) and industrial participation. The results demonstrated that financial incentives, flexible implementation, and efficient promotion were directly correlated to industrial participation. Significantly, the R2 value revealed that 58.3% of the changes in industrial participation were influenced by financial incentives, flexible implementation, and efficient promotion at a substantial level. The findings also demonstrated that productive collaboration and digital administration produced a substantial impact through efficient promotion with an R2 value of 60.6% despite not being directly correlated to industrial participation. Further IPMA analysis disclosed that implementation flexibility and efficient promotion were ranked high in both importance and performance. Digital administration also ranked high in performance despite being ranked low in importance due to indirectly impacting industrial participation, which propounded that the strategy was highly associated with efficient promotion as the mediator and should be prioritised for improvement. The government should improve digital administration more to enhance industrial participation in the NDTS programme. Notably, financial incentives were ranked low in both importance and performance similar to productive collaboration despite directly impacting industrial participation,

The findings on flexible implementation supported previous studies that explained embedded flexibilisation in apprenticeship training, which enabled employers to maintain high-quality participation (Di Maio et al., 2020). Flexibility in apprenticeship implementation allows employers to successfully train apprentices according to specific needs and equip apprentices with relevant competencies to adapt to a highly fluid economic market (Pilz, 2018). For instance, 55.3% of Andalusian companies were interested in participating when being provided with adequate flexibility to train the apprentices for respective benefits despite the trainers' high workload. The flexibility could emerge in terms of modular curricula (OECD/ILO, 2017), pathways, and accessibility to obtain qualifications, particularly among disadvantaged youths, part-time employees, and students with low academic achievement (Reegård & Dębowski, 2020). Simultaneously, simple and effective training assessments allow coaches to train apprentices according to personal expertise. The DSD as the authority body could also review and revise the NDTS guidelines and procedures to ensure that NDTS delivery is more appealing and effortless for the industry to implement. Corporations are allowed to enhance corresponding curricula, tools, and equipment according to relevant requirements despite the standard skillset outlined on the National Occupational Skills Standard (NOSS). Coaches providing in-house training is also permissible to conduct training based in personal expertise and experience. Apprentices' assessment should be based on performance according to the training hours specified in the curriculum, which could avoid apprentices from neglected during the training period.

This study discovered that efficient promotion was significantly correlated to digital administration, which was consistent with prior researchers (Erkut, 2020; Hanisch et al., 2023; Milakovich, 2021; Xie et al., 2022; Yuan et al., (2023). Previous studies discussed the concept of digital governance to reform governmental decision-making and service delivery through the application of digital and information technologies (ICT). Digital governance facilitates bidirectional communications through the integrated system and social media for the government to improve organisational performance, service delivery, and decision-making (Erkut, 2020; Milakovich, 2021). Digitalisation in administration also increases transparency while reducing bureaucracy, which improves industrial trust and confidence to participate in governmental programmes that promote skill training for employees and produce productive collaboration across industries (Yuan et al., 2023). Moreover, productive collaboration was revealed to significantly enhance industrial engagement through promotion activities. Hughes et al. (2006) asserted that employers who were satisfied with apprentices' performance would promote the apprenticeship programme to other employers.

In addition, the findings on digital administration supported the Malaysia Digital Economy Blueprint (MyDIGITAL) announced in 2020 and continued in Madani Economy, Empowering the People in 2023 to strengthen the digitalisation agenda for more efficient and effective public services. The DSD introduces the Malaysian Skills Integration Management System (MySPIKE) as the holistic digital platform for skill programme data management. The administration transformation initiative indicates the essential transformation from walk-in department-task-oriented services to citizen-focused remote internet services. The DSD could also optimise the platform not only for data management but also for social media to promote the NDTS programme more extensively. Kaprawi et al. (2021) further recommended the DSD invest in marketing activities, such as online media to boost career information, advice, guidance, and awareness of potential employers in the NDTS

programme (Irwin, 2020). Social media, including Facebook, Instagram, TikTok, and YouTube, could be optimised to advertise skill-training programmes, connect companies with local skill development agencies, manage stakeholder alliances, and provide companies with a platform for improvement suggestions.

Meanwhile, the impact of financial incentives on industrial participation was ranked low in both importance and performance, which postulated that improvement in this area would not further increase industrial participation. Attracting other firms to provide work-based training requires more than solely providing financial support. Other issues could also arise, such as increased administrative work and a shortage of trainers with the necessary skills and expertise to effectively train apprentices (ILO, 2020b). The results further supported the DSD Q-Fact 2022 statistic, which explicated the decline of membership by an average of 12% annually between 2016 and 2020 when financial incentives and advantages continued. In addition, the findings supported the statement from the International Labour Organisation (ILO, 2020). The Organisation for Economic Co-operation and Development, OECD (2021) also reported that financial incentives might be insufficient to maintain long-term industrial participation, although the incentives might persuade employers to participate in the apprenticeship system. Financial incentives might motivate companies to offer apprenticeship programmes for the first time while leaving the system when issues and difficulties emerge during implementation (Australian Development Agency, 2019). Nonetheless, certain academicians (Durrant, 2015; Hodgson et al., 2019; Rigby & Sanz, 2016; Roberts, 2020) emphasised the importance of the relationship between the cost and benefits of the apprenticeship system and supported the argument of industrial willingness to participate in the apprenticeship system without financial support from policymakers (Hodgson et al., 2019; Relly et al., 2022c).

The current study successfuly identifies the three most crucial startegies to increase industry participation in NDTS programme from the viewpoint of manufacturing sectors. It is advised that future research expand the current study by looking at other industries sectors. It is recommended to further extend the knowledge to investigate the relationship between digitalisation and industry engagement in apprenticeship system and this would benefits Malaysia and other apprenticeship countries.

6. Theoretical Contributions

The current study complements the argument from Valiente and Scandurra (2017) highlighting limited studies in apprenticeship countries that focus on the factors to engage employers in dual training programmes at the national level. The factors influencing the training practices could not be generalised across regions but are required to be identified based on national needs, although relevant issues have been discussed globally. Emmenegger and Seitzl (2020) and Pilz and Wiemann (2020) recommended that apprenticeship countries develop strategies by integrating elements from other countries, which allows policymakers to identify improvement and reformation areas. The present study contributed to the existing knowledge body by underscoring the required strategies for increasing employer engagement and industrial participation from the perspective of a Malaysian company, which would benefit other countries by allowing the employers to share and work toward the sustainability of the apprenticeship system. The findings also provided an alternative perspective to the existing literature on employer engagement, which frequently concentrates on the direct relationships between research constructs. While financial incentives, flexible implementation, and efficient promotion significantly, positively, and directly impacted industrial participation, this study expanded the current literature by assessing the mediating effects of digital administration and productive collaboration on industrial participation via efficient promotion. A reflecting relationship was discovered between digitalisation and industrial participation in skill training systems.

7. Managerial Implication

The practical implication and knowledge derived from the findings of both supported and rejected hypotheses in this study could assist the government in employing effective strategies for enhancing employer engagement in the apprenticeship programme. The current findings also offered empirical evidence that the government should concentrate on supporting flexible implementation in training and delivery. Flexibility in training delivery and assessment is necessary to ensure the apprenticeship programme is more focused on employment than academic achievement. For instance, the govenment should allow firms to use the necessary tools and equipment for hands-on training even when the curriculum lists specific requirements. In addition, apprentices assessment are made in accordance with their performance rather than training duration, therefore employers don't have to wait for the apprentcies to finish their training before hiring them.

The current study recommends the concept of digital governance through digital administration and online promotion strategy to promote social participation, wherein employers could efficiently obtain information, exchange ideas, and provide comments. Employers with high confidence in the system would participate in the programme with certainty and cohesion. Govenment could invest to develop a one-stop-management system to reduce bureaucracy and lessen documentations. In addition, social media networks are being used as new channels for promotion that are more engaging and offer greater coverage.

8. Conclusion

The apprenticeship programme provides an effective mechanism for a smooth transition from educational institutions to the workplace, develops employable individuals relevant to industrial needs, and boosts economic growth and productivity by raising skill levels. Employers are the key stakeholders in the training programme by providing a conducive environment to train apprentices and job placement upon completion. High employer engagement is essential to ensure the success of the programme. This study appraised effective governmental strategies to enhance employer engagement and industrial participation in the Malaysian apprenticeship programme. Particularly, the five elements of employer engagement highlighted in the past literature review, namely financial incentives, digital administration, productive collaboration, flexible implementation, and efficient promotion, that significantly influenced the industrial participation level were evaluated. The findings strengthened and refined the existing empirical research on engaging employers in the apprenticeship programme. Moreover, the present study provided supporting evidence for the relationship between employer engagement strategies and industrial participation. Three employer engagement strategies, namely 1) financial incentives, 2) flexible implementation, and 3) efficient promotion, significantly, positively, and directly impacted industrial participation in the NDTS programme. Contrarily, digital administration and productive collaboration required efficient promotion as a mediator to significantly impact industrial participation. Further analysis of importance and performance revealed that industrial demand for the government to prioritise improvement in terms of flexible NDTS implementation and optimising digitalisation in administration and promotion strategies. Nevertheless, the current study contains several limitations as this study only focused on manufacturing sectors in Malaysia, wherein the results might not be generalisable to other sectors. The findings on employer engagement in the NDTS programme might not be accurately reflected. Additionally, the findings associated digitalisation with skill training. Future studies could include other sectors to strengthen the empirical findings and produce more comprehensive results. The impact of digitisation on the NDTS and other skill training programmes could also be assessed by future researchers.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design**: Roziyati Abdullah, Zulkiflle Leman; **data collection**: Roziyati Abdullah; **analysis and interpretation of results**: Roziyati Abdullah, Zulkiflle Leman; **draft manuscript preparation**: Roziyati Abdullah, Zulkiflle Leman, B.T Hang Tuah Baharudin, Siti Azfanizam Ahmad. All authors reviewed the results and approved the final version of the manuscript.*

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