Information Systems Model of E-District Services in Manipur: An Empirical Study Using Delone and Mclean Model

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ABSTRACT:

The study evaluates the e-District services in selected districts of Manipur using DeLone and McLean Information System Model. Data was collected from the Common Service Centres who are using the e-District portal for availing the services. Data was analysed using Partial Least Square Structural Equation Modelling. Results found that service quality significantly influences satisfaction while system quality and information do not influence satisfaction. System quality and satisfaction were also found to influence behavioral intention to use e-District services while information quality and service quality do not influence behavioral intention to use. It is also found that both satisfaction and intention to use significantly influence net benefit. Further, results also reveal that the three quality parameters- system quality, information quality and service quality explained 64.6% of the variance in satisfaction (R2 = 0.646) and 41.3% that of behavioral intention to use (R2 = 0.413).

Keywords: e-District, DeLone and McLean IS Success Model

1.Introduction

The Government of India has taken up a lot of e-Government initiatives for improvement of public service delivery with the objective of ensuring good governance. Under the National e-Governance Plan (NeGP), e-District was introduced as a State Mission Mode project to deliver various citizen services electronically. With the help of this portal, the citizens can avail various services such as domicile certificates, caste certificates, residential certificates etc. through online mode. Various states have attempted to include maximum services under the ambit of e-District portal for the larger benefit of the citizens. According to the National e-Governance Service Delivery Assessment Report of 2023, the State of Manipur ranks at the bottom in delivering e-services(Sharma, 2024).

This raises concerns about the performance of e-District services and their implementation status in the State of Manipur. Hence, there is a need to assess the effectiveness of e-District services. It is also important to understand what factors influence user satisfaction and behavioral intention to use e-District services.

The purpose of this study is to evaluate the effectiveness of e-District services from the perspectives of Common Service Centres by using DeLone and McLean IS Model. The findings of this study will throw light on the factors influencing satisfaction and behavioral intention to use e-District services. The findings will be helpful for the policy makers and designers of e-District portal, particularly IT department to find ways for improvement.

2. Literature Review

Many empirical studies have been conducted for evaluation of various digital platforms using DeLone and McLean IS Model. Using this theoretical framework, Alasadi et al. (2018) evaluated the success of e-government system from the perspectives of Iraqi citizens. He found that all three quality constructs- system quality, information quality and service quality predict user satisfaction. These three factors also have an effect on the user's intention to use. Further, both user satisfaction and intention to use significantly impact net benefit. In another study by Sorongan & Hidayati (2020), while examining the factors affecting the success of e-government implementation in Balikpapan city of Indonesia, system quality was found to have a significant impact on user satisfaction. Kilani (2021) examined the factors affecting adoption of e-government services by integrating DeLone and McLean IS Success Model with Diffusion of Innovation Theory. The study found that quality parameters such as system quality, information quality and service quality as well as compatibility, innovativeness, computer self-efficacy jointly predict intention to adopt e-government services. Among these factors, system quality was the strongest predictor of intention to use. In another study on online platform, Viriando & Sfenrianto (2021) assessed the success factors and found the three quality attributes impacting user satisfaction. While information quality, service quality and trust predict intention to use. Further, both use and user satisfaction show positive influence on net benefit.

Rachmat et al. (2022) studied the effectiveness of Academic Information System in Hasanuddin University in Indonesia using PLS SEM and found that both system quality and information quality have a significant influence on user satisfaction. It was also found that both user satisfaction and actual use have a positive influence on individual impact. Çelik & Ayaz (2022) evaluated the success of Student Information System in state university in Turkey and the data was analysed using Structural Equation Modelling using R. It was found that the quality attributes of the application were the main determinants of use. In another study, Bashiri et al. (2023) evaluated the success of Iranian Electronic Health Record System (SEPAS) and found that system quality was the most influencing factor in the success of SEPAS. Utari & Fauziah (2023) explored the factors influencing user satisfaction and intention to use Paylater service in Indonesia. A model was proposed by extending DeLone and McLean IS model with perceived usefulness. It was found that system quality, information quality and perceived usefulness have a notable effect on both satisfaction and intention to use. In a recent study, Vaddhano (2023) studied the factors influencing user satisfaction and continuance intention to use mobile banking services in Indonesia by integrating DeLone and McLean IS Model with TAM. It is notable that the three quality attributes along with perceived usefulness have a significant effect on user satisfaction. Further, perceived usefulness and user satisfaction with mobile banking services have a significant influence on continuance intention to use.

3. Research Model and Hypotheses

The theoretical framework of this study is based on updated DeLone and McLean Information System Model. This model has been widely used for evaluating the effectiveness and success of

various information systems in e-commerce and e-governance platforms. According to this Model, quality aspects such as system quality, information quality and service quality determine user satisfaction and use/intention to use. Satisfaction with and use of the information system further impact the users' perceived net benefit. The research model is shown in Fig.1. In the context of the present study, system quality, information quality and service quality of e-District services predict satisfaction with and behavioural intention to use e-District services. The user satisfaction and intention to use also impact net benefit perceived by the users. In light of this theoretical framework, the following hypotheses are proposed.

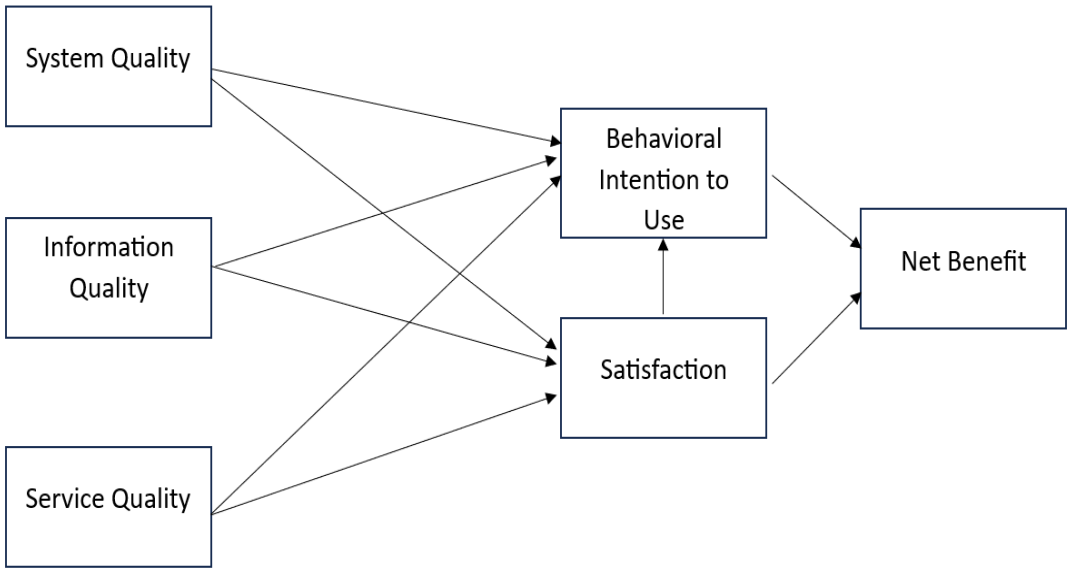

Fig.1 Research Model based on DeLone and McLean IS Model

Hypotheses:

H1a: System Quality of e-District services significantly influences satisfaction

H1b: System Quality of e-District services significantly influences behavioral intention to use.

H2a: Information Quality of e-District services significantly influences satisfaction

H2b: Information Quality of e-District services significantly influences behavioral intention to use.

H3a: Service Quality of e-District services significantly influences satisfaction

H3b: Service Quality of e-District services significantly influences behavioral intention to use.

H4a: Satisfaction with e-District services significantly influences behavioral intention to use.

H4b: Satisfaction with e-District services significantly influences net benefit.

H5: Behavioral intention to use significantly influences net benefit.

4. Methodology

The population for the study is the Village Level Entrepreneurs (VLEs) who operate the Common Service Centres (CSCs) of Manipur. Out of 16 districts of Manipur, 3 from valley and 3 three from hill were selected randomly. There are 640 active Common Service Centres in these 6 districts as on December, 2023. Sample size is obtained using Yamane's formula,

$$n = \frac{N}{1 + N(e^2)}$$

Where, N = population, e = standard margin of error. For 95% confidence level, the standard margin of error is 0.05. The minimum sample size from this formula gives 246. Out of 640 CSCs, 295 respondents were selected randomly under proportional representation. Data was collected using a pre-tested questionnaire. The questionnaire consists of 8 demographic questions and 30 questions on the six constructs. The items on the six constructs were based on

Likert scale ranging from strongly disagree to strongly agree. The questionnaire was sent to the respondents through google form. A total of 264 responses was received out of which 8 were incomplete and hence 256 responses were used for data analysis.

For studies relating to PLS SEM, the 10 times rule is the most widely cited rule. According to this rule, the sample size (n) is calculated as

$$n \geq 10 \times \max(\text{number of indicators on a construct, or number of paths into a construct})$$

In the present study, the maximum number of indicators on a construct is 8, while the maximum number of paths into a construct is 4. With this formula, the minimum sample is 80. Besides, statistical power analysis (G*Power) is also used to estimate the sample size. In the present study, the analysis was run with the effect size $f^2 = 0.15$(medium) (Cohen, 1988), significance level $\alpha = 0.05$, desired statistical power $1 - \beta = 0.80$, and 4 predictor variables (the maximum number of structural predictors for any endogenous construct in the proposed model). With this formula, the minimum sample size is 85. The present study was conducted from 256 usable responses. Hence, the adequacy of sample size has been justified from multiple dimensions.

Data was analysed using Partial Least Square - Structural Equation Modelling. PLS-SEM was used as it does not assume normality of data. Further, it is suitable for complex models. Data distribution in the present study is not normal, and the model used is complex; hence, PLS-SEM is suitable for the study.

5. Results

5.1 Demographic information of the respondents

Table 1 shows the demographic profile of the respondents. As seen in the table, the majority of the respondents are male (96.1%), while female respondents are extremely less (3.9%). More than half of the respondents (55.5%) are in the 26-35 age group. Further, close to two-thirds of the respondents (64.1%) are graduates. About three-fourths of the respondents have an annual income of up to Rs 25,000. Further, the majority of the respondents (79.7%) reside in rural areas.

Table 1. Demographic information of respondents

Variable		Frequency (N=256)	Percentage
Gender	Male	246	96.1
	Female	10	3.9
Age Group	25 and below	46	18.0
	Between 26 and 35	142	55.5
	Between 36 and 45	57	22.2
	46 and above	11	4.3
Educational Qualification	Upto Higher Secondary	30	11.7
	Diploma	8	3.1
	Graduate	164	64.1
	Post Graduate	47	18.4
	Others	7	2.7
Monthly Income	Upto Rs.25,000	189	73.8
	Rs.25,001 to Rs 50,000	46	18.0
	Rs.50,001 to Rs. 75,000	6	2.3
	Rs.75001 to 1,00,000	9	3.5
	Above Rs.1,00,000	6	2.3
Location	Rural	204	79.7
	Urban	52	20.3

Distance from the district headquarters	Less than 5 Km	50	19.5
	6 to 10 Km	57	22.3
	11 to 15 Km	43	16.8
	16 to 20 Km	35	13.7
	Above 20 Km	71	27.7
District	Imphal West	51	19.9
	Bishnupur	44	17.2
	Thoubal	90	35.2
	Ukhrul	28	10.9
	Senapati	20	7.8
	Kangpokpi	23	9.0

5.1 Assessment of Measurement Model

The first step in the analysis of data using PLS-SEM is the assessment of the measurement model. As suggested by (Hair et al., 2017), for evaluation of measurement model, indicator reliability, internal consistency reliability, convergent validity and discriminant validity are to be assessed.

5.1.1 Indicator reliability and internal consistency reliability

The indicator reliabilities are assessed by evaluating the item factor loadings. As shown in Table 2, the factor loadings for all items exceed 0.7, indicating sufficient indicator reliability. Further, internal consistency reliability is assessed by evaluating Cronbach's alpha and composite reliability. As shown in Table 2, the Cronbach's alpha and composite reliability values for all constructs exceed 0.7, indicating good internal consistency.

Table 2. Reliability and validity results

Construct	Item	Loadings	Cronbach's alpha	Composite Reliability	AVE
Behavioral intention to use (BIU)	BIU1	0.864	0.886	0.921	0.745
	BIU2	0.889			
	BIU3	0.866			
	BIU4	0.832			
Information Quality (INQ)	INQ1	0.759	0.902	0.928	0.721
	INQ2	0.850			
	INQ3	0.853			
	INQ4	0.902			
	INQ5	0.874			
Net Benefit (NB)	NB1	0.812	0.805	0.872	0.631
	NB2	0.742			
	NB3	0.829			

	NB4	0.791			
Satisfaction (SAT)	SAT1	0.841	0.862	0.906	0.708
	SAT2	0.821			
	SAT3	0.842			
	SAT4	0.860			
Service Quality (SVQ)	SVQ1	0.828	0.929	0.941	0.668
	SVQ2	0.838			
	SVQ3	0.822			
	SVQ4	0.750			
	SVQ5	0.859			
	SVQ6	0.772			
	SVQ7	0.843			
	SVQ8	0.819			
System Quality (SYQ)	SYQ1	0.758	0.856	0.897	0.635
	SYQ2	0.841			
	SYQ3	0.796			
	SYQ4	0.824			
	SYQ5	0.763			

5.1.2 Convergent Validity

The convergent validity is measured by assessing the AVE (Average Variance Extracted) values of the constructs. The threshold AVE value is 0.5 (Fornell & Larcker, 1981a). As seen in Table 2, the AVE values of all constructs exceed the recommended threshold. This confirms that the items sufficiently measure their corresponding constructs.

5.1.3 Discriminant Validity

Discriminant validity measures the distinctiveness of a construct from the rest of the constructs. It is measured by assessing the Fornell-Larcker Criteria, Cross Loadings and HTMT matrix. In Table 3, the values shown in the diagonal are the square root of AVE, while the other values indicate correlation with other constructs. As suggested by (Fornell & Larcker, 1981b), the values in diagonal should be greater than the values in their respective rows and columns. This condition is observed to be fulfilled in the said table.

Further, on examination of cross loading criteria, it is observed that every item loads highest on its own construct. Further, as suggested by (Henseler et al., 2015) in order to achieve good discriminant validity, the HTMT values upto 0.9 are acceptable. In Table 4, all the values are within the acceptable limit. Hence, from these observations, the discriminant validity is achieved.

Table 3. Fornell-Larcker Criteria

	BIU	INQ	NB	SAT	SVQ	SYQ
BIU	0.863					
INQ	0.507	0.849				
NB	0.556	0.516	0.794			
SAT	0.605	0.616	0.648	0.841		
SVQ	0.554	0.722	0.604	0.797	0.817	
SYQ	0.485	0.643	0.445	0.529	0.559	0.797

Table 4. Heterotrait- Monotrait ratio (HTMT) matrix

	BIU	INQ	NB	SAT	SVQ	SYQ
BIU						
INQ	0.565					
NB	0.659	0.604				
SAT	0.690	0.697	0.771			
SVQ	0.609	0.786	0.692	0.888		
SYQ	0.553	0.731	0.531	0.614	0.624	

Table 5. Cross Loadings

	BIU	INQ	NB	SAT	SVQ	SYQ
BIU1	**0.869**	0.475	0.461	0.592	0.532	0.443
BIU2	**0.891**	0.455	0.469	0.508	0.474	0.395
BIU3	**0.865**	0.438	0.481	0.492	0.485	0.444
BIU4	**0.827**	0.380	0.510	0.491	0.420	0.391
INQ1	0.430	**0.759**	0.390	0.489	0.547	0.582
INQ2	0.399	**0.850**	0.408	0.497	0.575	0.509
INQ3	0.397	**0.842**	0.459	0.496	0.588	0.522
INQ4	0.482	**0.904**	0.500	0.565	0.672	0.583
INQ5	0.437	**0.882**	0.428	0.560	0.672	0.529
NB1	0.411	0.294	**0.812**	0.485	0.390	0.272
NB2	0.448	0.454	**0.742**	0.434	0.429	0.377
NB3	0.483	0.473	**0.829**	0.520	0.514	0.435
NB4	0.424	0.415	**0.792**	0.602	0.567	0.327

SAT1	0.538	0.515	0.541	**0.840**	0.684	0.512
SAT2	0.444	0.499	0.580	**0.827**	0.681	0.387
SAT3	0.521	0.498	0.529	**0.838**	0.649	0.447
SAT4	0.530	0.561	0.530	**0.859**	0.667	0.433
SVQ1	0.434	0.566	0.443	0.661	**0.833**	0.410
SVQ2	0.427	0.584	0.482	0.692	**0.845**	0.428
SVQ3	0.504	0.650	0.525	0.698	**0.821**	0.517
SVQ4	0.529	0.595	0.459	0.582	**0.743**	0.484
SVQ5	0.420	0.638	0.523	0.674	**0.854**	0.485
SVQ6	0.409	0.538	0.485	0.548	**0.773**	0.413
SVQ7	0.479	0.593	0.514	0.689	**0.846**	0.459
SVQ8	0.413	0.548	0.517	0.648	**0.817**	0.448
SYQ1	0.296	0.484	0.250	0.412	0.441	**0.746**
SYQ2	0.388	0.555	0.409	0.482	0.469	**0.839**
SYQ3	0.367	0.470	0.361	0.376	0.367	**0.791**
SYQ4	0.426	0.496	0.361	0.433	0.464	**0.834**
SYQ5	0.443	0.552	0.377	0.401	0.479	**0.772**

5.2 Assessment of Structural Model

Following the suggestion of (Hair et al., 2017) , for assessment of the structural model, the collinearity issues are first examined. After fulfilling the criteria, the R^2(explained variance), f^2 (effect size), significance testing of the path co-efficient are then evaluated.

The collinearity issues are assessed by evaluating the Variation Inflation Factor (VIF) values. As suggested by (Sarstedt et al., 2021), the VIF values of the endogenous variables should be less than 5. As shown in Table 4, the VIF values for the variables are all less than 5. Hence, there are no collinearity issues.

5.2.1 Collinearity issues

Table 4. Variation Inflation Factors – Inner Model Matrix

	BIU	**INQ**	**NB**	**SAT**	**SVQ**	**SYQ**
BIU			1.576			
INQ	2.534			2.532		
NB						
SAT	2.824		1.576			
SVQ	3.598			2.160		
SYQ	1.796			1.761		

5.2.2 Assessment of R^2 values

The primary purpose of PLS-SEM is to maximise the explained variance which is determined by R^2 values. As suggested by Chin (1998), R^2 values greater than 0.67 are considered strong, 0.33 to 0.66 as mild, 0.19 to 0.33 as small. In the present study, it is found that the R^2 value of BIU is very close to 0.66 which indicates marginally strong. While R^2 values of SAT and NB show mild values. For SAT, R^2 value of 0.646 indicates that 64.6% of the variance in satisfaction is explained by the three factors- system quality, information quality and service quality. While these same three factors explained 41.3% of the variance in behavioral intention to use. Further, both SAT and BIU explained 46.2% of the variance in NB.

Table 5. R-square values

	R-square	R-square adjusted
BIU	0.413	0.403
NB	0.462	0.458
SAT	0.646	0.642

5.2.3 Effect size (f^2)

Effect size is a measure of how much effect an exogenous construct has on an endogenous construct. It is measured by change in R^2 value by omitting an exogenous construct. As per (Cohen, 1988), f^2 value of 0.02, 0.15 and 0.35 indicates small, medium and large effects respectively. As seen in Table 6, SYQ and SAT show small effects on BIU while INQ and SVQ show no effect. However, BIU shows small effect on BIU while SAT shows medium effect on NB. With regards to SAT, the exogenous construct SVQ shows a very strong effect, while SYQ shows a small effect. On the other hand, INQ shows no effect on SAT.

Table 6. Effect size (f^2)

	BIU	INQ	NB	SAT	SVQ	SYQ
BIU			0.079			
INQ	0.007			0.001		
NB						
SAT	0.094		0.284			
SVQ	0.002			0.666		
SYQ	0.028			0.020		

5.2.4 Hypothesis results

The testing of the hypotheses is done using bootstrapping procedure with 5000 subsamples. The significance of the path coefficients was assessed using t-values and p-values. Table 7 gives the hypothesis results. It is observed that system quality does not significantly influence satisfaction ($\beta = 0.112, t = 1.958, p = 0.050$) while it significantly influences behavioral intention to use ($\beta = 0.171, t = 2.241, p = 0.025$). It is also observed that information quality does not significantly influence satisfaction ($\beta = 0.029, t = 0.423, p = 0.672$) and behavioral intention to use ($\beta = 0.103, t = 1.162, p = 0.245$). It is also found that service quality significantly influences satisfaction ($\beta = 0.714, t = 11.352, p = 0.000$) and behavioral intention to use ($\beta = 0.069, t = 0.603, p = 0.547$). Furthermore, it is also found that satisfaction significantly influences behavioral intention to use ($\beta = 0.395, t = 3.920, p = 0.000$). Besides, both satisfaction ($\beta = 0.491, t = 7.111, p = 0.000$) and behavioural intention to use ($\beta = 0.259, t = 4.042, p = 0.000$) significantly influence net benefit.

Table 7. Results of Hypothesis testing

Hypothesis	Relationship	Path co-efficient (β)	t- value	p-value	Result
H1	SYQ -> SAT	0.112	1.958	0.050	Not supported
H2	SYQ -> BIU	0.171	2.241	0.025	Supported
H3	INQ -> SAT	0.029	0.423	0.672	Not supported
H4	INQ -> BIU	0.103	1.162	0.245	Not supported
H5	SVQ -> SAT	0.714	11.352	0.000	Supported
H6	SVQ -> BIU	0.069	0.603	0.547	Not supported
H7	SAT -> BIU	0.395	3.920	0.000	Supported
H8	SAT -> NB	0.491	7.111	0.000	Supported
H9	BIU -> NB	0.259	4.042	0.000	Supported

5.2.5 Assessment of model fit

The model fit is assessed by evaluating the SRMR values. The SRMR values less than 0.08 indicates good model fit. In the present model, the SRMR value for the saturated model is 0.058 while the for the estimated model, SRMR value is 0.061. This indicates good model fit.

Table 8. SRMR values

	Saturated model	**Estimated model**
SRMR	0.058	0.061

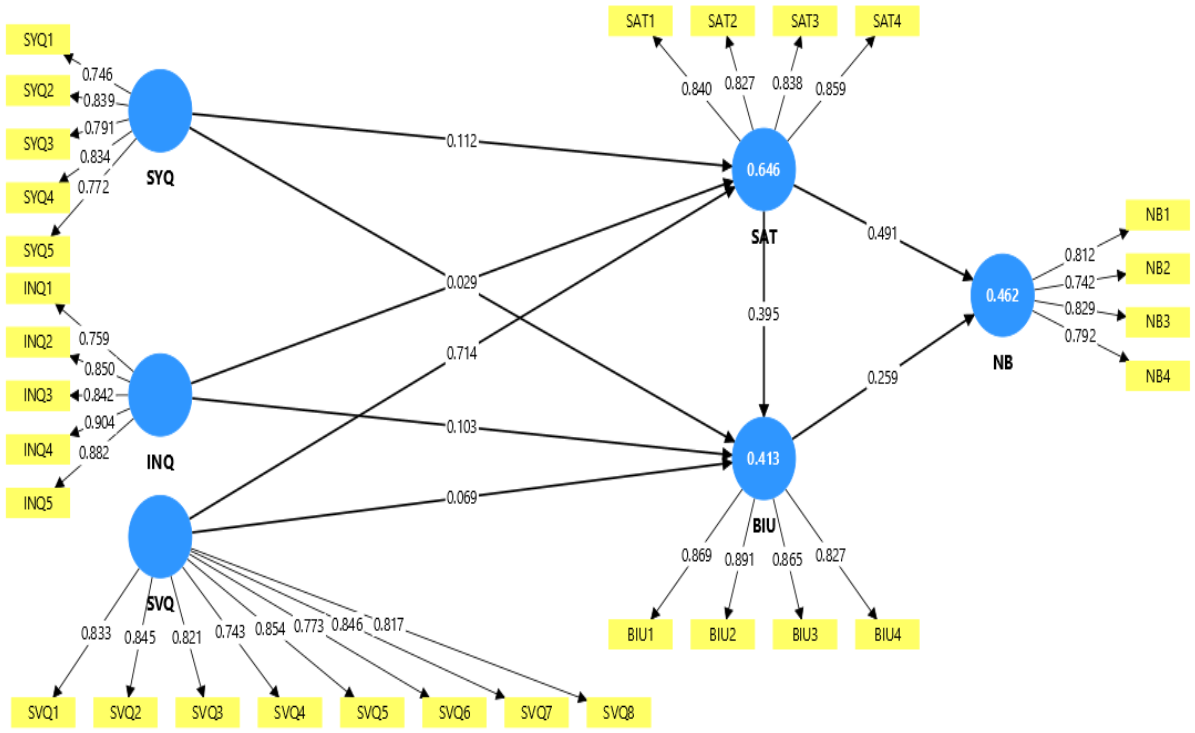

Fig.2. PLS Algorithm model

6. Discussion

The purpose of the study is to assess the effectiveness of e-District services using DeLone and McLean IS Model. Results indicate that among the three quality constructs, only service quality significantly influences satisfaction with e-District services. This indicates that when the users receive good service quality, such as prompt response to user queries, timely resolution of technical issues, reliable service delivery, etc., they are more likely to feel satisfied. The finding is consistent with the studies of (Alasadi et al., 2018; Jaafreh, 2017; Kala et al., 2024; Lutfi, 2023; Manchanda & Mukherjee, 2014; Nookhao & Kiattisin, 2023; Utari & Fauziah, 2023; Vaddhano, 2023; Viriando & Sfenrianto, 2021). Further, the insignificant influence of system quality on user satisfaction is consistent with the findings of (Alotaibi & Alshahrani, 2022; Çelik & Ayaz, 2022). The insignificant influence indicates that although system quality is essential for the operationalisation of e-District services, it may not be the sole determinant of satisfaction. Similarly, the insignificant influence of information quality of e-District services with user satisfaction, though it contradicts with the theory, the finding is consistent with the studies of (Lutfi, 2023; Rachmat et al., 2022; Sorongan & Hidayati, 2020; Viriando & Sfenrianto, 2021)

Further, out of the three quality constructs, only system quality influences behavioural intention to use e-District services. This indicates that users are more likely to use e-District services when they perceive that it is easy to use and navigate, and requires less effort. This is consistent with the previous studies (Çelik & Ayaz, 2022; Kilani, 2021; Utari & Fauziah, 2023). In addition to system quality, satisfaction was also found to influence behavioural intention to use. It indicates that when users feel satisfied, they are more likely to use e-District services. This finding is also consistent with (Kala et al., 2024; Tufail et al., 2017; Vaddhano, 2023)

Furthermore, results indicate that both satisfaction with and intention to use e-District services significantly influence net benefit. When users are satisfied and intend to use e-District services, it is perceived as a benefit by the users. This finding is also consistent with the studies of (Alasadi et al., 2018; Alotaibi & Alshahrani, 2022; Manchanda & Mukherjee, 2014; Viriando & Sfenrianto, 2021)

7. Limitation

The present study has certain limitations. First, the study is conducted using a cross-sectional approach. Future research could undertake a longitudinal study to understand the changing behaviour of users in using the e-District services. Second, the study is carried out using a quantitative method. Future research could be taken up by adopting a mixed-method, which could incorporate focus group discussions, interviews, etc., to gain meaningful insights on e-District services. Third, the findings in the present reflect the views of only the Common Service Centres. There are other citizens who obtain services from the e-District portal directly or indirectly. Future research may also incorporate them to uncover their perceptions of e-District services and ways to improve them. Further, studies can also be conducted from the perspectives of the officials and staff who directly provide services to the citizens.

8. Conclusion

The study aimed to evaluate the effectiveness and performance of e-District services in selected districts of Manipur. The evaluation was done with the help of DeLone and McLean IS Model. Data from 256 Common Service Centres were analysed using Partial Least Square Structural Equation Modelling using Smart PLS 4. Results indicate that among three quality factors, only service quality predicts user satisfaction. This calls for the need to enhance e-District portal interface in order to achieve user satisfaction. Further, both service quality and satisfaction predict behavioural intention to use. The policy makers and designers of e-District portal also need to emphasise on improving the quality of service such as prompt response to user queries, timely resolution of technical issues, reliable service delivery etc. This will lead to higher user

satisfaction and also increase the number of users accessing e-District services.

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