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THE ROLE OF INFORMATION TECHNOLOGY FOR SMALL MEDIUM ENTERPRISES: FOCUSING ON VEHICLE COMPANIES IN MONGOLIA

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Abstract— One of the problems faced by SMEs is the lack of use of information technology. They are not able to build their own database, which makes it impossible for them to expand their business, protect their company from risk. A survey was conducted to increase the company's productivity and improve its financial condition using statistics from the last 27 years, selecting companies that are making a valuable contribution to the business and operating in the mining and transportation sectors. This will allow the company to expand its operations by using information technology to increase productivity and anticipate and address operational issues.

Keywords— Information System, SME, Vehicle

1. INTRODUCTION

SMEs play an important role in the country's economic development. The majority of Mongolia's manufacturing enterprises are SMEs. Since Mongolia transitioned to a free economy in 1990, many SMEs have started operating. However, Mongolia's economic development depends solely on the mining sector. The sector employs a total of 58,000 people and accounts for 80% of exports, but it also destabilizes the economy[1].

The law on SME stipulates that an SME is an enterprise with an annual turnover of less than 1.5 billion tugriks and with less than 200 employees. In fact, the definitions vary in the following sectors: In the industrial sector, if an enterprise has less than 20 employees and the annual turnover is below 250 million tugriks, it is classified as an SME. In service, if an enterprise has less than 50 employees and the annual turnover is below 1 billion tugriks, it is classified as an SME.* According to the Mongolian Law on SMEs, the sector, the number of employees and the annual income are determined below:

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Table 1. Definition of SMEs in Mongolia

Category	Sector	Number of employees	Annual revenue in MNT
Microenterprises	Manufacturing and service	≥19 ≥ 9	≥ 250 million ≥ 250 million
Small enterprises	Trade/services, manufacturing and services	≥ 9 ≥19 ≥ 49	≥ 250 billion ≥ 250 billion ≥ 1.0 billion
Medium enterprises	Wholesale trade, retail trade and manufacturing	≥ 149 ≥ 199 ≥ 199	≥ 1.5 billion ≥ 1.5 billion ≥ 1.5 billion

Source: Law on SMEs, 2007

Out of a total of 80,000 enterprises operating in Mongolia, SMEs account for 17% of GDP and 2.3% of exports, but account for 43% of the total labor force[2]. Despite the large workforce, the prevalence of information technology in SMEs is low. Due to the inability of SMEs to use information technology:

- It is difficult to get information about government investment and financing
- Information on new equipment and purchases are not available
- It is not possible to advertise their products on the Internet
- There are many issues such as companies not being able to collect comprehensive information on the number and size of products they produce.

An information system is a system that integrates all branches and functions of an organization into a company system and thus integrates industry data into a single mode. Organizations have been trying to develop and use information systems for the last 20 years, some have failed and most have been successful. At the core of an enterprise system is a single comprehensive database. When new information is entered in one place, related information is automatically updated. Despite its capacity to integrate, an enterprise system is not flexible. It is a generic solution that does not always fit with each enterprise's individual characteristics.

Therefore, we analyzed the impact of Company A, a major representative of Mongolian SMEs, on productivity through the use of a selective information system.

2. LITERATURE REVIEW

2.1. SMALL AND MEDIUM-SIZE ENTERPRISES (SME)

SMEs have played an important role in the country's economy, innovation and job creation. Therefore, due to these changes, SMEs owners avoid to using previous system and they are looking for new concepts[3]. The sector that plays the most important role in the country's economic recovery, is the creation of a structure for the distribution of various goods and services and the distribution of labor, which supports regional economic growth[4]. SMEs are the most important sector for economic and industrial development, and international scholars work in the field.

- Make a significant contribution to the socio-economy, create employment, develop exports, create employment and start a new era of industrial development[5]
- It is becoming a factor to build SMEs in developing countries[6].

- Developed countries develop industrial services, which are important for job creation and poverty reduction[7].

In 1990, Mongolia made a transition from centralized planned economy to a democratic parliamentary system with free market. This transition brought about many positive changes in the country, such as multi-party election, democracy, land privatization, market economy and international cooperation. At the same time, SMEs began their own specific historical development also from 1990. Today, SMEs make a significant contribution to the Mongolian economy by employing around 67% of the national workforce* producing 20% of the GDP, accounting for 2.3% of exports and 19% of enterprise income tax.

2.1. IT ROLE IN SME

Globalization brings new information and new information systems every day. Due to these changes, SMEs are reluctant to use the old system and prefer to replace it[8]. SME information systems define statistics depending on their source, and their use varies[9]. The use of new technology in SMEs provides better implementation and impact than the use of information technology in large enterprises[10]. In today's world, information systems that increase business competition face the challenges of ever-changing SME authorities[11]. However, SMEs have the potential to develop better competitiveness and marketing for information security strategy needs. The new information systems will change the structure of the companys[12]. Manufacturers have made special adjustments to improve various economic media[13].

Using SME information systems:

a. With the introduction of information systems by SMEs, the country's economic growth and innovation can flourish [3].
b. Information technology and SMEs play an important role in improving international competition, productivity and employment[14].
c. Creates new types of jobs and innovations for people with high security and reliable information services[15].
d. Communication information technology for entrepreneurs provides a way to advertise and trade. This saves time, reduces risk, makes it easier to trade, and makes it cheaper to work with a more reliable information system[16].
e. Due to information control, new production technologies can be introduced quickly. This will allow SMEs to be more flexible and produce products that meet the needs of their customers[17].

It is evident that not only bigger corporations but also SMEs already started focusing on information system[18]. Since the core of Mongolian economy is SME, The government of Mongolia developed few programs to financially support small and medium businesses. Therefore, it is considered the use of information as a way to develop collaboration and financial capacity[19]. Many organizations continue to run separate ERPs for media use and demonstrate their effectiveness. The most widely used information systems, Enterprise Resource Planning (ERP) and Supply Chain Management (SCM), are rapidly absorbing new technologies by SMEs[20].

3. METHODOLOGY

Below data were collected and only utilization of transportation data were selected. The data was then analyzed using software SPSS. This study offers a systematic analysis of Information system financial benefits in this company that was made using E-views program to get statistical analysis and econometric analysis, such as cross-section and panel data analysis with time series estimation.

To examine the possibility of improving the annual productivity of the vehicle, the numerical values of the 4 groups of company were compared and determined by the a Tornqvist formula. The analysis compares annual vehicle productivity, fleet utilization rate, average daily mileage, and average load capacity to calculate how many vehicles can operate per day.

4. ANALYSIS

This table shows the productivity of Company A's trucking operations and the norm per day. 27-year statistics for 10 groups were collected from the organization's information system.

Table 2. Data Indicators of Utilization of Transportation /1993-2019 year/

	Average number of vehicle	**Days of a vehicle in factory**	**Days of a vehicle ready for operation**	**Coefficient of technical readiness**	**Coefficient of usage of parking**	**Daily average run, thousand/km**	**Really average loading, ton**	**Freight transportation, thousand/ ton/km**	**Yearly productivity of a vehicle, ton/km**	**Daily productivity of a vehicle ton/km**
Year	T	U	Ub	Ktb	Kp	Gh	D	AE	Bj	Bu
1993	45	365	323.8	0.887	0.887	0.371	24.3	58120	1291.6	4.5
1994	44	365	338.4	0.927	0.927	0.275	31.5	59691	1356.6	4.33
1995	44	365	345.7	0.947	0.947	0.374	22.4	60409	1372.9	4.19
1996	43	365	343.5	0.941	0.941	0.362	25.1	62858	1461.8	4.52
1997	42	365	342.4	0.938	0.938	0.318	29.6	63615	1514.6	4.72
1998	44	365	332.5	0.911	0.911	0.343	30	68653	1560.3	5.15
1999	44	365	246.7	0.676	0.676	0.331	38.3	46458	1055.9	6.33
2000	45	365	242.7	0.665	0.665	0.358	36.6	47578	1057.3	6.55
2001	44	365	301.1	0.825	0.825	0.345	30.2	56835	1291.7	5.2
2002	39	365	334.7	0.917	0.917	0.343	38.5	78958	2024.6	6.6
2003	33	365	340.9	0.934	0.934	0.358	40.8	76740	2325.5	7.3
2004	25	365	324.9	0.89	0.63	0.394	75.6	76202	3048.1	14.89
2005	21	365	321.2	0.88	0.68	0.409	87.7	82225	3915.5	17.93
2006	20	365	332.2	0.91	0.74	0.367	90.9	81975	4098.8	16.68
2007	24	365	295.7	0.81	0.65	0.369	97.1	82698	3445.8	17.93
2008	24	365	313.9	0.86	0.7	0.361	96.4	91904	3829.3	17.43
2009	23	365	365	1	0.75	0.313	95.8	94464	4107.1	15
2010	22	365	343.1	0.94	0.82	0.349	96.8	104635	4756.1	16.91
2011	23	365	357.7	0.98	0.86	0.336	100.3	119353	5189.3	16.87
2012	22	365	354.1	0.97	0.85	0.366	100.6	121926	5542.1	18.42
2013	23	365	361.4	0.99	0.84	0.343	104.1	124741	5423.5	17.87
2014	23	365	361.4	0.99	0.85	0.346	106.8	130500	5673.9	18.47
2015	23	365	361.4	0.99	0.85	0.363	107.6	138000	6000	19.53
2016	18	365	361.4	0.99	0.85	0.371	110.6	113200	6288.9	20.48
2017	20	365	354.1	0.97	0.86	0.411	111	139000	6950	22.83
2018	20	365	357.7	0.98	0.83	0.395	113.5	133000	6650	22.4
2019	21	365	357.7	0.98	0.87	0.396	116.1	150360	7160	23.01

Source: IS of the organization

This is a graph showing the growth and decline of the factors that influenced Company A and its 27-year performance.

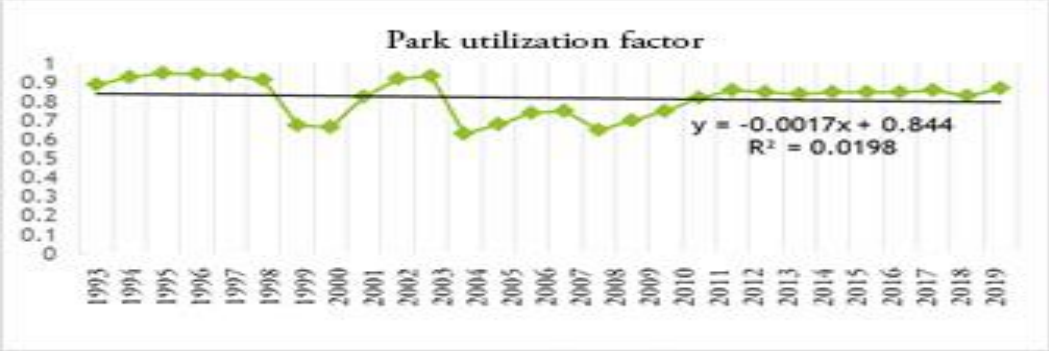

Fig. 1 Dynamics of Data Indicators of Utilization of Transportation Between 1993-2019

Regardless of the kinds of transportation services and objects to transport, the common indicators are used in tracking and analyzing practices. These indicators are divided into 4 groups, including:

1. Indicators showing usage of working hours
2. Indicators showing technical capacity of operation
3. Indicators showing margin of production
4. Indicators showing outputs

<u>Indicators showing usage of working hours</u>

1. $\text{Days of vehicle in factory } (O) = \frac{\text{Days of all vehicle in factory}}{\text{Number of vehicle}}$
   (1)
2. Days of all vehicle in factory (O_b)=$\text{Number of vehicles} * 365;$
   (2)
3. Days of vehicles ready for operation =
   $\text{Days ofall vehicles in factory} * \text{Coefficient of technical readiness};$
4. Days of vehicle operated = Days of vehicle ready for operation $* \text{Coefficient of usage of parking}$
5. $\text{Days of a vehicle operated per year} = \frac{\text{Days of vehicle operated,all}}{\text{Number of vehicle}}$
   (3)

6. $\text{Coefficient of usage of parking (Kp)} = \frac{\text{Days of vehicle operated, all}}{\text{Days of all vehicles in factory}}$ (4)

Indicators showing technical capacity of operation

7. $\text{Average run per day}(Gh) = \frac{\text{Total run}}{\text{Days of vehicle operated,all}}$; (5)
8. Average run per hour (Gts)= $\frac{\text{Average run per day}}{\text{Shift duration}}$; (6)
9. Total run with freight per year (Gj)= $\text{total run per year} * 0{,}5$; (7)
10. $\text{Coefficient of usage of run (Kg)} = \frac{\text{Run with freight}}{\text{Total run}}$ (8)
11. $\text{Real average loading (Dj)} = \frac{\text{Total freight transportation operated}}{\text{Run with freight}}$; (9)
12. $\text{Coefficient of usage of loading(Kd)} = \frac{\text{Real loading}}{\text{Average loading of platter}}$; (10)
13. $\text{Production of a vehicle per year (Bj)} = \frac{\text{Total freight transportation operated}}{\text{Number of vehicle}}$ (11)

Indicators showing margin of production

14. Number of race– Number of operation
15. Total freight transportation, thousand ton/km $(AE) = \frac{\text{platter run with freight}}{\text{real average loading}}$; (12)
16. Freight transported, ton (At) is calculated by sum of total freight transported.

Indicators showing outputs

17. Expense of a ton/km = $\frac{\text{Total expense}}{\text{Freight transport}}$; (13)
18. Income of a ton/km = $\frac{\text{Total income}}{\text{Freight transport}}$; (14)
19. Profit of a ton/km = $\text{Income of a}\frac{\text{km}}{\text{ton}} - \text{Income of a}\ \frac{\text{km}}{\text{ton}}$; (15)

We assume that the effect of impact factors in changes of total freight transportation can be determined by replacement approach. Inter-correlation of these indicators are estimated by numeric indicators.

$$AE=M*U*Kp*G*Kg*D*Kd \quad (16)$$

Is represented and the effect of individual impact factors shall be estimated by replacement approach as below:

1. Impact of a changes in number of vehicles $\Delta AE_M=AE^1-AE_0$
2. Impact of changes in day vehicles ready for operation $\Delta AE_O=AE^2-AE^1$
3. Impact of changes in usage of vehicle parking $\Delta AE_{Kp}=AE^3-AE^2$
4. Impact of changes in average run per day $\Delta AE_t=AE^4-AE^3$
5. Impact of changes in usage of run $\Delta AE_{Kg}=AE^5-AE^4$
6. Impact of changes in average loading of platter $\Delta AE_D=AE^6-AE^5$
7. Impact of changes in usage of loading $\Delta AE_{Kd}=AE_1-AE^6$

Yearly productivity of vehicle is defined by correlation and regression approach. Impact of yearly productivity of vehicle, coefficient of usage of parking, daily run, an average loading is defined by correlation approach and calculated between year 1993-2019 for 27 years.

Table 3. Estimation of Impact Factors on Changes of Yearly Productivity of a Vehicle

SUMMARY OUTPUT					
Regression Statistics					
Multiple R	**0.973**				
R Square	**0.947**				
Adjusted R Square	0.9408				
Standard Error	498.32				
Observations	28				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3		35784487.2	**144.1**	1.76
Residual	24	5959844	248326.84		

		Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept		-8848.19	1556.29	-5.68	7.4201480
Coefficient of usage of parking		5901.39	1272.39	4.64	0.0001042
Daily average run		10647.73	2998.88	3.55	0.0016254
Real average loading		45.00	3.20991	14.01	4.6983537
Total	27	113313305.9			

Thus: **Correlation and Relation coefficient**: $R_{(B,Kp,Gh,D)} = 0.973$

Determination coefficient: $R^2 = 0.947$ is a change in yearly productivity of vehicle and comprised of 94,7% $Kp,\ Gh, D$.

Fisher's criterion: $\boldsymbol{F_{theory}} = \quad 2.96 < \boldsymbol{F_{real}} = 144.1$

$F_{theory} < F_{real}$ value is high indicating that we have chosen the right equation.

Productivity: $\boldsymbol{Y_{(B,Kp,Gh,D)}} = -8848.19 + 5901.39K_p + 10647.73G_h + 45.00D$ (17)

Criterion: $t^{Kp}_{real} = 4.64 > t^{Kp}_{theory} = 2.05$ (18)

$t^{Gh}_{real} = 3.55 > t^{Gh}_{theory} = 2.05$ (19)

$t^{D}_{real} = 14.01 > Tt^{D}_{theory} = 2.05$ (20)

Cheking point (*P-value):* $\rightarrow 0$ seeking in this case, $Kp,\ Gh, D$ parameters equals to 0 suggests equation is correct.

Table 4. Evaluating Through E-Views Program:

Dependent Variable: SER01				
Method: Least Squares				
Sample: 1993 2019				
Included observations: 28				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-8864.8	1555.652	-5.698472	0
Coefficient of usage of parking	5909.8	1271.227	4.648907	0.0001
Real average loading	45.014	3.203409	14.05184	0
Daily average run	10671	2994.182	3.563895	0.0016
R-squared	0.9475	Mean dependent var		3629.8
Adjusted R-squared	0.941	S.D. dependent var		2048.6
S.E. of regression	497.81	Akaike info criterion		15.39
Sum squared resid	6E+06	Schwarz criterion		15.58
Log likelihood	-211.46	Hannan-Quinn criter.		15.448
F-statistic	144.4172	Durbin-Watson stat		0.5845
Prob(F-statistic)	0			

A. Opportunities in improving the operation of technological transportation of company.

Production of transportation is improved due to increased loading with reduced number of vehicle.

While calculating impact factors for production per year through regression approach, Production $Y_{(B,\ Kp,\ Gh,\ D)} = -8848.19 + 5901.39K_p + 10647.73G_h + 45.00D$

$$Бg_t = O_t * Kp_t * Гh_t * 0.5 * D_t = 363 * 0.848 * 0.417 * 108.78 = 6972.7 \quad (21)$$

Determine the number of machines required by the a Tornqvist formula;

$$T_t = \frac{AE_t}{Bg_{t-1}} = \frac{13000}{6972.7} = 18.6 \quad (22)$$

5. CONCLUSION

When average loading of vehicle and average run per day are stable, the production of transportation is increased by 590.39 due to coefficient of usage of parking is increased by 0.1 unit. When average loading of vehicle and coefficient of usage of parking are stable, the production of vehicle increased by 10647.7 ton/km due to average run per day increased by 1 km.

It is shown that the coefficient of usage of parking and average run per day are stable, the production of vehicle is increased by 45 ton/km due to average loading increased by 1 ton. This calculation will be tested against the Fisher and Student criteria: Since the $F, T_{theory} < F, T_{real}$ is greater than the actual value, our calculation is correct.

According to research on opportunities in improving operation of transportation of the company, the production per year can be reached to 6972.7 thousand ton.km if days of vehicle in factory reach to 363, coefficient of usage of parking reach to 0.848, average run reach to 0.417 thousand km, average loading reach to 108.78 ton.

The result of our research was a new way to improve vehicle productivity. Company A calculated using an information system operating 22 vehicles per day and this was

reduced to 18-19 vehicles. According to this forecast, Company A will be able to operate 19 vehicles per day and deduct reduced vehicle costs for technical upgrades.

The results of this study show that an operating organization can be more developed using modern information technology and perform more productive work at a lower cost. As a result, Company A used 22 vehicles per day, compared to 19 vehicles per day. This indicates that the company has the opportunity to reduce financial costs and increase productivity.

In the future, this study will allow the company to optimised its operations, as well as to anticipate risks. With the use of modern information technology, SMEs will be able to grow and expand their operations more rapidly.

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