The Need for Digital Twin and Psychological Engagement Through Emotional Intelligence in Start-Ups for Sustainable Business Strategy

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ABSTRACT

In a digital world, the digital twin plays a significant role in making the product and system easy for any manufacturing plant. By using digital technologies, including artificial intelligence and machine learning, one can reduce human interventions, attain solutions to plant design and reduce costs and errors in the production stages. Emotional intelligent entrepreneurs have found digital twin technologies in start-ups to have sustainable business strategies during challenging periods. Emotional intelligence, especially attention and emotional clarity, significantly affects psychological and mental issues. During the economic surge and pandemic, the global economy has been struggling to sustain in the business and find new business strategies to mitigate obstacles and improve the current system to be robust. Researchers have considered forty-one start-ups to study their digital twin implementation in their business and entrepreneurs' emotional intelligence to have a sustainable business. Researchers have used a convenient sampling technique to collect data from Micro, Small, and Medium Enterprises (MSME) entrepreneurs in India and Abroad. Researchers have used Statistical Package for the Social Sciences (SPSS) statistical tool for the descriptive and reliability analysis. Analysis of a Moment Structure (AMOS) has been used for data analysis and to check the model fitness through SEM. Researchers have collected data and evaluated entrepreneurs and their start-ups through questionnaires. Through this study, Researchers proposed a model and, based on the model, found that the model has an acceptable fit and that Digital Twin possibilities in start-ups and entrepreneurs' emotional intelligence positively impact start-ups' sustainability.

Keywords: Digital Twin, Psychological Engagement through Emotional Intelligence, Start-ups, Sustainable Business Strategy, MSME Entrepreneurs.

1. INTRODUCTION

1.1. Need for Digital Twin and Emotional Intelligence in Start-ups:

Digital Twin provides virtual images constantly synchronised with the actual operating scenario. Digital Twin technology faces different challenges in the manufacturing industry [5], [6], [18], [20]. The engineering service industry is required to have Digital Twin and emotional intelligence to mitigate the Start-up business challenges. To overcome these challenges, this research study analyses outcomes and recommendations for Start-up sustainability.

1.2 Psychological Asset

Self-regulation is one of the critical elements in emotional intelligence, and it is understood as a psychological asset that enables entrepreneurs to manage feelings, thoughts, behaviours and desires, reducing risk factors related to health and the business environment [15]. Emotional intelligence is vital when striving to reduce the risk of suffering possible health clinic problems, both psychological and mental issues [13]. Researchers observed that Mayer, J. D., & Salovey, P. explained how they connect their proposal of emotional intelligence to clinical psychological issues [14].

1.3 Research Problem

Digital Twin is applied in the manufacturing industry [6]; however, Digital Twin in the Services industry need more developments and improvement in this sector. We observed that we would have to improve the existing model with service industry start-ups' business sustainability through emotional intelligence and Digital Twin and Innovation.

1.4 Research Gap

Start-ups in India have to compete with other established local companies and abroad companies. In order to sustain and excel in the competitive environment, start-ups in India have to deliver their extra efforts with good quality, lower price and value editions. We found the research gaps in earlier studies, and to overcome these gaps, engineering service industry start-ups, their sustainability, and their business strategy to be explored further to meet the above criteria.

2. RESEARCH DESIGN

We have used a convenient sampling technique to collect data from Micro, Small, and Medium Enterprises (MSME) entrepreneurs in India and Abroad. We have considered forty-one start-ups to study their digital twin implementation in their business and entrepreneurs' emotional intelligence to have a sustainable business. We have collected data and evaluated entrepreneurs and their start-ups through questionnaires. We have used Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structure (AMOS) statistical tools for the data analysis.

3. REVIEW OF LITERATURE

Based on literature study, we found that digital twin and emotional intelligence explored to some extent for the manufacturing and other industries [1], [2], [3], [4], [5], [6],[7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19] and [20] rather engineering plant industry service sector. Hence we propose that the engineering service plant industry further explore Digital twin, innovation and emotional intelligence for a sustainable business.

Objectives of the study are as follows:

- To study the demographic profile of the Start-ups

- To evaluate whether all the measures fit the recommended value, indicating a good fit of the structural model for the collected data with Digital Twin and Innovation in engineering plant industry start-ups.

- To evaluate whether all the measures fit the recommended value, indicating a good fit of the structural model for the collected data with Emotional Intelligence in engineering plant industry start-ups.

Based on the Literature study, we propose a new model (Fig-1).

Fig-1: Conceptual Model
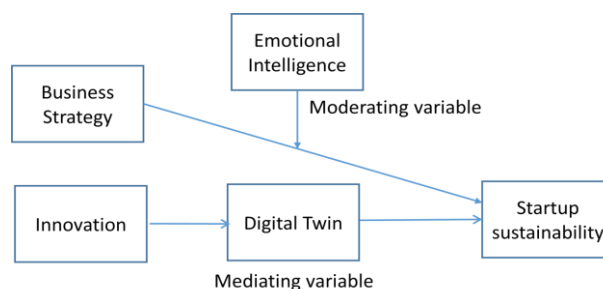
Based on the new model, the following hypotheses are framed.

H0: New model has a good fit

H1: New model needs a better fit.

4. ANALYSIS &FINDINGS

The study proposes the following variables,
- Start-up sustainability - dependent variable,
- Business Strategy and Innovation – Independent variables
- Digital Twin Mediating variable
- Emotional Intelligence – Moderating variable

Data analyses were carried out through Statistical Package for Social Science (SPSS) and analysis of Moment Structure (AMOS) like descriptive, reliability, and data analysis through SEM.

Start-up's Respondents:
Table-1 shows the type of start-ups analysed for this study.

Table-1: Type of Start-up

Type of Start-up		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Consultant	19	46.3	46.3	46.3
	EPC	22	53.7	53.7	100.0
	Total	41	100.0	100.0	

46.3% of start-ups provide consultancy services, and 53.7% provide Engineering, Procurement and Construction (EPC) services.

Table -2 shows the type of projects handled by start-ups.

Table-2: Type of Projects

Type of Project		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pre-bid Engineering	1	2.4	2.4	2.4
	FEED(Front End Design)	3	7.3	7.3	9.8

	Frequency	Percent	Valid Percent	Cumulative Percent
Basic Engineering	1	2.4	2.4	12.2
Detail Engineering	17	41.5	41.5	53.7
Detail Engineering and Procurement Services	13	31.7	31.7	85.4
3D Modelling Services	4	9.8	9.8	95.1
As-built	2	4.9	4.9	100.0
Total	41	100.0	100.0	

Start-up services are analysed, and the services are distributed among the start-ups to deliver the clients. Start-ups provide 2.4% pre-bid engineering services, 7.3% FEED services, 2.4% Basic Engineering services, 41.5% Detail engineering services, 31.7% Detail engineering and Procurement support services, 9.8% 3D modelling services and 4.9% As-built services.

As per the Tamilnadu government, 3-5 years are considered for start-ups' growth and achieving the targets for them and the government's goal in terms of economy. Table-3 shows the Start-up's age.

Table-3: Start-ups Age

Start-up Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	One year old	6	14.6	14.6	14.6
	Two years old	10	24.4	24.4	39.0
	Three years old	7	17.1	17.1	56.1
	Four years old	11	26.8	26.8	82.9
	Five years old	7	17.1	17.1	100.0
	Total	41	100.0	100.0	

Among forty-one start-ups, 14.6% start-ups served one year with the compliance, 24.4% start-ups served two years with the compliance, 17.1% start-ups served three years with the compliance, 26.8% start-ups served four years with the compliance, and 17.1% served five years with the compliance.

Start-ups participated in this study from different countries. Table-4 shows the start-ups that participated from each country.

Table-4: Country

Country		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	India	15	36.6	36.6	36.6
	UAE	17	41.5	41.5	78.0
	Egypt	1	2.4	2.4	80.5
	Saudi Arabia	6	14.6	14.6	95.1
	Qatar	1	2.4	2.4	97.6
	Senegal	1	2.4	2.4	100.0
	Total	41	100.0	100.0	

From the above table, 36.6% of start-ups are from India, 41.5% are from the United Arab Emirates(UAE), 2.4% are from Egypt, 14.6% are from Saudi Arabia, 2.4% are from Qatar, and 2.4% are from Senegal.

While applying the Likert scale in the study, Cronbach's alpha coefficient is necessary to evaluate consistency and reliability (Joseph et al., 2003). Table-5 provides Cronbach's Alpha against each factor considered in the study.

**Table-5: Consistency and Reliability Analysis**

Item-Total Statistics	
	Cronbach's Alpha
Digital Twin	.818
Emotional Intelligence	.828
Start-up Sustainability	.758
Business Strategy	.793
Innovation	.711

Table-5 shows the consistency and reliability achieved against each factor, proving the high level of internal consistency for the scale. Digital Twin achieved 0.818, Emotional Intelligence achieved 0.828, Start-up Sustainability achieved 0.758, Business strategy achieved 0.793, and innovation achieved 0.711.

Structural Equation Modelling (SEM):

Data were analysed through Structural Equation Modelling for the model fit assessment. Fig-2 shows the model developed in SEM.

Fig-2: Structural Model based on standardised coefficient on Start-up Sustainability
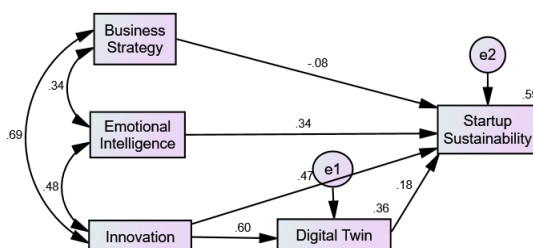
Based on the standardised coefficient, Innovation on Digital Twin (0.6) is the most influencing path in the SEM Model, followed by Innovation on Start-up Sustainability (0.47) and Emotional Intelligence on Start-up Sustainability (0.341). The unstandardised coefficient of Innovation on Digital Twin is 0.522, representing the partial effect of Innovation on Digital Twin, holding the other path variables as constant, followed by Innovation on Start-up Sustainability (0.376) and Emotional Intelligence on Start-up Sustainability (0.273). The estimated positive sign implies that such an effect is positive that Digital Twin would increase by 0.522 for every digital innovation to achieve Start-up sustainability.

The analysis found that the calculated P value is 0.387, more significant than 0.05, and indicates a perfect fit. Here Goodness of Fit Index (GFI) value (0.982) and Adjusted Goodness of Fit Index (AGFI) value (0.863) is more significant than 0.9, which represents it is a good fit. The calculated Normed Fit Index (NFI) value (0.979) and Comparative Fit Index (CFI) value (1.000) indicate that it is perfectly fit. Also, the Root Mean square Residuals (RMR) value is 0.276; the smaller RMR is, the better, which shows a perfect fit.

We found the mediating role of Digital Twin on the relationship between Innovation and Start-up Sustainability. Results show that a significant indirect impact of Innovation and Start-up Sustainability (0.86) was positive and significant. Furthermore, the direct effect of Innovation on Digital Twin (0.522) was also found to be significant, followed by Innovation on Start-up Sustainability (0.376).

We found that the moderating role of Emotional Intelligence on the relationship between Business Strategy and Start-up Sustainability (0.456) is positive and found a significant moderating effect of Emotional Intelligence on the relationship between Business Strategy and Start-up Sustainability.

5. CONCLUSION

This research empirically analysed the factors determining the Start-up's sustainability, business strategy, emotional intelligence, Digital twin and innovation Start-up model using structural equation modelling. This research affirms and develops Digital Twin in the context of the engineering service industry. The findings show that Cronbach's alpha for all five factors is above 0.7, which shows a high internal consistency and reliability level for the Start-up scale. Based on data analysis in the SEM model, we found that the model has a perfect fit and indicates the acceptability of the structural model. This research will benefit start-ups and MSMEs for their improvement in Digital Twin and psychological engagement through emotional intelligence for sustainable business strategy. Client satisfaction towards Digital twin and emotional intelligence are highly competitive globally for Start-ups sustainable business strategy.

6.0 SUGGESTION

Though the government and MSME have been striving for the fact that digitalisation is prime for business, digitalisation is to be a simplified and compatible and robust system to improve India's local strength. To achieve this, Governments and MSMEs must develop local MSME companies, develop software developers and provide training programs at various levels, including rural areas, to compete with the world.

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