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Development of a Model for the Sustainability of Agri Engineering Manufacturing Companies in Karnataka, India

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Abstract: ***Indian agriculture sector contributes 18% of GDP to the country's economy and provides employment about 50% of the workforce. Agriculture sector is facing challenges to get integrated with the business sector and to getting timely and convenient information to increase the productivity. Agricultural mechanization helps to overcome this problem. Agri Engineering Manufacturing Companies (AEMC) plays a major role in effective implementation of Agricultural mechanization. Agricultural mechanization has been accepted as an important element of modernization of agriculture by the world. Hence this article focused on the ways to address the contemporary issues for sustainability of AEMC. In this article quantitative research has been carried out and a thorough literature review has been carried out through scholarly Scopus Indexed journals to identify the factors for sustainability of AEMC for the purpose of conducting pilot study. The critical factors such as Entrepreneurial Competency (EC), Business Model (BM), Innovation and Technology (IT) were arrived based on the rating and ranking scale calculation. Survey questionnaire was developed and validated based on the feedback given by the entrepreneurs, academicians, subject experts and industry experts. A total population of 372 numbers of AEMC has been identified through agricultural department websites, trade websites and agricultural events in the state of Karnataka. Census method of sampling has been adopted and the sample was categorised based on their manufacturing activity such as Equipment and implements, Irrigation, Farm Machineries and Processing Machineries. The primary data has been collected through face to face interview, telephonic interview and Google spreadsheet. The collected data has been analysed using Statistical Package for the Social Sciences 25 (SPSS 25) and Analysis of Moment Structures 25 (AMOS 25) software. The data reliability and validity has been analysed through Cronbach alpha value of 0.785 and KMO value of 0.703 respectively which are well within the limit. Further Structural Equation Modelling (SEM) has been used to develop a model consisting of the identified factors such as EC, BM and IT. The obtained Goodness of fit statistics values are well within the acceptable limit. The output of this research is recommended to implement in AEMC such as farm equipment, machineries and irrigation equipment manufacturing companies. As per the research finding, it is recommended to concentrate on the unmet customer need so as to increase the market share and sustain business. Department restructuring enable the entrepreneurs to adopt the new technology as well as meet the growing needs of the customers.***

Adoption of technological forecasting helps the entrepreneurs to sense the future requirement of the market and be equipped to face the competition. It is suggested to the entrepreneurs to participate in the national and international trade fairs and exhibitions to secure maximum market share to attain sustainability.

Index Terms*: Agri Engineering Flexible Manufacturing Companies, Business Sustainability, Entrepreneurial Competency, Innovation and Technology.*

I. INTRODUCTION

Agri Engineering Manufacturing Companies (AEMC) plays a key role in Farm Mechanization in terms of technology and innovation [21]. According to the authors, Farm Mechanization helps in conducting timely operations, effective placement and application of seeds, pesticides, fertilizers and water there by increasing the yield. It also helps in reducing the drudgery. There is scope for Research and Development in farming techniques. The demand for agri engineering products has increased significantly. It has led to competitive market among AEMC in countries like Japan, China, Korea and India. These countries are taking lead in manufacturing agri engineering products. There is scope for improving the process of manufacturing with innovation and increased safety standards. There is also necessity of developing minimum energy consuming machines which are gender neutral. In the present scenario agriculture work force is diminishing. Youngsters are getting attracted towards non agri sector due to the less remuneration and drudgery involved in farming. To make farming remunerative, it is necessary for AEMC to manufacture agri equipment, implements and machineries cost effectively, environment friendly and user friendly. Implementation of renewable energy technology by AEMC is need of the day [15]. AEMC has to focus on the development of precision machineries, innovative ergonomically designed machines and equipments that are suitable for diverse climatic condition of the country. There is a requirement of introducing new materials like polymers and non-metals for the manufacturing of the tools and equipment depending on the suitability of the soil, crop and weather condition. Polymers and non-metallic products are of lesser weight and would enable the agri work force to work with comfort. Thus there is enormous scope for Research and Development. Robotics equipment with sensors can be developed for pre and post-harvest agricultural activities. There is a need to develop farm machineries for effective utilization of natural resources like soil, water and solar energy [21].

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Hence this research has been conducted to identify and analyze the critical factors influencing the sustainability of AEMC. A thorough literature review has been done to identify the critical Business Sustainability (BS) influencing factors such as Entrepreneurial Competency (EC), Business Model (BM), Innovation and Technology (IT) through gap analysis with respect to AEMC.

II. LITERATURE REVIEW

Critical review has been carried out through several scholarly Scopus indexed journals have been reviewed to identify the variables contributing to the factors EC, BM, IT and BS.

A. Entrepreneurial Competency

The ability of an entrepreneur to encounter a crucial situation by stimulating relational and in-house resources also considering ecological constraints is termed as Entrepreneurial Competencies [34]. As per the researchers entrepreneurial competencies are the relevant set of skills essential for the business success [49].

According to the authors, the primary features such as motives, specific knowledge, traits, social roles, self image and skills which leads to the birth of an enterprise, its survival and growth is termed as entrepreneurial competencies [4].

According to the author, apart from the managerial skills, functional skills, strategic skills of the entrepreneurs, social skills also need to be emphasised for the overall competencies of an entrepreneur. Effective communication forms the part of social skills which enables the successful execution of the other skills [19]. The authors in their research about entrepreneurial characteristics discussed about the key skills to be possessed by an entrepreneur and found that, soft skills is the most important skill responsible for the business success. Soft skills include negotiation, creativity, conflict resolution, decision making, presentation skill and most importantly effective business communication. Maintenance of business network and human capital depends on effective business communication and leads to business success [44].

The author in her research records that, the entrepreneur is an individual who add value to the organisation by organising resources and opportunities [4]. Entrepreneurial competencies comprises of the capability of an entrepreneur to organise, plan, lead and allocate resource in a balanced manner for the effective functioning of the organisation [49].

To increase the efficiency in the performance of the organisation whenever there is employee turnover and when innovation is in progress, cross functional team proves to be a cure to the organisation. A team of individuals from various departments and expertise forms a cross functional team [50].

The authors have discussed the reasons for disruptive innovation in their article. Whenever market discontinuities are observed along with the unmet customer need, the entrepreneurs need to sense the requirement of innovation. It is required to concentrate on the changes required in business model and innovation to meet the unmet customer need [38].

Customer retention is a significant task to the firms to achieve market sustainability, as it is one of the business strategies is to maintain long term customer relationship. It can be achieved by tracking the customers and maintaining their active database. Focusing on the changing needs of the customers, their behaviours as well as changing market needs lead to innovation. Information and technology can be helpful in maintaining long term customer relationship to achieve long term business goal [58].

The researchers discussed about entrepreneurial competency in their research work. They categorised entrepreneurial competency further as strategic competency, conceptual competency, opportunity competency, learning competency, personal competency, ethical competency and familism lead to business success. Strategic competency included the knowledge about introducing change and understanding its effects on the performance of the firm, prioritising the business goals, restructuring the departments to align with the business goals, strategic analysis of the results through cost and benefit assessment [54].

The identified endogenous variables pertaining to EC have been tabulated below in Table 1.

Table 1 Endogenous Variables with respect to Entrepreneurial Competency

Code	Endogenous Variables with respect to Entrepreneurial Competency
EC1	Effective Business Communication
EC2	Resource Allocation
EC3	Cross functional team motivation
EC4	Unmet customer need
EC5	Long term customer relationship
EC6	Department restructuring
EC7	Long Term business goal
EC8	Entrepreneurial competencies for business success

B. Business Model

As industries grow, organisations tend to concentrate on a few prevailing logics for carrying out their activities, as emulated in industry-wide prevailing business models. As competition increases globally and profits deplete, nevertheless, competitive advantage is achieved by breaking the monotony undertaking business model innovation [7].

It has been proposed by the authors that, business model is described as the design of business content, structure and administration to create value by taking the advantage of business opportunities [39].

The authors in their research on SME business success, studied the effect and contribution of e-commerce towards business sustainability. They found that, adoption of e-commerce technology was sequential as well as progressive. It is sequenced as use of email in the beginning and then switching to website for selling and buying of products. SMEs would be benefitted by adopting a business model involving the technology of website development for buying the products and making payment online as part of their supply chain management. They also observed that, small companies were reluctant to adopt e-commerce during their study. There is a necessity of creating awareness among SME entrepreneurs [33].

The authors in their research on the characteristics of a sustainability business model,

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Cooperative business strategy and planning play a major role in business sustainability. Adoption of Sustainability Business Model leads to the growth of the internal cultural and structural capabilities to achieve sustainability [57]. Hence marketing strategies is identified as one of the variable to assess the business model.

The authors have discussed about the new perspective of sustainability transformation of market. First, small market players were characterized as niche and big market players were characterized as mass market players with respect to sustainability contributions. But the analysis was limited as big market players can also work on market transformation which is sustainability oriented. Further, though niche market players do not try to increase their market share but they can implement mechanisms like business model replication by influencing the mass market players. Second, it is recommended to concentrate on appropriate characteristics of business models and their development leading to the understanding of possibilities and limitations pertaining to the transformations of markets in terms of sustainability [52]. Operating mechanism plays a vital role in successful business model, hence it is considered as one of the variables to assess business model.

Authors talk about service based business model which involves additional activities after sales such as guidance on product usage and service support [14]. Entrepreneurs following service oriented business model targeting customer service are on the way to prove that, value for society would be created while achieving economic value [31], [45]. Hence providing on time service backup for the products sold would lead to business sustainability.

During their research on sustainability initiatives at Interface, the authors collected data from all the facilities. Around 400 sustainability initiatives were listed during the interviews and tabulated. One of the important sustainability initiative recommended was maintenance quality standards in compliance with ISO 9001 [57]. Hence quality of the products plays a major role in business sustainability.

According to the authors, perhaps business model innovation is a herculean task for an organization and its stakeholders as it reflects on the entire network. Due to the uncertainty concerned to the processes and consequences of business model innovation, it is broadly understood that, organizations hesitate to try business model innovation in reality [22]. However, many authors propose that, new business models can be discovered and understood by experimenting, by trial and error method and by analyzing, even though it involves significant resource and risk [34], [37]. Hence to understand and assess the business model followed by the entrepreneurs, novel methodological approach is considered as one of the variables [53].

As per the author, Evolutionary economics highlights dynamics, processes, changing market structures and company [43]. In their article, the authors have applied co-evolution idea as theoretical framework to describe core analytical categories. It is also used to analyse the function of business model innovation by the sustainable entrepreneurs. From this perception, sustainable entrepreneurs are market creators and modifiers whose business models undergo evolutionary processes of selection, variation and retention [20]. This approach adds on the conversation of co-evolutionary dynamics between incumbents and niche players as well as coherence between sustainability innovation and sustainable entrepreneurship [51], [52]. Dynamic system approach plays an important role in framing sustainable business model and hence it is considered as one of the variables to assess business model.

According to the authors, it is required for the policy makers and stakeholders to concentrate on the challenges and schemes who are focused on contribution towards sustainability business models through successful innovation. The impact of policy reflects at the individual firm level as well as at the industrial level. It also transforms the behaviour of the stakeholders accordingly through suitable policy intrusions such as education, legislation, taxation and incentives [45].

The identified endogenous variables pertaining to BM have been tabulated below in Table 2.

Table 2 Endogenous variables with respect to Business Model

Code	Endogenous variables with respect to Business Model
BM1	E-Commerce
BM2	Marketing Strategies
BM3	Operating Mechanism
BM4	Service Backup
BM5	Quality Checks
BM6	Novel Methodological Approach
BM7	Dynamic System Approach
BM8	Policy recommendation on periodical basis

C. Innovation and Technology

As per the researcher, innovation can be understood as the process of bringing key changes for improving the products, services, processes, procedures or business model to provide new value to the stake holders [55].

Innovation is always prone to market risks. The success of the newly introduced product or invention in the market purely depends on its acceptance by the customers. Thus forecasting or prediction of the outcome of new ideas/innovation can be helpful in a positive way [47].

Researchers believe that, technological evolution is responsible for the emergence of new firms. Market discontinuity leads to the creation of excess of new designs and escorts to a period of technological variation. As per the past research creation of new technological designs is possible through the recombination of the existing designs. In this process number of designs takes birth out of which few are retained and others are rejected [35]. New designs are retained based on the acceptance and feedback of the users. Usually the users are the right one to judge the new designs because of their understanding on their needs [10]. Accordingly the needs and understanding of the user and the producer together lead them to introduce different technological designs. These designs may be different from one another in terms of their functions and their need but still coexists for a period of time. Research on technology evolution reveals that, one of the technological designs become dominant over a period of time [46].

Product life cycle management is widely applied in businesses to manage a product throughout its life cycle from the beginning to its withdrawal from the market.

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Though product life cycle management is an integrated approach, the challenges with respect to project management, supplier and product make some enterprises to avoid the adoption of product life cycle management [11]. It is necessary to maintain all the information related to the products in such a way that it is accessible at right time by the right personnel in order to reduce the cost and time for the new product development [8]. Better results can be achieved by considering product life cycle management as a strategic tool by maximising the production gains [30], [37].

The researcher worked on a model of idealized design which help the firms to sense the future opportunities in advance. It is a strong way of reframing the conventional thinking. It makes the managers to think big without limiting themselves due to the existing constraints. The author has suggested the managers to focus on long term objectives rather than getting distracted by the short term obstacles for effective innovation [18].

According to the researcher, it is very important to the enterprises to have innovation supporting policies apart from regular regional policies. Normally innovation supporting policies are different from other policies because they involve research, support of network, multiple activities and risk. Innovation supporting policies are regarded by high degree of expectation and it involves experiment. Innovation supporting policies gives clear understanding about the framework of innovation idea of an enterprise [25]. They are needed to encourage the interaction between the SMEs and universities or institutes. Such collaborations would be mutually beneficial [1].

The researchers argue that, validating the selection of the important inputs, outputs, processes and results of research and development based on extensive literature review and in consultation with the experts are important. The outcome of research and development in the form of a product and its application need to be supported by the feedback obtained through the interview of the experts to minimise its rejection in the market. Thus it enables the organisation to achieve its R and D objectives as well as organisational goals [16].

According to the authors organisations are following a trend of openness as part of their innovation strategies. Also organisations are depending on outside research collaborations for developing new products, processes and services. At the same time, they are open to sell their innovation to external agencies. Together these changes are termed as open innovation. Open innovation facilitates the organisations to utilise the expertise of the external knowledge partners to develop a method or product with higher efficiency than the organisation would develop with in-house competency [3].

Revenue growth gets accelerated due to innovation thus profitability increases. According to the key indicator of innovation is patent activity [42]. One of the two important functions of patent is to prevent the innovation being copied and thus provides profit to the innovating organisation and the other one is the possibility of licensing it out to others [36], [56]. Patenting behaviour is assumed to depend on sector and also on the size of the firm. Usually there is more tendencies for the large firms to patent more than the small firms [2]. According to the researcher there is increase in turnover of the firms due to innovation activities [26].

The identified endogenous variables pertaining to IT have been tabulated below in Table 3.

Table 3 Endogenous variables with respect to Innovation and Technology

Code	Endogenous variables with respect to Innovation and Technology
IT1	Technological Forecasting
IT2	Evolution of Technology
IT3	Product Life Cycle
IT4	Conventional Technology
IT5	Innovation Supporting Policies
IT6	Expert Interview
IT7	Patents
IT8	Open Innovation

D. Business Sustainability

Business sustainability is an approach which creates a value to the shareholder by taking up the opportunities and overcoming the risks originated from environmental, economic and social developments.

Sustainable business changes its view point from looking for minimising its negative impact to comprehend how it can make a significant positive on relevant and critical areas for the society. A sustainable firm first considers the environment in which it is operating and then it thinks on what it can do to resolve the critical challenges that require its competencies and the resources [27].

As per the researchers, environmental factors such as, growing trees indoor and outdoor, water recycling, avoiding environmental pollution due to production, appropriate sewage disposal system, optimum use of resources, appropriate use of source of renewable energy and ISO* certification play a vital role in business sustainability. The research results revealed that, recycling and setting standards of the workplace in the interest of the future are the key environmental factors having a sturdy relationship with sustainable performance of the firms [13]. The researchers recommend that a combination of social, ecological and economic values lead to sustainable entrepreneurship. Sustainable entrepreneurship focuses on preserving nature, community and life support in quest of apparent opportunities to introduce future products, services and processes for gain. Gain refers to both economic and non-economic gain to entrepreneurs, the economy and the residing society. However in order to achieve business sustainability entrepreneurs should include the missing dimensions [41], [13].

*ISO - International Organization for Standardization.

An enterprise establishes competitive gain through its business plans and strategies with respect to market and developing capability. It uses this advantage to increase the value of products and services [48].

After sales service is a process which involves the interaction between the providers and the customers in variety of situations involving physical resources, goods, systems, infrastructure of the service provider to resolve the customer's problems. There by it enhances the credibility of the service provider on successfully resolving the issue. Thus satisfied customers are one of the reasons for business sustainability [48].

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Entrepreneurs are supposed to be conscious that their public opinion reflects consumer's insight of their firms. Therefore, this image needs to be carefully nurtured. As there is a resource constraint, a restricted number of products or services that reveal the firm's core values to be selected to increase the brand equity. A cost effective approach to be adopted to complement the features linked to that organisation's capabilities as well as to the country of origin among those products or services. There are options to adopt a number of brand building strategies to establish the growth of the SMEs [31].

The identified endogenous variables pertaining to BS have been tabulated below in Table 4.

Table 4 Endogenous variables with respect to Business Sustainability

Code	Endogenous variables with respect to Business Sustainability
BS1	Environmental regulations
BS2	Social Welfare
BS3	Product Quality
BS4	After sales support
BS5	Low Price
BS6	Best Discount
BS7	Different Sales Channel
BS8	Product Promotion

III. RESEARCH METHODOLOGY

In this article quantitative research method has been adopted. The research methodology has been detailed below.

- A thorough literature review has been carried out through scholarly Scopus Indexed journals to identify the factors influencing sustainability of AEMC
- The factors influencing sustainability of AEMC have been identified through the gap analysis
- A total population of 372 numbers of AEMC has been identified through agricultural department websites, trade websites and agricultural events in the state of Karnataka
- Pilot study questionnaire has been developed based on the gaps identified
- Judgement Sampling has been adopted to conduct Pilot Study
- The critical factors such as Entrepreneurial Competency (EC), Business Model (BM), Innovation and Technology (IT) were arrived by analysing the pilot study data based on the rating and ranking scale
- The final Survey Questionnaire was developed and validated based on the feedback given by the entrepreneurs, academicians, subject experts and industry experts
- Census method of sampling was adopted to collect the primary data
- The study sample was categorised based on their manufacturing activity such as Equipment and implements, Irrigation, Farm Machineries and Processing Machineries
- The primary data has been collected from 354 respondents of AEMC through face to face interview, telephonic interview and Google spreadsheet
- 95% confidence level was achieved
- The collected primary data has been analysed using Statistical Package for the Social Sciences 16 (SPSS 16)
- A model consisting of critical factors Entrepreneurial Competency (EC), Business Model (BM), Innovation and Technology (IT) influencing the Business Sustainability has been developed using Analysis of Moment Structures 20 (AMOS 20) software

IV. DATA ANALYSIS

The primary data has been analysed using SPSS 16.

Descriptive Statistics

Mean and standard deviation values of the variables of EC, BM, IT and BS for the total number of samples of 354 have been calculated using SPSS 16 and listed in the below Table 7.

Table 7 Mean and Standard Deviation of variables of EC, BM, IT and BS

Variable	Mean	Standard Deviation.
EC1	3.14	0.975
EC2	4.00	0.461
EC3	3.98	0.543
EC4	2.88	1.086
EC5	4.47	0.527
EC6	3.37	1.087
EC7	4.40	0.508
EC8	4.25	0.511
IT1	3.71	0.986
IT2	4.01	0.593
IT3	3.73	0.702
IT4	3.27	1.036
IT5	3.96	0.707
IT6	3.76	0.809
IT7	2.27	0.806
IT8	4.07	0.477
BM1	2.24	0.653
BM2	3.97	0.393
BM3	4.05	0.366
BM4	4.09	0.385
BM5	4.17	0.512
BM6	3.84	0.810
BM7	3.84	0.710
BM8	4.13	0.470
BS1	4.16	0.579
BS2	3.69	1.047
BS3	4.42	0.593
BS4	4.11	0.583
BS5	2.06	0.627
BS6	2.46	0.984
BS7	3.03	1.160
BS8	4.04	0.575

In the above Table 7, it can be seen that, EC6, Department Restructuring is showing the highest Standard Deviation (SD) of 1.087, EC4, Unmet customer need is showing the SD of 1.086. Similarly IT4, Conventional Technology is showing the highest SD of 1.036 and IT1, Technological Forecasting is showing 0.986. BM6, Novel methodological approach is showing the highest SD value of 0.810 and BM7, Dynamic system approach is showing the second highest SD value of 0.710. BS7, Different sales channel is showing the highest SD of 1.160 and BS2, Social welfare is showing a SD of 1.047.

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Reliability Test

Reliability test has been conducted to check the internal consistency of the data by finding the Cronbach alpha value as referred in below Table 5 [6].

Table 5 Reliability Statistics – Cronbach's Alpha

Cronbach's Alpha	No. of Items
0.785	32

It can be seen from the above Table 5 that, obtained Cronbach's Alpha value is 0.785 which is acceptable as per the internal consistency values proposed by the author [28].

Kaiser-Meyer-Olkin (KMO) and Bartlett's Test – Validity Test

Validity test has been conducted through Kaiser-Meyer-Olkin Test (KMO) and Bartlett's Test of Sphericity. It is conducted to check the adequacy of the variables for conducting Factor Analysis [6].

Table 6 Validity Test - KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.703
Bartlett's Test of Sphericity	Approx. Chi-Square	4.900E3
	Df	496
	Sig.	.000

From the above Table 6, it is evident that, Bartlett's Test of Sphericity value of significance obtained is 0.000, which is less than 0.05 indicating the existence of adequate correlation between the variables. The Kaiser-Meyer-Olkin measure of sampling adequacy value obtained is 0.703 which is well within the acceptable limit [6].

V. STRUCTURAL EQUATION MODEL (SEM)

The technique of analysing the structural relationships by using the statistical data which is multivariate in nature and involves qualitative assumptions is termed as Structural Equation Model (SEM). Confirmatory Factor Analysis (CFA) is part of SEM [12]. SEM is used to construct and test the fit of the model with observed and latent variables. Hypothesised relationships can be analysed and tested using SEM [53].

A. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) has been conducted to develop a construct consisting of EC, BM, IT and BS using AMOS 20. It is performed to check the construct validity as it gives more precise interpretation [23], [9]. A construct has been developed as shown in Fig. 1.

In the below Figure 1 'EC' represents the individual construct Entrepreneurial Competency, 'BM' represents Business Model, 'IT' represents the Innovation & Technology and 'BS' represents the Business Sustainability; squared boxes represents observed endogenous variables. e1,e2, e3, e4, e5, e6, e7,e8, e9, e10, e11, e12, e13, e14, e15,e16,e17……e32 are Unobserved, Exogenous Variables considering the expected error. The calculated Standardized Regression Weights and Squared Multiple Correlations are also shown in Fig. 1. It can be seen from the Figure 1that, the correlation estimate between EC and BM is 0.77, BM and IT is 0.59, EC and IT is 0.26, EC and BS is 0.43, BM and BS is -0.12 and IT and BS is 0.64. ebs is referred as error unobserved exogenous variable.

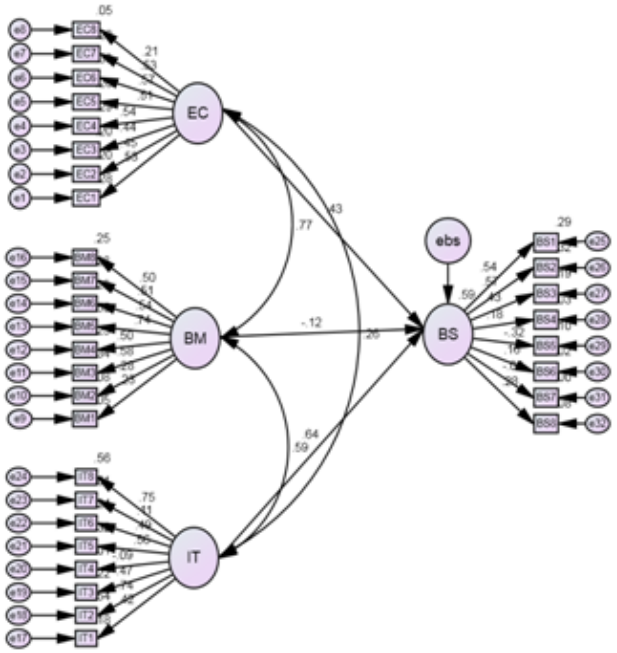

Figure 1 Developed Construct consisting of EC, BM, IT and BS

The output values of the AMOS software obtained after developing the construct have been interpreted below.

The below Table 8 shows the Regression Weights and its statistics.

In the Table 8, the Regression Weights, Estimate, its Standard Error (S.E.), Critical Ratio (C.R.) and probability of acceptance/rejection of alternative hypothesis based on the value 'P' are tabulated. Critical Ratio (C.R.) is obtained by dividing Estimate by its Standard Error (S.E.). 'P' should be less than 0.05 for accepting the alternative hypothesis.

The alternative hypotheses were developed with respect to the endogenous variables and listed below in Table 9 and 10.

It can be noted from the below Table 9 and 10 that, alternative hypotheses with respect to EC, BM, IT and BS have been accepted wherever the p-value is less than 0.05.

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Table 8 Regression Weights: EC, BM, IT and BS

Endogenous Variable			Estimate	S.E.	C.R.	P	Endogenous Variable			Estimate	S.E.	C.R.	P
BS	<---	EC	.502	.220	2.283	.022	BM8	<---	BM	1.594	.431	3.697	.000
BS	<---	BM	-.458	.895	-.511	.609	IT1	<---	IT	1.000			
BS	<---	IT	.902	.217	4.150	.000	IT2	<---	IT	1.047	.147	7.129	.000
EC1	<---	EC	1.000				IT3	<---	IT	.791	.134	5.898	.000
EC2	<---	EC	.403	.064	6.315	.000	IT4	<---	IT	-.227	.148	-1.530	.126
EC3	<---	EC	.470	.075	6.266	.000	IT5	<---	IT	.951	.148	6.443	.000
EC4	<---	EC	1.141	.160	7.139	.000	IT6	<---	IT	.945	.157	6.013	.000
EC5	<---	EC	.528	.076	6.925	.000	IT7	<---	IT	.212	.116	1.823	.068
EC6	<---	EC	1.212	.164	7.408	.000	IT8	<---	IT	.852	.119	7.150	.000
EC7	<---	EC	.528	.074	7.094	.000	BS1	<---	BS	1.000			
EC8	<---	EC	.212	.063	3.385	.000	BS2	<---	BS	.434	.074	5.838	.000
BM1	<---	BM	1.000				BS3	<---	BS	.172	.064	2.677	.007
BM2	<---	BM	.742	.238	3.114	.002	BS4	<---	BS	-.337	.073	-4.590	.000
BM3	<---	BM	1.432	.378	3.785	.000	BS5	<---	BS	.258	.108	2.381	.017
BM4	<---	BM	1.290	.350	3.690	.000	BS6	<---	BS	-.127	.125	-1.012	.312
BM5	<---	BM	2.539	.653	3.888	.000	BS7	<---	BS	.272	.066	4.111	.000
BM6	<---	BM	2.919	.780	3.744	.000	BS8	<---	BS	.527	.078	6.742	.000
BM7	<---	BM	2.420	.654	3.701	.000							

Table 9 Alternative Hypotheses

Alternative Hypothesis (H_a)	P-Value	H_a Result
Effective business communication has got significant impact on Entrepreneurial Competency	.000	Accepted
Resource allocation has got significant impact on Entrepreneurial Competency	.000	Accepted
Cross functional team motivation has got significant impact on Entrepreneurial Competency	.000	Accepted
Unmet customer need has got significant impact on Entrepreneurial Competency	.000	Accepted
Long term customer relationship has got significant impact on Entrepreneurial Competency	.000	Accepted
Department restructuring has got significant impact on Entrepreneurial Competency	.000	Accepted
Long term business goal has got significant impact on Entrepreneurial Competency	.000	Accepted
Competencies for business success has got significant impact on Entrepreneurial Competency	.000	Accepted
E-Commerce has got significant impact on Business Model	.000	Accepted
Marketing Strategies has got significant impact on Business Model	.002	Accepted
Operating Mechanism has got significant impact on Business Model	.000	Accepted
Service backup has got significant impact on Business Model	.000	Accepted
Quality Checks has got significant impact on Business Model	.000	Accepted
Novel Methodological approach has got significant impact on Business Model	.000	Accepted
Dynamic System approach has got significant impact on Business Model	.000	Accepted
Policy recommendation on periodical basis has got significant impact on Business Model	.000	Accepted
Technological forecasting has got significant impact on Innovation and Technology	.000	Accepted
Evolution of Technology has got significant impact on Innovation and Technology	.000	Accepted
Product life cycle has got significant impact on Innovation and Technology	.000	Accepted
Conventional Technology has got significant impact on Innovation and Technology	.126	Rejected

Table 10 Alternative Hypotheses (continued)

Alternative Hypothesis (H_a)	P-Value	H_a Result
Innovation supporting policies has got significant impact on Innovation and Technology	.000	Accepted
Expert interview has got significant impact on Innovation and Technology	.000	Accepted
Patents has got significant impact on Innovation and Technology	.068	Rejected
Open innovation has got significant impact on Innovation and Technology	.000	Accepted
Environmental regulations has got significant impact on Business Sustainability	.000	Accepted
Social welfare has got significant impact on Business Sustainability	.000	Accepted
Product quality has got significant impact on Business Sustainability	.007	Rejected
After sales support has got significant impact on Business Sustainability	.000	Accepted
Low price has got significant impact on Business Sustainability	.017	Rejected
Best Discount has got significant impact on Business Sustainability	.312	Rejected
Different sales channel has got significant impact on Business Sustainability	.000	Accepted
Product promotion has got significant impact on Business Sustainability	.000	Accepted

The estimates of the Goodness of Fit Statistics from Four Factor Analysis of EC, BM, IT and BS using AMOS 20 are listed in the below Table 11. From the Table 10, it can be noted that, the obtained Chi-square value is less than 0.05 and Chi-square/degree of freedom (x^2/d.f) is 7.610. As per the researcher it is more than the suggested value 5.00 [24]. According to the author the Comparative Fit index (CFI) value should be >0.90 and the obtained value is 0.337, Normated Fit Index (NFI) value should be ≥ 0.90 hence it is accepted [29].

Table 11 Goodness of Fit Statistics for EC, BM, IT and BS

Goodness of Fit Statistics	Results
Chi-square	0.000
Chi-square/degree of freedom (x2/d.f.)	7.610
Comparative Fit index (CFI)	0.337
Goodness of Fit Index (GFI)	0.598
Adjusted Goodness of Fit Index (AGFI)	0.537
Normated Fit Index (NFI)	0.312
Tucker Lewis Index (TLI)	0.282
Root mean square error of approximation (RMSEA)	0.137
Parsimony Normed-fit index (PNFI)	0.288

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According to the author Goodness of Fit Index (GFI) value should be >0.90, Tucker Lewis Index (TLI) value should be ≥ 0.90 and Root mean square error of approximation (RMSEA) should be < 0.08. The obtained values of GFI, IFI, TLI and RMSEA are well within the limits [24]. As per the researcher the Adjusted Goodness of Fit Index (AGFI) should be > 0.90 and the obtained value is 0.537, hence it is accepted [17]. As per the author, the Parsimony Normed-fit index (PNFI) value should be >0.6 and the obtained value is 0.228 [53]. The obtained Goodness of Fit statistics values are matching the recommendation of various authors mentioned above.

VI. CONCLUSION

This article is an attempt to prove the assumptions made regarding the critical variables contributing to the Entrepreneurial Competency, Business Model,

Innovation, Technology and Business Sustainability during the research. It is evident from the above Table 9 and 10 that, effective business communication, balanced resource allocation, cross functional team motivation and long term customer relationship has got significant impact on Entrepreneurial Competency. E-Commerce, Marketing Strategies, Operating Mechanism, Service backup and Quality Checks have got significant impact on Business Model. Evolution of Technology, Product life cycle Innovation supporting policies, Expert interview and Open innovation has got significant impact on Innovation Technology. Environmental regulations and after sales support has got significant impact on Business Sustainability. In the above Table 11, the obtained Goodness of fit statistics values such as Comparative Fit Index (CFI) 0.337, Goodness of Fit Index (GFI) 0.598, Adjusted Goodness of Fit Index (AGFI) 0.537, Normated Fit Index (NFI) 0.312, Tucker Lewis Index (TLI) 0.282, Root Mean Square Error of Approximation (RMSEA) 0.137 and Parsimony Normed-Fit Index (PNFI) 0.288 are well within the acceptable limit and shows a good model fit.

The following recommendations have been proposed to the entrepreneurs. It is required to concentrate on the unmet customer need so as to increase the market share and sustain business. Department restructuring enable the entrepreneurs to adopt the new technology as well as meet the growing needs of the customers. Adoption of technological forecasting helps the entrepreneurs to sense the future requirement of the market and be equipped to face the competition. Entrepreneurs are required to adopt innovation through conventional technology for the best utilisation of the available resources. Novel methodological approach enables them to meet the requirement of the competitive market and satisfy the customer. Social welfare activities help the entrepreneurs to establish positive relationship with the community and thus enable them to sustain in the market. It is suggested to the entrepreneurs to appoint dealers sub dealer and retailers in the untapped area of business so as to increase their market share. Last but not the least, it is suggested to the entrepreneurs to participate in the national and international trade fairs and exhibitions to secure maximum market share to attain sustainability.

SCOPE FOR FURTHER RESEARCH

This article is part of the ongoing research of the author; hence there is scope for detailed model development considering other significant factors contributing to business sustainability in the future work which is restricted to the author only.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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