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CROWDSOURCING FOR BUSINESS STRATEGY AND SUSTAINABILITY: A PARTIAL LEAST SQUARE STRUCTURAL EQUATION MODEL

Purpose. The goal of this research was to scrutinize how business strategy helps to increase business sustainability by considering the roles of quadratic effects and students' Innovation in the formation of business. It is worthwhile to investigate the role of partial least square structural equation modeling (PLS-SEM) in crowdsourcing business strategy approaches toward sustainability.

Methodology. To attain these goals, we conducted quantitative research, which included first-order by three dimensions of business strategy for the analyzed reflective model. In order to gather quantitative data and identify the predictor factors that affect the sustainability associated with the quadratic effects, a thorough exploratory PLS-SEM strategy was applied.

Findings. The participants (N = 218) studying at Daffodil International University (DIU) in Bangladesh took part in the online survey. The findings indicate that DIU students' intention for businesses strategy is conscious of the potential changes, and that they have begun to build internal processes geared toward sustainability. Also, the first-order constructs are the selection of environment, long-term behavior, and strategical involvements management resources into business strategies which have a positive correlation with the significant impact on business sustainability. While business strategy contributed to the formation of an innovative sustainability model, the presence of a linear effect and a positive parabolic effect was statistically significant. Finally, business strategy has a favorable impact on sustainability with both linear and parabolic effects.

Originality. Business strategy is proved to have contributed to forming an innovative model of sustainability, having a linear effect and a positive parabola effect as statistically significant. As a result, business strategy has a beneficial impact on sustainability, with both linear and parabolic effects. These findings have ramifications for how potential entrepreneurs handle their businesses in order to improve sustainability.

Practical value. The results show that business strategy is essential for aspiring entrepreneurs to increase creativity and efficiency in the direction of sustainability.

Keywords: *crowdsourcing, business strategy, sustainability, structural equation modeling*

Introduction. The word entrepreneurship means different things to different people who have diverse strategies for their specific zone of study, such as entrepreneur and entrepreneurship [1]. Entrepreneurship is not limited to a choice group of people or even any student with a proper mindset, determination, and motivation who can grow an entrepreneurial perspective to that of a single expert is known as the wisdom of the crowd [2]. Entrepreneurial strategy is how a business establishes or re-establishes its core relationships with its environment (Murray J. A., 1984), like the diverse area of digital entrepreneurship, where creating software is based on information systems (IS), conceiving business strategies, and developing innovation strategies. Additionally, societal entrepreneurship for crowd wisdom meets learning, business, and digital entrepreneurship at this intersection [3].

Nevertheless, there is a gap in the crowdsourcing business strategy to gather or practice new knowledge to invent the business model that helps sustainable performance, particularly among graduate students in Bangladesh [3, 4]. Indeed, the research question demonstrated a need to focus on the signal research problem mentioned above. However, the research question is centered on the research to get the answer empirically that is predicted hypothetically. An entrepreneurial strategy is a choice-oriented method to overcome the inconsistency of the entrepreneurship approach [5, 6]. However, entrepreneurship encompasses classifying and exploiting entrepre-

neurial chances to generate the most value. Entrepreneurial firms are also essential to act strategically for the incorporation of entrepreneurial and strategic decisions (Hitt M. A., Ireland R. D., Camp S. M., and Sexton D. L., 2001). The entrepreneur's integration is before entering to set up a new invention or business re-innovation that acts as a strategically important approach in different strategic plans. The idea of innovation-associated age became an integral part of entrepreneurship within the mid-twentieth century shaping the implementation of business strategy and proposes [6]. Innovation, which involves presenting one innovative and pertinent thing, is one of the foremost troublesome responsibilities for the entrepreneur. Therefore, it receives not solely the flexibility to make and hypothesize but the flexibility to grasp all the forces to add to the surroundings. The term 'Entrepreneurship' is similar to individual and is the engine of financial growth [1]. Entrepreneurs produce job chances within the market and facilitate cutting off the redundancy rate. Hence, the method of business strategy initiates from growing business sustainability. A specific type of crowdsourcing called "creative crowdsourcing" enables business strategies to develop by enlisting scattered people to tap into crowd wisdom [2].

Therefore, it is necessary to determine whether the university's business push approach impacts its students' intention on business strategy. Nevertheless, the study aims to look at the intentions of university students' structurally and fix up their applying knowledge to new business strategy approaches that would be sustainable business in a competitive environment. Strategic entrepreneurship queries commonly asked

replicate the accumulated countrywide and global attention to entrepreneurs and entrepreneurship by individuals, clusters, researchers, students, and organizations. The event of the assumption of entrepreneurship counterparts to a reasonable degree is the event of the time itself. The term entrepreneur is French and, virtually interpreted, means "between-taker" or "go-between" [1]. As administrations, businesses, and shoppers develop a lot of activities, actual entrepreneurial management enhances a lot of necessity. Whereas a free enterprise has historically been watched as a personal segment development, business, government, and social free enterprise have industrialized in an exceeding range of various areas like not-for-profits, for-profits, and public sector organizations. Therefore, entrepreneurship could be a universal construct and may be functional at small and medium-sized enterprises (SMEs). First-order constructs influence individual business strategy, thus there is a connection between competitive business strategy and business sustainability [7]. Yet, the business's strategy is engaged in crowdsourcing activities and collaborates with successful solution providers for sustainability [2, 8]. Therefore, the research question is generated from the research gap by the above literature: Does crowdsourcing for business strategy has a quadratic effect on sustainability?

Strategy could be a unifying framework for a prosperous effective business strategy using crowdsourcing to support innovation that may be achieved directly on sustainable business mediating of quadratic effects [8]. Therefore, the research objective is to identify the quadratic relationship between business strategy and sustainability rather than linear effects. Nevertheless, relationships between constructs in PLS-SEM can take many different shapes (Chin, W. W., Marcelin, B. L., Newsted, P. R., 2003). For example, when the values of the latent variables are shown in a scatterplot, linear interactions may be represented by straight lines (with positive or negative slopes). In contrast, quadratic relationships comprise any correlations that are curves rather than straight lines [9], (Chin, W. W., Marcelin, B. L., Newsted, P. R., 2003). However, the following section has developed theoretically an associated understanding of effective business strategy constructs measured by first-order constructs.

Literature review. The innovation casts light on the role that university assistance plays in fostering entrepreneurship propensity via business education. Universities are becoming increasingly involved in promoting business propensity, teaching it, and promoting it to advance economic and social wellbeing. In addition, many institutions, both in developed and emerging nations, have been making investments to encourage and promote new establishments [10]. However, in this perception, the researchers have aligned the literature focused on the two phenomena, crowdsourcing for business strategy and sustainability in business. Indeed, in crowdsourcing to satisfy changing economic stress, entrepreneur requirements, and legal constraints, sustainability must be included in the strategy [3, 11]. Additionally, sustainability has increased profitability, attracted top personnel, and decreased expenses [11].

Business Strategy. Entrepreneurship is creating a progression normally in three simple crowd-wisdom strategies [5]: the business strategy, where a powerful decision-maker takes bold choices; the adaptive strategy, where a partnership of decision-makers responds to environmental forces with small, rambling steps; and the planning strategy, where analysts assimilate strategic decisions into logical plans (Mintzberg H., 1973). However, these three headway constructs have a stronger relationship with business sustainability. Nevertheless, the business strategy selected in this study is a latent independent variable whose dimensions are measured by the environment, long-term behavior, and management resources strategically to get business success [10]. The entire number of enterprises and organizations using crowdsourcing systems has increased in the current digital era, retaining sustainability [11]. Nevertheless, the strategies of entrepreneur decisions have focused

on the sustainability of business performance [10]. Even while knowledge about crowdsourcing is expanding, these activities' structural dynamics are still not well understood [5]. One of the trendiest themes in management strategy right now is crowdsourcing-enabled innovation that taps into crowd wisdom. The innovative initiatives to use crowdsourcing tools and crowd creativity to address social, environmental, and economic sustainability concerns are of particular relevance [11].

Selection of Environment. Environment selection is a very vital procedure before entering the new business setup, and the nature of entrepreneurial strategy construction and its relationship with strategy, environment, and business performance [6], (Dess G. G., Lumpkin G. T., Covin J. G., 1997). Thus, the business strategy has focused on the two major strategies — crowdsourcing and innovation [2, 7] of entrepreneurship that works and how it has been successfully used earlier. Therefore they can be applied in today's business environment (Drucker P. F., 1985). Analyzing the information dynamics and environmental structure is that the inner selection-retention surroundings. On the information aspect, the collective perception of crowd wisdom in entrepreneurial concepts is subjected more and more to the intellect, empiricist, and pragmatic criteria within the technique of information creation [5]. Organizations frequently struggle with how to effectively organize various crowdsourcing activities and link effectively with some other business operations since crowdsourcing is distinct from many other business methods [12]. However, this argument helps to elucidate the way individual information enters an organization, the associated technique and the way individual knowledge becomes shared among the cluster (Floyd S. W., Wooldridge B., 1999). Therefore, a selection of environments on the beneficial effects of business on the development of an adaptive mechanism for controlling the execution of business strategies is important. It has been demonstrated that when strategy helps decision-making tools and flexible processes are used in the selection environment, the corresponding sustainability functions more effectively. The application of a business strategy in a selection environment validates its elements, establishes the instruments for environmental diagnostics, and connections between the selection of environment and the strategy for business [10].

Long-Term Behavior. Despite the dominant use of any sustainability programs that crowd wisdom make diverse [4], there are few proofs of the long-run effects of entrepreneurship, and their effectiveness is well established (Liu Y., 2007). The long-term business plan is to make better performance achieving the goals that have the powerful link with one of the strategies of entrepreneurship [10]. Therefore, making and structuring a successful enterprise requires effective planning [1]. Although the procedure of evolving the essential plans is truly vital, the method and the correction are compulsory in tapping in notes that make the procedure rational and, actually, ensure a good chance for the project achievement. Crowdsourcing outlines these issues as long-term behaviors and emphasizes the experiences of thought leaders and innovators before projecting the future direction of the business strategy [11, 13]. Frequently somewhat hypothesized in the attention of a businessperson does not create logic when it is committed to note. A commonly requested query is how long an entrepreneur's plan should be. While there is no straight response to this query, occasionally it is lengthy to get the result. Yet the entrepreneur's requirements to write the plan itself should get assistance with rewriting the plan most encouragingly (Zott C., Amit R., 2007). But no substance how decent the contented approaches the occupational plan appearances and is offered moves its valuation. However, a well-informed entrepreneur will easily distinguish whether the strategy was mentioned, primarily mentioned by the businessperson or externally prepared by someone else [1, 14], (Drucker P. F., 1985).

Managing resources strategically. There are three key features of entrepreneur creativity to manage resources strategi-

cally: knowledge, determination, and capability [1]. First, information on the way of action is mandatory for chance identification, problem-solving, and choice creation. The second point of drive mentions the craving, wish, and inspiration to do somewhat different and innovative with the confidence to continue as a first motivator. Finally, capability states how an entrepreneur pursues to classify an answer to a difficult issue by implementing various artistic procedures to precisely measure and estimate the condition and classify the top viable way of the act [1]. Therefore, training is the related skill and information that an entrepreneur takes to the chance appreciation procedure [7]. However, the groundwork phase makes it easy for crowdsourcing [2]. An entrepreneur makes an effort to get responses to a query or problem. Cutting-edge businesses rely on public engagement to succeed. Because they are sustainable, these crowdsourced business concepts are effective [13]. Though, it is essential to recognize the subjects involved completely. In the business development phase, an entrepreneur reflects on knowledge or thoughts around a problem. However, the period and interplanetary are reflected in the key that may not be directly approaching. This phase is a center where additional benefits may be desired to develop onward. An entrepreneur selects the top optimal, which can be sometimes considered close to risk and indecision [6]. The final achievement of managing resources strategically is contingent on whether they can be supported into action [1]. Crowdsourcing development tools have the potential to expand greatly by enabling outside innovators to engage in business growth [13].

Sustainability. Due to the speedily cumulative acceptance of crowdsourcing for business analytics, examination of the past factors of the adoption of the strategy [8] and the subsequent impact of the latter on the firm's performance has become an important research topic [14]. With the growing adoption of business analytics, investment firms need to understand how business value is created from investments. Business management approaches appear at the sustainable business as an entire level rather than divisions [15]. The business strategy involves studying the general business presentation; however, the professional will have higher influence in their areas and become sustainable (Morgan N.A., 2012). However, it needs the position of planned and active purposes and the business' established actions to achieve performance. An entrepreneurial strategy seeks a mixture of obtainable infomation; entrepreneurs are additionally knowledgeable concerning the company's position and can build higher choices for crowdsourcing [5]. The impact of efficiency is focused on and innovation business model style is concentrated on the performance of entrepreneurial corporations. The potential markets are of scope in style; that is entrepreneurs' commitment to incorporate each efficiency and innovation (Zott C., Amit R., 2007). Associate degree entrepreneurial strategy within the business approach is extremely abundant and necessary to perpetually live the business performance so winning small businesses become those of sustainable performance. Crowd wisdom for entrepreneurial strategy is a key performance indicator [4] that is a measurable value to demonstrate how effectively a company is achieving key business objectives (Morgan N.A., 2012). The selection of the right strategy depends on the industry size and activities with a marketing environment that has a part of the business that an entrepreneur is looking to track. Each department will use different strategy types to measure success based on specific business goals and targets. To pursue this study on the new entrepreneur, three constructs were selected to measure the entrepreneurial strategy directly. Moreover, it was selected as a key business metric to track in a real-time reporting tool [14]. Therefore, crowdsourcing of an entrepreneurial strategy can be done using a dashboard reporting tool, giving its entire business insights into the current performance. In today's busy and fast-changing business world, businesses need the right strategies to help them succeed and effective tools to help an entrepreneur enhance their strategic ambitions (Zott C., Amit R., 2007).

The most successful businesses today develop strategies toward sustainability that will help them face the challenges of the 4th Industrial Revolution and use leading strategy and planning tools to help strategically develop, monitor, and deliver great strategies (Bouwman, H., Nikou, S., Molina-Castillo, F.J., de Reuver, M., 2018).

After reviewing the literature, only one hypothesis H1 was generated regarding the constructs of crowdsourcing for business strategy and sustainability. The central hypothesis considers a significant relationship between them. Nevertheless, the business strategy is measured with three dimensions that are called second-order constructs of the independent variable (business strategy) towards the dependent variable (sustainability). Therefore, the central hypothesis in this research is:

H1: There is a significant positive relationship between crowdsourcing business strategy and sustainability. The above hypothesis is empirically tested and aligned with crowdsourcing, which entails a big number of scattered students giving their thoughts and completing quick tasks to focus on company strategy that promotes sustainability. To take into consideration the diversity and perceptions among diverse backgrounds, students' invention is of importance while learning from academics. We suggest a structural equation of the controlled proposed approach in this article, with a parabola curve rather than identify not only the liner curve for regression justifications. We create a powerful stochastic nonlinear inference algorithm that scales to very large datasets, and we experimentally show how the suggested model is superior to cutting-edge methods.

Moreover, hypothesis H1 is accumulated to test the relationship traits of crowdsourcing for business strategy and sustainability structurally. Yet, hypothesis H1 is used to test whether crowdsourcing for business strategy and sustainability has quadratic effects; if yes, then what are the quadratic relationships between business strategy and sustainability? Hence, once a component interacts with itself, it is said to have a quadratic effect. Whereas the result is that X is a linear term, XY is an interaction with Y, and X^2 has a quadratic impact [13,14]. However, a structural relationship has been drawn which is a conceptual framework in this research. Therefore, the total effect is examined by the survey data collection using Smart-PLS software to develop the concept. Eventually, the following conceptual framework has shown a structural relationship between exogenous and endogenous variables, where exogenous variables are measured by three dimensions of the second order (Fig. 1).

Purpose. The goal of this research was to scrutinize how business strategy help to increase business sustainability by considering the roles of quadratic effects and the student's Innovation in the formation of business. It is worthwhile to investigate the role of partial least square structural equation modeling (PLS-SEM) in crowdsourcing business strategy approaches toward sustainability.

Methods. This study is conducted with a quantitative approach. Quantitative analysis is estimating essential aspects to
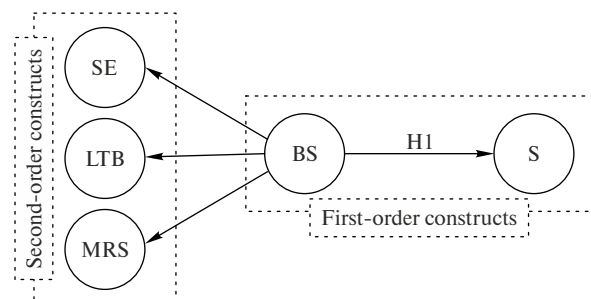

Fig. 1. Conceptual Framework:

SE = selection of environment; LTB = long-term behavior; MRS = managing resources strategically; BS = business strategy; S = sustainability

recover the knowledge domain and measure important aspects relating to the characteristics of management tools to check the hypotheses (Kiefer, C. P., Carrillo-Hermosilla, J., Del Río, P., Callealta Barroso, F. J., 2017). Yet, the strategy is applied for the data collection with survey method. Subsequently, the data collection method was the cross-sectional one of time horizon. Whereas the technique and procedure for the collected data were analyzed with SPSS and Smart-PLS.

Sampling Technique. The data was obtained from primary sources of survey items. The sampling technique used was simple random sampling and research choice selected by mono-method. The target population of Daffodil International University and the respondents were the students of the business administration department, who were concerned about crowdsourcing for business strategy and sustainability. In this study, a sample of students was chosen to estimate business strategy and sustainability. The information obtained from the interviews was then used to evaluate each student's potential as an entrepreneur in terms of creativity, progress, and crowd wisdom. Additional background information on business background enables the students to study topic to identify any potential crowdsourced reasons and aid the students in learning what they need to know. Finally, the strategies were used to collect survey data to answer the research question and create evidence that is consistent across the data methodology.

Data gathering surveys gather information on a certain set of people's attitudes, behavior, or understanding (Chih-Pei, H., Yan-Yi, C., 2017). The survey form was provided online to collect the data. The survey links to the questionnaires were distributed by email to the students. The total number of survey questionnaires received was 233 out of 292. Therefore, response rates were almost 80 % (233/292), and non-response bias was tested in the survey data confirmed. Because the response rates go below 70 %, non-response becomes a serious problem. Non-response bias is not the result of gathering false data but rather the lack of participation (Cull, W. L., O'Connor, K. G., Sharp, S., Tang, S. F. S., 2005; Rahi, S., 2017).

The respondents have to respond sharing their opinion on close-ended questions. Eventually, a total of 218 questionnaires were selected after screening as the final data set. Moreover, all the surveyed items were measured by the Likert scale of 1 to 5 points. Therefore, Likert scale 1 = strongly disagree, Likert scale 2 = disagree, Likert scale 3 = neutral, Likert scale 4 = agree, and Likert scale 5 = strongly agree.

Data Processing Management. Five constructs are demonstrated, under the independent variable of business strategy: selection of environment, long-term behavior, and strategically managing resources. The business strategy is identified as a predictor variable that impacts sustainability. However, PLS-SEM is developing as a statistical modeling technique and it has increased exponentially in social science (Hair, J. F. J., Hult, G. T. M., Ringle, C., Sarstedt, M., 2014; Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). The diversity of disciplines, due to the appreciation of PLS-SEM's unique methodological features makes it a feasible alternative to the more common variance-based SEM approach (Leguina, A., 2015). The entire study is conducted by Smart-PLS software to test the variance-based structural equation modeling to test the quadratic effects. Therefore, in the next section, data is analyzed in several stages, such as descriptive statistics for demographic analysis. The internal consistency is measured by the measurement variables with validity test, and structural model of VB-SEM to explore the hypothesis relationships. Moreover, the identified predictor construct has a quadratic effect on sustainability. The quadratic effect being significant, the predictor variable is tested by using the smart-pls output of path coefficient parameters using the quadratic equation.

Results. *Descriptive Statistics.* Table 1 shows demographic statistics for the respondents' gender and age. As for males, the highest crowd number of participants in the survey were aged

Descriptive statistics for gender and age cross-tabulation

		Age			Percentage, %	Total
		18−20	21−23	24−26		
Gender	male	55	62	47	75	164
	female	4	35	15	25	54
Total		59	97	62	100	218

21−23, both male and female students were 62 and 35. The second highest number of the respondents was aged between 24−26, males and females, respectively, 47 and 15, with a total of 62 students. However, the percentage is the highest for male students at 75 %, whereas for female students make 25 %.

Exploratory Factor Analysis (EFA). One group of multivariate statistical techniques called EFA seeks to isolate the fewest possible hypothetical entities (Jung, S., Lee, S., 2011). However, EFA is a statistical technique used in multivariate statistics to reveal the underlying structure of a sizable group of variables (Henseler, M., Ringle, J., Sarstedt, C. M., 2015; Kiefer, C. P., Carrillo-Hermosilla, J., Del Río, P., Callealta Barroso, F. J., 2017). Therefore, the main objective of EFA, a method used in factor analysis, is to discover the underlying correlations between measured variables (Henseler, M., Ringle, J., Sarstedt, C. M., 2015; Chih-Pei, H., Yan-Yi, C., 2017). In EFA, two tests show if the data are appropriate for structure detection shown in Tables 2 and 3. Nevertheless, a statistic called the Kaiser-Meyer-Olkin Measure of Sampling Adequacy shows in Table 1, how much of the variance in the variables may be due to underlying causes. KMO is a test used to gauge how strongly the variables' partial correlations are correlated (Hadia, N. Ul, Abdullah, N., Sentosa, I., 2016). KMO levels around 1.0 are excellent, whereas those below 0.5 are deemed unsatisfactory [15] (Cull, W. L., O'Connor, K. G., Sharp, S., Tang, S. F. S., 2005; Rahi, S., 2017; Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). However, the value of KMO is 0.86, which shows 86 % of sample adequacy generating the correlations between the measured variables with a significant level at 0.000, which is less than 0.05. Therefore, KMO and Bartlett's test of Sphericity allows testing the further analysis.

The main result of principal components analysis is the rotated component matrix, often known as the loading (Fincham, D., Schickerling, J., Temane, M., Nel, D., De Roover, W., Seedat, S., 2008). In contrast, estimates of the correlations between every variable and the estimated components are included. It is identified what the components stand for using the rotatable component matrix. In the EFA critique, the value of measured items is 0.50 to 1 showing that the component matrix displays the items' and the components' Pearson correlations (Vilkaite-Vaitone, N., Skackauskiene, I., Díaz-Meneses, G., 2022). However, the entire measured variables reached more than 0.50 as displayed in Table 3. Therefore, the component matrix permitted the next analysis of the reliability and validity test of the measured variables.

Reliability and Validity Analysis. Concepts like validity and reliability are used to assess the caliber of the research (Iqbal, M. M., Mia, M. M., 2020) (Table 4). It demonstrates how effectively a methodology, method, or test measures

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.86
Bartlett's Test of Sphericity	Approx. Chi-square	1593.85
	df	120
	Sig.	0.000

Rotated Component Matrix[a]

	Component			
	1	2	3	4
SE1	0.796	–	–	–
SE2	0.827	–	–	–
SE3	0.839	–	–	–
SE4	0.757	–	–	–
MRS1	–	0.789	–	–
MRS2	–	0.790	–	–
MRS3	–	0.825	–	–
MRS4	–	0.749	–	–
LTB1	–	–	0.709	–
LTB2	–	–	0.791	–
LTB3	–	–	0.768	–
LTB4	–	–	0.783	–
S1	–	–	–	0.646
S2	–	–	–	0.676
S3	–	–	–	0.809
S4	–	–	–	0.772

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations

Reliability and validity test

	Mean	Standard deviation	Corrected Item − Total Correlation	Cronbach's Alpha		N
SE1	4.21	0.87	0.72	0.83	0.87	218
SE2	4.20	0.88	0.75	0.82		218
SE3	4.17	0.92	0.75	0.82		218
SE4	4.20	0.84	0.66	0.85		218
MRS1	4.20	0.88	0.73	0.83	0.86	218
MRS2	4.20	0.88	0.74	0.82		218
MRS3	4.17	0.92	0.75	0.82		218
MRS4	4.20	0.84	0.66	0.85		218
LTB1	3.72	0.84	0.52	0.79	0.80	218
LTB2	4.03	0.85	0.69	0.71		218
LTB3	4.22	0.84	0.65	0.73		218
LTB4	3.94	0.95	0.61	0.76		218
S1	3.75	0.98	0.57	0.73	0.78	218
S2	4.05	0.99	0.57	0.73		218
S3	3.89	0.97	0.60	0.71		218
S4	3.79	0.99	0.58	0.72		218

something (Leguina, A., 2015; Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). Validity is concerned with measurement's accuracy, whereas reliability is concerned with a measurement's consistency (Jung, S., Lee, S., 2011). In social science, the range of Cronbach's alpha 0.90 and above is great, 0.80–0.89 – good, below 0.70, there may be limited application; 0.70–0.79 acceptable (Ferguson, E., Cox, T., 1993; Fincham, D., Schickerling, J., Temane, M., Nel, D., De Roover, W., Seedat, S., 2008; Hadia, N. Ul, Abdullah, N.,

Sentosa, I., 2016; Kamal, I., Rahman, A., Mia, M. M., 2020). Table 4 shows that the reliability of each Cronbach's alpha is more than 0.70. However, mostly the measured variable is achieved being higher than 0.80, which is good for the accuracy of the measurement's consistency. Yet, all constructs are good with the value of Cronbach's alpha more than the acceptable range which is allowed to do further analysis such as the structural equation model (SEM).

Partial Least Square Structural Equation Model (PLS-SEM). The PLS-SEM has two common standard algorithms; the first element is the PLS algorithm, and the second element is PLS bootstrapping [15,16], (Jung, S., Lee, S., 2011; Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). Therefore, the variance-based PLS path modeling method was developed on the principle that the PLS algorithm is a structure of regressions in terms of weight paths (Wold, H., 1982). The weight paths have achieved convergence satisfying the fixed-point equations for a general examination of the equations (Dijkstra, T. K., 2010). However, PLS attains slightly greater statistical power in approaching a model in path analysis (Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Thiele, K. O., 2017).

PLS-SEM Algorithm. The PLS-SEM algorithm is essentially a series of regressions using weight vectors (Kroonenberg, P. M., Lohmoller, J.-B., 1990). However, at convergence, the weight vectors fulfill fixed point equations [15,17]. In the following Fig. 2, quality phases are part of the recommended and used basic PLS algorithm in SmartPLS, such as r-square, f-square, construct reliability and validity, and discriminant validity [14], (Morgan N. A., 2012; Santos, J. R. A., 1999). Yet, Fig. 2 demonstrates the quadratic effects (QE) between business strategy and sustainability. The quadratic effects have identified the relations as a moderating effect at −0.06 with 0.30, meaning 30 % influenced by business strategy. However, crowdsourcing for business strategy and sustainability are positively correlated. Secondly, the factor loadings achieved more than the desired value of 0.70 for each latent variable for their items. Eventually, the regression coefficients in PLS are known as the "beta" values, and they are multiplied by *X* data to produce anticipated *Y* data (Henseler, M., Ringle, J., Sarstedt, C. M., 2015). Indeed, the second-order constructs are highly reached and reflected with crowdsourcing for the business strategy through SE, LTB, and MRS, respectively beta (β) is 0.80, 0.69, and 0.83. Therefore, path coefficients of three dimensions with beta values feature high correlations with the impacts of the business strategy plan with crowdsourcing [8]. Nevertheless, three dimensions confirmed the first-order latent construct measured for the business strategy influenced by crowdsourcing [5]. Subsequently, we explore the following quality criterion estimates of r-square, f-square, construct reliability and validity, and discriminant validity of basic pls algorithm.

R-Squared (R^2). In a regression model, R^2, also known as the coefficient of determination, is a statistical metric that quantifies how much of the variation in the dependent variable can be accounted for the independent variable (Tucker, L. R.,
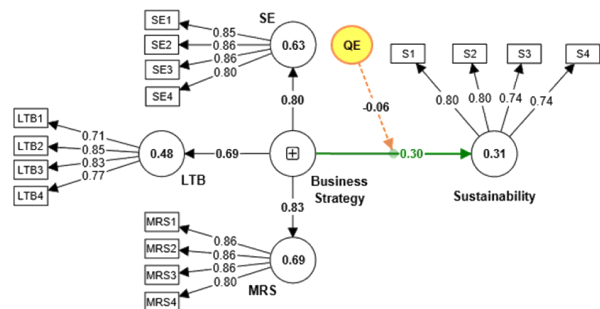

Fig. 2. Path coefficient model

Lewis, C., 1973; Heale, R., Twycross, A., 2015). R^2, thus, displays how well the crowd data match the regression model and the goodness of fit. The range of R^2 values is 0 to 1 (Tucker, L. R., Lewis, C., 1973; Wheaton, G. F., Muthén, B., Alwin, B., Summers, D. F., 1977). R^2 is most frequently used to determine how well a regression model explains the observed data. Predictive models should typically avoid having low r-squared values [18, 19]. In Table 5, the statistic shows the proportion of the dependent variable's variation that the independent variables account for collectively. The crowdsourcing for the business strategy has been identified with three latent first-order constructs influenced by its measured variables that are accounted as the path coefficient of determination of 0.48, which is 48 % for LTB. The second dimension of MRS achieved is 0.69, which is 69 % — the highest level among the dimensions influenced by the measured variables. Eventually, the second highest SE dimension accounted for 0.63, which is 63 % — the proportion of the dependent variable by the measured variable. Therefore, the first-order constructs have been demonstrated by three variables, which are a selection of environment, long-term behavior, and management resources; strategically, the R^2 values fit well for the prediction of second-order constructs and goodness of fit [18].

Subsequently, the dependent variable accounted for 31 % (0.31) by a predictive variable of business strategy with quadratic effects. Therefore, the quadratic effect of the QE variable has been supported and the coefficient determination is quantified as statistically significant for business strategy construct on sustainability [15].

F-square (f^2). An f^2 is often used to guarantee that the effect size is generalized to the crowd population of items from which the items were pulled, which further suggests that the impact is relatively specific throughout items (Wold, H., 1982; Tiira, K., Lohi, H., 2014). Effect size is a quantifiable measure of the discrepancy between evidence and a certain hypothesis; therefore, the suitable formula for computing the effect size is f-square (Cohen J., 1988). However, the crowd numbers are considered small if the value of $f^2 \geq 0.15$ and too large once the value of $f^2 \geq 0.35$ impact sizes (Wold, H., 1982; Morgan N. A., 2012). However, the effect size is 0.40 between business strategy and sustainability of the central hypothesis H1. Therefore, the effect size of hypothesis H1 is true because the size of the effect is 0.40, which is impacted by the large effect size greater than 0.35. Eventually, statistical significance is essentially the likelihood of the data found on a hypothesis H1 that is statistically correct by its effect size for the conceptual model.

Constructs Reliability and Validity. In the following Table 6, the survey data is calculated with Smart-PLS software to develop the output of four constructs for their internal consistency parameters. However, Table 6 shows a matrix of Cronbach's alpha, rho_A (reliability coefficient), composite reliability, and average variance extracted (AVE) accordingly. Cronbach's alpha is desirable at ≥ 0.70 (Dijkstra, T. K., 2010); however, the independent variable with three dimensions is achieved at > 0.80, whereas the dependent variable is 0.78. Therefore, it is identified within an acceptable range greater than 0.70 of internal consistency of Cronbach's alpha values [20, 21]. Likewise, the value of rho_A, composite reliability, and AVE should be more than 0.70, which is confirmed by the

reliability of the measured variables [22], (Hair, J. F. J., Hult, G. T. M., Ringle, C., Sarstedt, M., 2014). However, the AVE value is 0.59, which poorly fits sustainability. Indeed, this value is not problematic, whereas the collinearity statistics (VIF) for an outer model of each measured variable are less than 2 as VIF Table 6 shows. Therefore, VIF confirmed that sustainability is not an issue of collinearity statistics.

Discriminant Validity. The following Tables 7, 8 and 9 explore construct discriminant test that has achieved the desired value accordingly. The main condition for discriminant validity is that each model's latent construct accounts for more variance in its pointers than what is shared with other constructs of the model (MacKenzie, S. B., Podsakoff, P. M., Jarvis, C. B., 2005). There is a rule of thumb in the discriminant validity; items of a scale must load powerfully on the intended construct and poorly on unintended constructs (Gefen, D., Straub, D., 2005). However, these test results of the discriminant validity of constructs are calculated by examining the cross-loadings of all indicators, which are usually used as techniques to evaluate the discriminant validity [23]. The way to check discriminant validity in partial least squares through three common criteria is HTMT (Heterotrait-Monotrait), Fornell-Larcker criterion, and cross-loadings [18].

Therefore, the first discriminant validity is HTMT, Table 7 shows a lack of discriminant validity by HTMT scores that are near 1 [18]. But comparing the HTMT to a predetermined threshold is necessary when using it as a criterion and when there is a lack of discriminant validity if the HTMT value is higher than 0.90 [24]. However, in the crowdsourcing for the business strategy row, there is only one criterion that becomes more than 0.90. Yet, the rest of the value is less than 0.90 of the entire values; therefore, HTMT criterion confirmed that there is no discriminant validity.

One of the most often used methods for evaluating the discriminant validity of measurement models is the Fornell-Larcker criteria [24]. The square root of the average variance retrieved by a construct must meet this requirement, and it must also be bigger than the correlation between the construct and any other construct [14], (Morgan N. A., 2012). Table 8 shows the Fornell-Larcker criterion correlations between the constructs which are higher than those of each row except in the business strategy, which its dimensions have measured.

Table 6

Construct reliability and validity

Constructs	Cronbach's α	rho_A	Composite reliability	The average variance extracted (AVE)
Business strategy	0.87	0.88	0.89	0.41
SE	0.87	0.87	0.91	0.71
LTB	0.80	0.82	0.87	0.63
MRS	0.87	0.87	0.91	0.72
Sustainability	0.78	0.79	0.85	0.59

Table 5

R-square matrix

	R-square
LTB (long-term behavior)	0.48
MRS (manage resources strategically)	0.69
SE (selection environment)	0.63
Sustainability	0.31

Table 7

Discriminant validity-HTMT ratio

Constructs	Business strategy	LTB	MRS	SE	Sustainability
Business strategy	0.00	—	—	—	—
LTB	0.87	—	—	—	—
MRS	0.93	0.45	—	—	—
SE	0.90	0.40	0.54	—	—
Sustainability	0.63	0.45	0.58	0.45	—

Table 8

Discriminant validity – Fornell-Larcker criterion

Constructs	Business strategy	LTB	MRS	SE	Sustainability
Business strategy	0.64	–	–	–	–
LTB	0.69	0.79	–	–	–
MRS	0.83	0.38	0.85	–	–
SE	0.80	0.34	0.47	0.85	–
Sustainability	0.53	0.36	0.48	0.39	0.77

Table 9

Discriminant validity – Cross loadings

Items	LTB	MRS	SE	Sustainability
LTB1	0.71	0.26	0.20	0.22
LTB2	0.85	0.37	0.31	0.32
LTB3	0.83	0.34	0.31	0.34
LTB4	0.77	0.23	0.23	0.25
MRS1	0.38	0.86	0.42	0.42
MRS2	0.31	0.86	0.43	0.45
MRS3	0.28	0.86	0.43	0.38
MRS4	0.34	0.80	0.32	0.38
S1	0.30	0.47	0.32	0.80
S2	0.28	0.38	0.43	0.80
S3	0.26	0.31	0.16	0.74
S4	0.28	0.30	0.24	0.74
SE1	0.31	0.43	0.85	0.39
SE2	0.31	0.40	0.86	0.32
SE3	0.24	0.42	0.86	0.27
SE4	0.29	0.35	0.80	0.33

Table 10

Collinearity statistics (VIF) – Outer model

Items	VIF
LTB1	1.41
LTB2	1.91
LTB3	1.78
LTB4	1.63
MRS1	2.17
MRS2	2.37
MRS3	2.30
MRS4	1.79
S1	1.50
S2	1.51
S3	1.59
S4	1.54
SE1	2.15
SE2	2.37
SE3	2.32
SE4	1.79

Nevertheless, the measurement model is confirmed by the Fornell-Larcker ratio indicating no lack of discriminant validity and it has been established.

Let us check the final discriminant validity by using the cross-loadings shown in Table 9. According to cross-loadings, compared to other constructs in the research, a given item should have larger loadings on its parent construct [14], (Morgan N. A., 2012). However, the following Table 9 shows that no cross-loadings are found in each item under the constructs. Therefore, the cross-loading has established the discriminant validity.

Collinearity statistics. A set of multiple regression items' variance inflation factor (VIF) is an estimate of how multicollinear they are (O'Brien, R. M., 2007). The VIF for a linear regression variable is mathematically equivalent to the ratio of the variance of the whole model [19], (Morgan N. A., 2012). Generally speaking, multicollinearity may occur, and additional research is necessary if the VIF is greater than 4 or the tolerance is lower than 0.25 (O'Brien, R. M., 2007). In addition, severe multicollinearity must be adjusted when VIF is more than 10 or tolerance is lower than 0.10 [19, 20]. However, Table 10 shows there are no collinearity issues found in the outer model. Yet, the value is between less than 4 and greater than 0.10. Eventually, no multicollinearity issues are found in the model in the measured variables.

Path Model. The structural equation models (SEM) are usually used for theory testing, predictive analytics, and the ability of SEM to keep theoretical reliability in the perspective of predictive modeling, classifying how the best to guess from SEM, which is significant [21, 25]. By achieving composite re-liability, convergent validity, and t-statistics with p-value are naturally higher discovering of PLS-SEM, other metrics such as discriminant validity and beta coefficients are similar [26], (Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). For example, the following Fig. 3 of bootstrapping variance-based t-statistics has executed each measured variable. Variables are more than the cut-off point and greater than 1.96 with p-values less than 0.05. However, if the desired value of t-statistics is ≥ 1.96 then the p-value becomes significant at ≤ 0.05 (Hair, J. F., Matthews, L. M., Matthews, R. L., Sarstedt, M., 2017). Nevertheless, in Fig. 3 a quadratic path effect is a significant impact between business strategy and sustainability. Whereas, the QE (quadratic effect) effect of t-statistics demonstrated 2.32, which is greater than 1.96, and the p-value is less than 0.05. Therefore, crowdsourcing for business strategy and sustainability has a quadratic effect that is statistically significant with a positive relationship.

Table 12 shows the path coefficient of quadratic effects of the t-statistics between the constructs of the hypothesis relationship and the first-order constructs. For example, for the central hypothesis H1 the t-value is 3.45, and the p-value is 0.00 between the business strategy → sustainability. Therefore, the t-value is > 0.196 and the p-value is < 0.05, a statistically

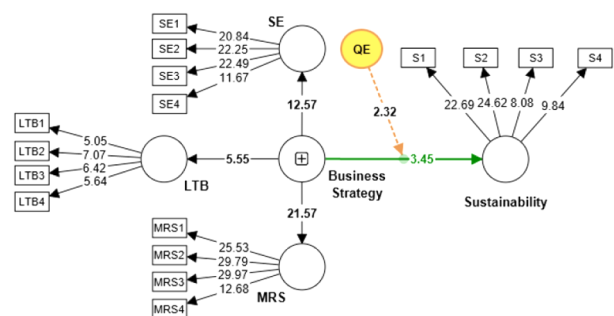*Fig. 3. Hypothesized path model*

positive and significant association influenced by the quadratic effects. However, the quadratic effects show the t-statistics 2.32 with a p-value is 0.02, which is demonstrated as greater than 1.96 and less than 0.05 of the p-value by the crowd number of respondents. Nevertheless, the central hypothesis of H1 is accepted with quadratic effects. Eventually, hypothesis H1 is also accepted without quadratic effects in Fig. 4.

Indeed, the second-order construct of long-term behavior (LTB) is significant and positively associated with business strategy → LTB. Whereas the t-value is 5.55 with a p-value is 0.00. The second dimension of the second-order construct, managing resources strategically (MRS) is significant. The t-value is 21.57 and the p-value is 0.00, which is a positively measured business strategy. Finally, the selection of environment (SE) is also restrained by statistically and positively significant measures of the business strategy, whereas the t-value is 12.57 and the p-value is 0.00. Eventually, the second-order constructs of three dimensions reflected positively significant measures of crowdsourcing for the business strategy. Therefore, business strategy is confirmed by its three dimensions as the independent variable.

Nevertheless, the conceptual framework Fig. 3 shows the two main variables, the independent variable, and the dependent variable. Fig. 3 displayed an independent variable measured with three dimensions. However, as mentioned earlier in the introduction part the research objective is to identify the quadratic effects between crowdsourcing for business strategy and sustainability rather than linear effects only. Indeed, the quadratic effects are already demonstrated between business strategy and sustainability. Therefore, QE effects positively and significantly influenced independent and dependent variables through its crowd wisdom which was the collective opinion of crowdsourcing impact on sustainability [5].

Conclusions. In this study, with the data analysis on the above results of Table 11, the conceptual model has supported crowdsourcing through bootstrapping on the variance based-structural equation model. The research objective has found that the relationships are positively related to quadratic effects on sustainability. There is a significant approach by empirical crowd data of business strategy which initiates from the growth for long-term performance. Yet, three dimensions of second-order constructs were tested, and the results were accepted to measure the business strategy of crowdsourcing. Furthermore, all measured variable parameters have a good fit to the latent constructs. As a result, the conceptual model was statistically validated and discovered via the first-order construct of the exogenous variable with the quadratic impacts variable towards endogenous variables that are positively influenced by business strategy and sustainability.

Nonetheless, the research has pointed to a positive strategy influencing crowdsourcing for company strategy as a quadratic effect of moderating role toward sustainability. As a result, the output in Fig. 5 demonstrates this effect, whereas the business strategy can make a more dynamic business sustainable.

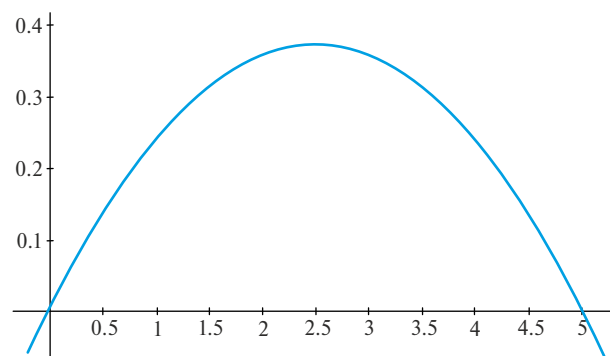Indeed, the parabola looks up of $y = f(x) = -x^2$, and the

Fig. 4. Path coefficient with t-statistics of the inner model without quadratic effects

Table 11

Path coefficients with quadratic effects

	Original sample	t-statistics	p- values	Remark
Business Strategy → LTB	0.69	5.55	0.00	Accepted
Business Strategy → MRS	0.83	21.57	0.00	Accepted
Business Strategy → SE	0.8	12.57	0.00	Accepted
Business Strategy → Sustainability	0.3	3.45	0.00	H1 accepted
QE (Business Strategy) → Sustainability	−0.06	2.32	0.02	Accepted

Fig. 5. Parabola curb of quadratic effects

graph will look like the positive curb in the following figure, whereas the point of degree x^2 is quadratic. However, the following graph is displayed from the equation of $y = -0.06x^2 + 0.30x$. Nevertheless, with a quadratic effect, the value is −0.06 and the business strategy is 0.30 influenced towards sustainability by its crowdsourcing. As a result, the research gap is represented by the research question, which states that crowdsourcing for company strategy influenced considerably beneficial associations with sustainability. Eventually, the students will have crowd wisdom that will aid them in their commercial success through knowledge innovation from the institution where they learnt.

However, since the graph is not linear, the aforementioned graph (Fig. 5) is not a straight line. However, x has two roots: the first is 0 and the second is positive 5. When x is 0, it means one root, negative means no root, and positive means two roots [14, 22], (MacKenzie, S. B., Podsakoff, P. M., Jarvis, C. B., 2005). Moreover, when the value of the path coefficient is decreased, the curb is wider, and when the path coefficient is increased, then the curb is narrow. Subsequently, the quadratic effects of the path coefficient are negative (−0.06) indicating the curb is wider, as Fig. 5 shows. Therefore, crowdsourcing for the business strategy has a quadratic effect that is demonstrated with the predicted variable toward sustainability by a wider curve with two roots. Yet, the two roots are positive parabola curves for the equation of $Y = -0.06x^2 + 0.30x$. In contrast, the quadratic effect of the path coefficient (β) numerical value is −0.06 and for the business strategy and sustainability, the β value is 0.30 for regression equation. Eventually, the prediction is identified and statistically significant. Therefore, crowdsourcing for business strategy has a quadratic effect on sustainability, identified through a large number of students' opinions. Being applied at the very beginning of the business to make a successful entrepreneur, heterogeneity and viewpoints are essential for selection of environment, long-term behavior, and management resources strategically for sustainability. Students can use crowdsourcing methods to generate unique knowledge for their contemporaries and lead-
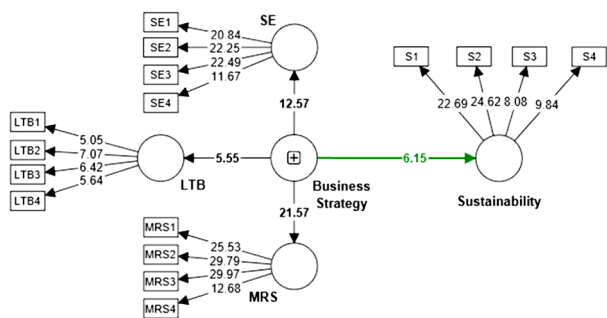
ing technologies of the journey while also deepening their knowledge of the subjects.

It is worth looking into the role of partial least square structural equation modeling (PLS-SEM) in crowdsourcing business strategy approaches to sustainability. We did quantitative research to achieve these objectives, which included first-order by three dimensions of company strategy for analyzing the reflecting model. Whereas business strategy has led to the development of sustainable model innovation, the presence of a linear effect and a positive parabolic effect was statistically significant. Ultimately, business strategy does have an influence on sustainability that is both linear and parabolic. These outcomes have implications for how potential entrepreneurs run their enterprises to increase sustainability.

The limitations are caused by the fact that the sample represented only one university. Additionally, data were gathered at a private university. It is crucial to reproduce this study in many settings, like most other studies. Sampling errors arise whenever a sample is chosen using a simple probability sampling approach but does not accurately represent the target population. In a nutshell, the study has "sampling bias" or "collection bias" limitations. Further, this study supports the use of the formative-based structural equation model by validating its theory and, specifically, by evaluating the confirmatory factor examination. Practical ramifications are as follows: business strategy is adopted by many businesses, and a strategic plan is needed to support crowd knowledge on individual implementations of collective crowdsourced behaviors and practices. To increase creativity and efficiency in the direction of sustainability, this article supports the idea that business strategy is important for aspiring entrepreneurs.

Furthermore, a significant addition to this research's approach to the problem is the framing of business strategy for the new business planners as knowing the needs. However, this study may have some drawbacks. One is experimental, and the other is purposeful perspective sampling constitutes the foundation for the outcome predictions in the model. In contrast, sampling techniques might be more helpful for future studies, such as stratified or cluster sampling, to engage a wider target population. Additionally, the research proposes future lines with confirmatory factor analysis to confirm the latent constructs are statistically covariance relations among them. Yet, confirmatory factor testing validates the analysis, including the covariance-based structural equation model (CB-SEM).

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Краудсорсинг для бізнес-стратегії та сталого розвитку: модель структурного рівняння часткового найменшого квадрата

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Мета. Мета цього дослідження полягала в тому, щоб вивчити, як бізнес-стратегія допомагає підвищити стійкість бізнесу, ураховуючи роль квадратичних ефектів та інновацій студентів у формуванні бізнесу. Варто дослідити роль часткового моделювання структурних рівнянь найменших квадратів (PLS-SEM) у підходах краудсорсингових бізнес-стратегій до стійкості.

Методика. Для досягнення зазначених цілей проведене кількісне дослідження, що включало перший порядок за трьома вимірами бізнес-стратегії для аналізованої рефлексивної моделі. Щоб зібрати кількісні дані й визначити фактори прогнозу, що впливають на стійкість, пов'язану з квадратичними ефектами, була застосована ретельна дослідницька стратегія PLS-SEM.

Результати. Учасники (N = 218), які навчаються в Міжнародному університеті Daffodil (DIU) у Бангладеш, взяли участь в онлайн-опитуванні. Отримані дані свідчать про те, що намір студентів DIU щодо бізнес-стратегії усвідомлює потенційні зміни та що вони почали будувати внутрішні процеси, орієнтовані на сталість. Крім того, конструктами першого порядку є вибір середовища, довгострокова поведінка та стратегічна участь ресурсів управління в бізнес-стратегії, що мають позитивний зв'язок зі значним впливом на стійкість бізнесу. У той час як бізнес-стратегія сприяла формуванню інноваційної моделі стійкості, наявність лінійного ефекту й позитивного ефекту параболи була статистично значущою. Нарешті, бізнес-стратегія має сприятливий вплив на сталість як з лінійним, так і з параболічним ефектом.

Наукова новизна. Доведено, що бізнес-стратегія сприяла формуванню інноваційної моделі стійкості, а наявність лінійного ефекту й позитивного ефекту параболи була статистично значущою. Як результат, бізнес-стратегія має сприятливий вплив на сталість як з лінійним, так і з параболічним ефектом. Отримані результати впливають на те, як потенційні підприємці керують своїм бізнесом, щоб покращити стійкість.

Практична значимість. Отримані результати свідчать, що бізнес-стратегія є важливою для підприємців, які прагнуть підвищити креативність і ефективність у напрямі сталого розвитку.

Ключові слова: *краудсорсинг, бізнес-стратегія, стійкий розвиток, моделювання структурними рівняннями*