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Article

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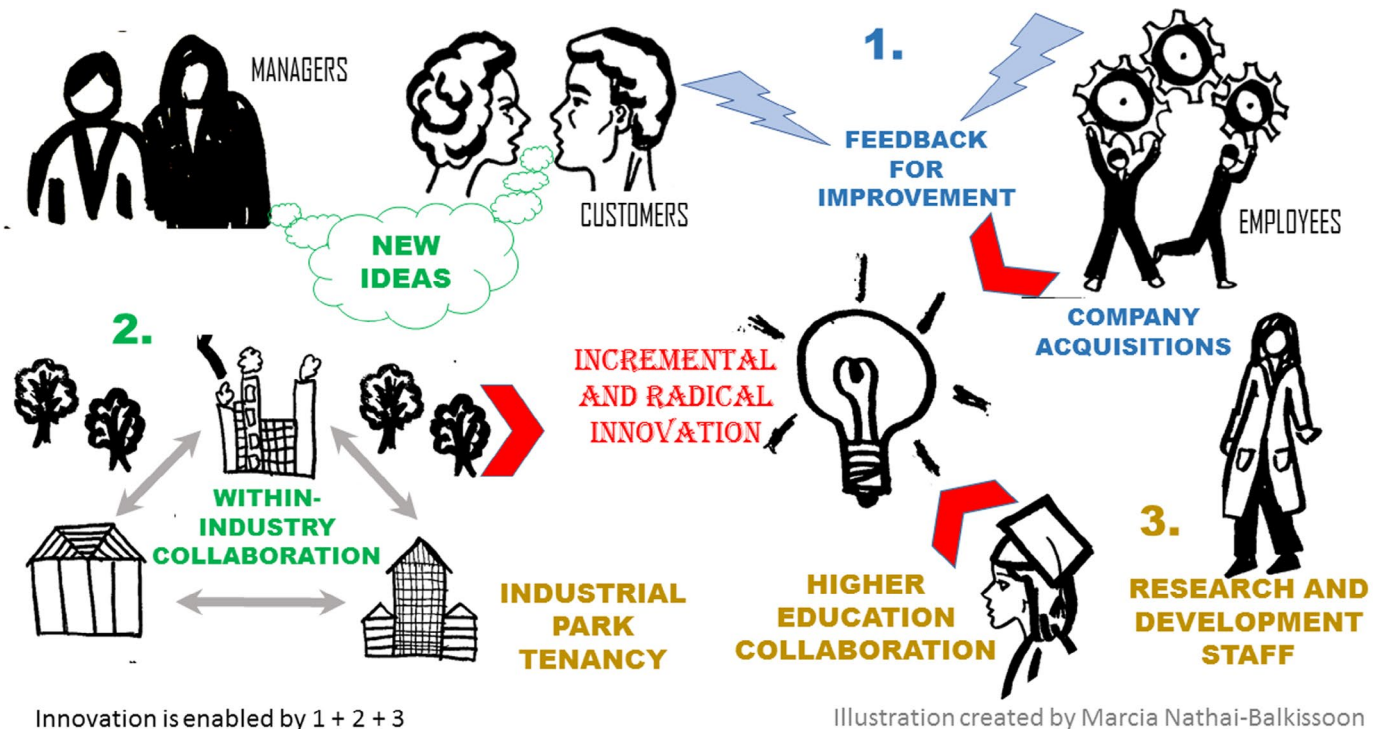
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MANAGEMENT | RESEARCH ARTICLE

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MANAGEMENT | RESEARCH ARTICLE

Pilot development of innovation scales for beverage manufacturing companies in a developing country

Marcia Nathai-Balkissoon^{1*}, Chris Maharaj², Rafael Guerrero³, Rydell Mahabir² and Isaac Dialsingh³

Abstract: Innovation can enhance economic success for companies and countries alike. This study identified innovation drivers for beverage manufacturing companies in the developing nation, Trinidad and Tobago (T&T). Factor analysis using principal components analysis was applied to self-reported data from 14 beverage manufacturers, organising 10 influencing variables into 3 components that impacted on the companies' innovation. Component 1 addresses the role of company acquisitions, customer feedback and employee feedback regarding product improvements, Component 2 deals with the value of same-industry company collaborations and new ideas proposed by managers or customers and Component 3 focuses on supporting research and development through industrial park tenancy, hiring R&D personnel and higher education collaboration. Findings are discussed in the context of several characteristics of innovation in T&T, including the observed tendency of companies to practice incremental as opposed to radical innovation. Management recommendations to boost innovation include leveraging government policies, developing external collaborations, making management systems more innovation-focused, enhancing employees' innovation competencies, focusing on actively generating new ideas to drive radical innovation and embedding innovation targets and performance measures into routine operations. Prospects for further research include studying how innovation is supported or hindered by within-industry collaboration in developed vs. developing countries.

ABOUT THE AUTHORS

The authors are engineering, management and statistics lecturers and students. Their research interests range from waste and asset management to industrial engineering and safety management to statistical modelling. The group's collaboration on this paper arose from a shared interest in system evaluation and improvement, as well as innovation management, which they recognise as important for the growth and long-term economic well-being of developing nations. This paper presents findings about factors that support incremental and radical innovation in beverage manufacturing companies in the developing nation, Trinidad and Tobago, and makes recommendations for managers to boost innovation in their own companies. Continuing research will seek to understand how influencing factors vary with industry sectors, and recommend how policy and practice should better target innovation in developing nation contexts.

PUBLIC INTEREST STATEMENT

How can companies in developing nations become more innovative and help their countries' economies? This paper reveals some of the things that encourage innovation in beverage companies. First, it found that companies are more innovative if they improve products by listening to their employees and customers, and if they invest in items that help them work better. Second, it found that new ideas from customers and managers, as well as working together with other beverage companies helped with entirely new creations. Third, it was important to focus on research and development specifically, and this could happen when a company was housed in an industrial park, hired R&D staff, and worked with universities to do research. Managers can encourage innovation by gathering big new ideas, encouraging smaller improvements, making room for regular research and development work, taking advantage of government funding, and measuring the innovations their companies create.

Subjects: Industrial Engineering & Manufacturing; Manufacturing & Processing; Development Policy; Business, Management and Accounting; Strategic Management; Management of Technology & Innovation; Innovation Management; Small Business Management; Manufacturing Industries; Food Manufacturing & Related Industries

Keywords: innovation; beverage company; beverage manufacturing; principal components analysis; PCA; SPSS analysis; Trinidad and Tobago; T&T; developing country; small island developing state

1. Introduction

For the twin-island Republic of Trinidad and Tobago (T&T), innovation has the potential to support diversification of its oil-and-gas-dependent economy (Beales, 2013; Sorias, 2015; T&T's first innovation centre to open in August, 2014), boost economic growth (Galindo & Méndez-Picazo, 2013), enhance international competitiveness and engender creative values and competencies in citizens (Paul, 2017). Though T&T has sought to grow its innovation capability for many years, the Global Innovation Index ranked the country at just 80 out of 141 countries in 2015 (Dutta, Lanvin, & Wunsch-Vincent, 2015) and 91 in 2017 (Dutta, Lanvin, & Wunsch-Vincent, 2017). Also in 2015, the country's Draft National Innovation Policy noted its concern that, among other things, innovation in the manufacturing sector had declined, and lamented the "lack of a common understanding of the innovation concept" (Trinidad and Tobago. Ministry of Planning and Sustainable Development, 2015, p. 14).

The T&T government has led the innovation thrust in several ways over the years. These have included the development of a national policy on science and technology between 1995 and 2001 (Swift, 2017b), the Prime Minister's award for innovation and invention which began in 2000, establishment of a Council for Competitiveness and Innovation in 2011 (Trinidad and Tobago Economic Development Board, 2011), identification of priority sectors for development starting as early as 2011 (WIPO, 2015), innovation support via the National ICT Plan 2012–2016 (Trinidad and Tobago. National Information and Communication Technology Company Limited [iGovTT], 2012), the provision of loans, training, and incubator services from the National Entrepreneurship Development Company Limited (NEDCO) and an innovation incubation thrust coordinated out of the Office of the Prime Minister and in collaboration with the Caribbean Industrial Research Institute (CARIRI) in 2013. Innovation policy development seems to have begun around 2005 (Swift, 2017b) and the most recent iteration, a National Innovation Policy has been submitted for cabinet approval alongside the country's strategies for national development and diversification (Paul, 2017), with a detailed consultation process having been included at an Innovation Conference (Economic Development Advisory Board [EDAB], 2016). Despite so many initiatives, T&T innovation has not progressed enough when evaluated on a global level.

The T&T manufacturing sector employs a disproportionately large portion of the labour force compared with all other sectors, and it is a prime development prospect for the country (Anatol, 2012; Sanders, 2013). Developing nations like Malaysia, China, India and Kenya have been recognised for excellent manufacturing innovation achievements that have bolstered their economies in the past several decades, and were considered innovation outperformers in the 2015 Global Innovation Index. Interestingly, the report also advised countries that "micro- and small businesses play an above average role for the broader economy, and potentially for innovation too" (Dutta et al., 2015, pp. 6–7). Indeed, it has been recognised that T&T's innovation thrust will include a focus on SMEs, because of their "potential to increase economic growth, employment opportunities and social development" (Ramkissoon-Babwah, 2013, p. 63). Further, it has been estimated that at least 10,000 exporting, innovation-driven SMEs are needed to create a buoyant T&T economy (Copeland, 2017). Considering the T&T manufacturing sector's relatively high employment rate and the ability of the manufacturing sector in several other developing countries to bolster challenged economies when invigorated by innovation, driving innovation in the T&T manufacturing sector appears not just reasonable but wise.

In line with the desire to support innovation policy and practice for manufacturing in T&T, the authors wanted to better understand the elements that boost innovation. Unfortunately, as pointed out by Ramkissoon-Babwah (2013), innovation research is lacking in T&T, and there are few insights into company innovation culture and practices. It has been recommended that countries should tailor their innovation approaches to their unique contexts and needs (The Organisation for Economic Co-operation and Development [OECD], 2015) but there are few empirical insights into which factors drive innovation within T&T's manufacturing sector or what actions would encourage company innovation. In Trinidad and Tobago, the food and beverage industry is the most vibrant manufacturing subsector (Exploring New Markets for T&T's Products's, 2013). More recently, the 2017 Just Drinks Confidence Survey predicted a challenging operating environment especially for beverage companies, so this sub-group would benefit from a better understanding of the factors that might enhance innovation (Heneghan, 2017). Thus, the authors chose to carry out principal components analysis (PCA) to identify innovation drivers in a group of small and medium beverage manufacturing companies in T&T. Further innovation studies will be conducted in other manufacturing subsectors in the future.

2. Method

2.1. Survey questionnaire

The survey questionnaire was structured based on the 17 variables that have been listed below, along with their parenthesised codes used later in the analysis stage of the research. A brief rationale for variable selection follows in the next paragraph.

- (1) What type of company acquisitions had been recently made (AqCp)
- (2) How employee feedback about product improvement was collected (EFbk)
- (3) The extent to which employees used the systems to give feedback (UEFbk)
- (4) How customer feedback about product improvement was collected (CFbk)
- (5) The extent to which customers used the systems to give feedback (UCFbk)
- (6) The degree to which management were involved in product generation (MgInPG)
- (7) Whether the company had agency collaborations for innovation-development (CPID)
- (8) Whether the company had collaborated with higher education institutions in doing research and development work (CRD)
- (9) Whether the company held tenancy status in an industrial park (TSIP)
- (10) Whether the company had hired personnel to support its R&D work (PRD)
- (11) Number of management-initiated new product ideas proposed in past 2 years (NIdMg)
- (12) Number of customer-initiated new product ideas proposed in past 2 years (NIdCFbk)
- (13) Number of collaborations with other beverage companies in past 2 years (CCpB)
- (14) Number of collaborations with different companies in past 2 years (CCpD)
- (15) Number of improved products in past 2 years (NImP)
- (16) Number of new jobs due to improved products in past 2 years (NJImP)
- (17) Increased customers due to improved products in past 2 years (PCIImP)

2.1.1. Internal and external ideas as innovation drivers

Sakkab (2002) observed that internal ideas might not drive innovation as much as external ideas, so that development might be dependent on a firm's ability to make external connections. Since they interact directly with company products, it is customers who understand the product's strengths and weaknesses, and are best positioned to provide inputs that spark company innovation (Meik & Brock, 2016; Verleye, 2015). Hamel and Tennant (2015) also pointed out that managers and employees are excellent drivers of innovation, as they can perceive needs and opportunities from the

perspectives of both company and customer. Therefore, the survey looked at considerations such as the extent to which the company used internal ideas from employees (variables 2 and 3) and managers (variable 6) and external ideas from customers (variables 4 and 5).

2.1.2. Collaboration and innovation system enablers as innovation drivers

Also, it is an increasingly held view that innovation is much less likely to be the achievement of a solo visionary, and much more likely to be the result of learning and collaborative work with innovation-system enablers and iterative efforts to improve existing (and sometimes failed) products or develop new products (Brown & Duguid, 2000; Brown & Eisenhardt, 1995; Katila & Ahuja, 2002; Szulanski, 1996). Based on this, variables were included that looked at company collaboration with innovation-support agencies (variable 7) and higher education institutions (variable 8), tenancy in an industrial park (variable 9), and partnership with collaborating firms (variables 13 and 14).

2.1.3. Innovation history as an innovation driver

It appears that companies that prioritise innovation and have a history of innovating are more likely to keep innovating (Alfranca, Rama, & von Tunzelmann, 2002), whether this is linked to technology adoption or other acquisitions and development aspects. Variables 11 and 12 were included with a focus on new product development over the past 2 years, while variables 15, 16, and 17 were included to look at the frequency and impact of recent improvement-related innovation in the same period. To take into consideration whether the companies prioritised innovation, variable 10 considered whether R&D personnel were in the company's employ, and variable 1 asked whether any company acquisitions had recently taken place, since these might have been correlatable with an increase in innovation.

2.2. Data collection and analysis

The aim of this study was to survey employee practices related to innovation. Only 14 companies were willing to take part in the survey. Other companies that were approached opted out because they feared that their company data could be leaked to their competitors. Excluding demographic items, the questionnaire consisted of 17 items (see the 17 variables listed in section 2.1) that were based on innovation metrics included in the 2013–2014 World Economic Forum's Global Competitiveness Survey (Schwab, 2013). A convenience sample was used to obtain the workers in this study, and 37 production line employees responded altogether. Each respondent took between 15 and 20 min to complete the survey. The questionnaires were hand delivered to the respondents at the various companies by the researcher who was present while the questionnaires were being filled out in order to address any concerns. The data collection took place from December 2013 to January 2014, and employee names were not collected to assure respondents of the anonymity of their responses.

While Green, Salkind, and Akey (2000) advocate for having at least 4 observations to 1 variable, this study had 37 responses across the 17 variables. However, the researchers believed it was important to pursue the work as a pilot study, since only a small group of small and medium enterprise (SME) beverage companies in Trinidad and Tobago was available to participate in the exercise. It is also notable that, due to the small number of SMEs that was available to take part in the study, there was no opportunity to consider whether data varied by the type of beverage being manufactured. Table 1 represents the distribution of production line employee respondents across the 14 SME beverage companies in the study.

Exploratory factor analysis was implemented to summarise the information (variance) contained in the variables into a smaller set of factors with minimal loss of the original information (Hair, Black, Babin, & Anderson, 2010). The Principal Component Analysis (PCA) extraction method (under the factor analysis menu) in the Statistical Package for the Social Sciences (SPSS-23) was chosen as the fitting procedure to identify the number of components that should be extracted. Yong and Pearce

Table 1. Distribution of employee respondents across SME beverage companies

Size	Company	Number of respondents
Small	Walker's	2 (5.4%)
	Cavalier Food Products	3 (8.1%)
	D's Cane Juice	4 (10.8%)
	Sonny's Cane Juice	3 (8.1%)
	Vision Ventures Ltd.	4 (10.8%)
	Drink for Life	2 (5.4%)
	Dolce Valle Dairy	1 (2.7%)
	PAX Yogurt Company	1 (2.7%)
	Harmony Drinks	2 (5.4%)
Small Total	9	22 (59.5%)
Medium	Antonio's Wine Dealers	3 (8.1%)
	Bandoo's Wine and Food Products	3 (8.1%)
	Reo Pure Ltd.	4 (10.8%)
	Wine Merchants (2003) Ltd.	3 (8.1%)
	Meico Ltd.	2 (5.4%)
Medium Total	5	15 (40.5%)
Total	14	37 (100%)

(2013) advise that, since this utilises the correlation matrix and outputs standardised results, it enables analysis across the different scales in the questionnaire. By the end of the PCA iterations, the number of variables had been reduced to 10, and so the response-to-variable ratio approached the recommended value of 4.

The assumptions of sample size and sufficient correlations between variable pairs were tested using the Kaiser–Meyer–Olkin (KMO) Sampling Adequacy and Bartlett's Test of Sphericity. The anti-image correlation matrix was used to identify when variable-specific measures of inter-correlation were unacceptably low. The process involved looking at the diagonal elements of the anti-image correlation matrix to determine whether any value was less than 0.5 (Field, 2009). The smallest absolute value under 0.5 was first deleted and the analysis was redone without that variable. This process continued until all of the diagonal elements of the anti-image correlation matrix had values above 0.5 (Hair et al., 2010). The measure of sampling adequacy (MSA) guidelines were also extended to individual variables. When deciding on the number of components to extract, the Kaiser eigenvalue method was used (Kaiser, 1960), so components were only extracted where their eigenvalues were 1.0 at minimum. In addition, rotation was used to achieve a simpler structure in order to group variables into the reduced components (Nathai-Balkissoon & Pun, 2016). Tabachnick and Fidell suggest using an oblique rotation and depending on the component correlation matrix, then switching to an orthogonal method such as Varimax rotation (as cited in Brown, 2009). This is the matrix rotation procedure used in this study.

The entire process was repeated, without any eliminated variable, until the remaining variables met the conditions that correlations were less than 0.3 across all variables, anti-image correlation matrix diagonal values were all under 0.5, communalities were less than 0.5 and the absolute values between cross-loadings remained under 0.2. The final components as well as the entire scale of variables were all evaluated for scale reliability using Cronbach's Alpha.

Detailed results of the PCA analysis are presented for those who wish to follow the approach.

Table 2. Correlation matrix (iteration 1)

	AqCp	EFbk	UEFbk	CFbk	UCFbk	MgInPG	CPID	CRD	TSIP	PRD	NIdMg	NIdCFbk	CCpB	CCpD	NImp	NJImp	PCIImp
AqCp	1.000	0.281	0.194	0.537	0.647	0.149	0.005	-0.026	-0.061	-0.072	0.082	0.146	0.085	0.397	-0.106	0.156	-0.272
EFbk		1.000	-0.069	0.569	0.545	0.421	0.138	0.065	-0.067	-0.004	-0.109	-0.180	-0.115	0.193	-0.182	-0.099	-0.320
UEFbk			1.000	0.359	0.046	0.119	0.076	0.150	0.069	0.245	-0.156	-0.237	-0.064	-0.143	0.119	0.144	0.009
CFbk				1.000	0.643	0.488	0.145	0.148	0.101	0.216	-0.195	-0.147	-0.133	0.301	-0.028	0.292	-0.219
UCFbk					1.000	0.144	-0.038	0.196	0.056	0.200	0.029	0.030	0.064	0.455	-0.108	0.118	-0.297
MgIn-PG						1.000	0.199	0.001	0.146	0.020	-0.146	-0.187	-0.107	0.121	-0.053	0.065	-0.038
CPID							1.000	-0.129	0.469	0.065	-0.170	-0.121	-0.021	0.193	0.076	0.130	-0.258
CRD								1.000	0.514	0.616	0.027	-0.044	0.213	0.014	0.377	0.131	0.159
TSIP									1.000	0.648	0.031	0.087	0.248	0.185	0.228	0.085	0.029
PRD										1.000	-0.014	0.066	0.072	0.117	0.080	0.073	0.141
NIdMg											1.000	0.788	0.731	0.345	0.264	0.078	-0.003
NIdCFbk												1.000	0.533	0.322	0.201	0.307	0.226
CCpB													1.000	0.421	0.551	0.188	-0.110
CCpD														1.000	0.257	0.348	-0.315
NImp															1.000	0.662	0.335
NJImp																1.000	0.182
PCIImp																	1.000

Table 3. Anti-image correlation matrix (iteration 1)

	AqCp	EFbk	UEFbk	CFbk	UCFbk	MgInPG	CPID	CRD	TSIP	PRD	NIdMg	NIdCFbk	CCpB	CCpD	NIImP	NJImP	PCIImP
Anti-image Correlation	0.636°	0.173	-0.318	-0.196	-0.434	-0.032	-0.024	-0.150	0.005	0.371	0.181	-0.239	-0.046	-0.198	0.072	0.075	0.038
		0.510°	0.256	-0.355	-0.375	-0.363	-0.280	-0.164	0.351	-0.047	0.091	-0.222	0.174	0.123	-0.258	0.380	0.262
			0.368°	-0.343	0.154	-0.002	-0.142	0.095	0.185	-0.380	-0.192	0.218	-0.014	0.332	-0.102	-0.005	0.028
				0.766°	-0.275	-0.313	0.068	0.050	-0.067	-0.103	0.021	0.041	0.065	-0.029	0.049	-0.245	0.034
					0.636°	0.339	0.122	-0.097	-0.064	-0.080	-0.121	0.239	-0.188	-0.253	0.260	-0.214	-0.180
						0.359°	0.039	0.027	-0.289	0.207	-0.227	0.368	-0.229	-0.189	0.350	-0.295	-0.397
							0.369a	0.437	-0.638	0.103	0.067	-0.032	0.179	-0.048	-0.160	-0.028	0.237
								0.543 ^{oo}	-0.367	-0.406	-0.074	0.080	0.143	0.283	-0.346	0.079	0.155
									0.490°	-0.443	0.196	-0.210	-0.098	0.038	-0.113	0.241	0.081
										0.501°	0.035	-0.012	-0.098	-0.314	0.319	-0.136	-0.243
											0.556°	-0.752	-0.128	-0.060	-0.300	0.454	0.334
												0.366°	-0.387	-0.101	0.615	-0.707	-0.639
													0.509°	0.082	-0.706	0.497	0.590
														0.654°	-0.308	0.054	0.350
															0.320°	-0.805	-0.737
																0.287°	0.533
																	0.248°

^{oo}Measures of sampling adequacy (MSA).

3. Results and interpretation

3.1. The PCA

3.1.1. Iteration 1

In the first iteration, several correlations had absolute values greater than 0.3 (Hair et al., 2010), indicating that the results were likely to be credible (see Table 2). Variables UEFbk and CPID had especially low correlations, however, so it was expected that the process of component extraction would have eliminated them during future iterations.

Then, looking at the anti-image correlation matrix (see Table 3) revealed that 8 variables had diagonal elements less than 0.5. The lowest of these corresponded with variable PCIImp, and so this variable was eliminated before iterating a second time.

3.1.2. Iteration 2

The KMO and Bartlett's test (see Table 4) was seen to be acceptable (KMO = 0.554, which exceeded the minimum acceptable value of 0.5) in the second iteration. The Bartlett's test returned a significance value of 0.000; this was even lower than the desired *p*-value of 0.05, and so it was an indication that some amount of correlation existed among the variables being tested. The KMO remained acceptable as it remained above 0.5, and the Bartlett's test consistently confirmed the significance of the analysis. This gave support to continue PCA at every iterative step.

With variable PCIImp eliminated from consideration, the diagonals of the anti-image correlation matrix revealed that correlation values for UEFbk, CPID, TSIP, NIdCFbk and NJImP were all less than 0.5. As a result, variable CPID (Collaborations for Promoting Innovation Development), which had the lowest diagonal value of 0.310, was eliminated in the third PCA iteration.

3.1.3. Iterations 3–5

Similar procedures were followed for iterations 3 through 5. In iteration 3, the variable UEFbk (Utilisation of Employee Feedback Concerning Product Improvement) was eliminated, since it had the lowest diagonal anti-image correlation value of 0.348. The variable NJImP (Number of New Jobs due to Improved Products within the Last 2 Years), was eliminated in iteration 4 (with the lowest diagonal value 0.390). Finally, variable NImP was eliminated due to its low anti-image correlation (0.456) in iteration 5.

3.1.4. Iteration 6

By the sixth iteration, none of the anti-image correlation values were under 0.5 (see Table 5), so the process was able to move forward to examining the component extractions.

Rotation of the dataspace was also important, to organise the variables into as few components as possible. The component correlation matrix advises whether an orthogonal or non-orthogonal method of rotation should be used in extracting components. When there are absolute correlations above 0.32, Tabachnick and Fidell (as cited in Brown, 2009) recommend that the Direct Oblimin method of rotation should be selected and in other cases, the orthogonal Varimax rotation method is more suitable. Also, the Varimax method of rotations would be implemented to prune away small

Table 4. KMO and Bartlett's test (iteration 2)

Adequacy Kaiser–Meyer–Olkin measure of sampling adequacy		0.554
Bartlett's Test of sphericity	Approx. χ^2	301.419
	<i>df</i>	120
	Sig.	0.000

Table 5. Anti-image correlation matrix (iteration 6)

	AqCp	EFbk	CFbk	UCFbk	MgInPG	CRD	TSIP	PRD	NIdMg	NIdCFbk	CCpB	CCpD
Anti-image Correlation	0.677 ^o	0.225	-0.309	-0.470	-0.012	-0.011	-0.013	0.278	0.059	-0.170	-0.014	-0.077
		0.710 ^o	-0.227	-0.410	-0.276	-0.067	0.070	0.146	-0.095	0.094	0.075	0.003
			0.769 ^o	-0.252	-0.406	-0.009	0.079	-0.222	0.134	-0.018	0.027	-0.066
				0.693 ^o	0.266	-0.107	0.079	-0.171	-0.037	0.059	0.016	-0.253
					0.571 ^o	0.074	-0.247	0.114	-0.096	0.123	0.055	-0.056
						0.661 ^o	-0.187	-0.423	-0.053	0.193	-0.238	0.238
							0.630 ^o	-0.482	0.219	-0.112	-0.256	-0.130
								0.579 ^o	-0.006	-0.148	0.201	-0.055
									0.601 ^o	-0.691	-0.575	-0.021
										0.645 ^o	0.130	-0.058
											0.660 ^o	-0.280
												0.802 ^o

^oMeasures of sampling adequacy (MSA).

Table 6. Component correlation matrix (iteration 6)

Component	1	2	3
1	1.000	-0.005	0.091
2	-0.005	1.000	0.050
3	0.091	0.050	1.000

Notes: Extraction method: principal component analysis. Rotation method: Oblimin with Kaiser normalisation.

component loadings and tighten up the number of variables with high loadings per component (Yong & Pearce, 2013). The component correlations from iteration 6 are presented in Table 6. Here, all the absolute valued correlations between the components were less than 0.32, so the decision was made to use the Varimax method of rotation when doing extractions.

At this point, the Total Variance Explained table becomes useful. This table presents Kaiser's eigenvalues for each of the components that could be derived from the data under analysis. An eigenvalue for each component is the amount of variance among all the variables that is accounted for by the component (Hair et al., 2010). For this study, components (sometimes called factors) were only considered valid in the case where their eigenvalues were 1 or greater. As Table 7 illustrates, there were 3 components with eigenvalues greater than 1, and these three combined to explain 67.229% of the variance of the independent variable (innovation in beverage companies) being explored. The eigenvalues from this iteration attributed 26.42% of the variance to the first component, 23.261% of the variance to the second and 17.548% of the variance to the third.

When extracting components, it is also useful to consider communalities because the goal of factor analysis is to explain as much variance as possible through the extracted factors (Child, 2006). A communality for each variable depicts the proportion of variance of the variable that can be explained by the components. The variable communalities are shown in Table 8. Extraction communalities less than 0.5 indicated that those variables should be excluded from the scale (Hair et al., 2010). Only the variable MgInPG (Management Involvement in Product Generation) had an extraction communality less than 0.5, so it was eliminated from further analysis.

3.1.5. Iteration 7

Three components again emerged when the extractions were done in this iteration, and their combined variance had increased to 71.212%. Further, no communality values fell below 0.5, and therefore no further variable elimination was needed.

Determination of where the variables should be grouped was based on the rotated component matrix since most variables would have high loadings on the first component compared to the others in the unrotated component matrix (Field, 2009). Therefore, the data were suppressed (all values less than 0.3 are hidden) to better view which variables were contained in the components. Each variable with loadings greater than 0.4 was considered significant (Hair et al., 2010) at this point. If a variable did not contain any significant component loadings then it would be considered for removal from the analysis.

In cases where a variable was seen to cross-load (i.e. when a variable had absolute loadings above 0.4 on more than one component), then that variable would be considered for elimination. The signs of the loadings affect the relationship between the variable and component but not the interpretation of the magnitude of the loading or the number of factors to retain (Kline, 1994). In addition, cross-loadings in which the absolute difference is less than 0.2 would also have to be eliminated (Anderson et al., 2004). For this paper, the variable with the smallest absolute difference between loadings would be eliminated from the analysis and then the test would be redone.

Table 7. Total variance table (iteration 6)

Component	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.170	26.420	26.420	3.170	26.420	26.420	3.047	25.391	25.391
2	2.791	23.261	49.681	2.791	23.261	49.681	2.748	22.903	48.294
3	2.106	17.548	67.229	2.106	17.548	67.229	2.272	18.935	67.229
4	0.970	8.081	75.311						
5	0.706	5.887	81.197						
6	0.577	4.812	86.009						
7	0.523	4.360	90.369						
8	0.343	2.855	93.224						
9	0.272	2.264	95.488						
10	0.224	1.869	97.358						
11	0.189	1.571	98.929						
12	0.129	1.071	100.000						

Note: Extraction method: principal component analysis.

Table 8. Variable communalities (iteration 6)

	Initial	Extraction
AqCp	1.000	0.617
EFbk	1.000	0.571
CFbk	1.000	0.791
UCFbk	1.000	0.732
MgInPG	1.000	0.320
CRD	1.000	0.677
TSIP	1.000	0.721
PRD	1.000	0.780
NIdMg	1.000	0.833
NIdCFbk	1.000	0.732
CCpB	1.000	0.718
CCpD	1.000	0.575

Note: Extraction method: principal component analysis.

Table 9. Rotated component matrix (iteration 7)

	Component		
	1	2	3
UCFbk	0.880		
CFbk	0.836		
AqCp	0.768		
EFbk	0.711		
NIdMg		0.920	
NIdCFbk		0.857	
CCpB		0.834	
CCpD	0.525	0.539	
PRD			0.884
TSIP			0.838
CRD			0.823

Notes: Extraction method: principal component analysis.

Rotation method: Varimax with Kaiser Normalization^a.

^aRotation converged in 4 iterations.

The rotated component matrix allocated three components, as shown in Table 9. However, for the variable CCpD (Collaborations with Other Companies in Different Industries within the Last 2 Years), there was cross-loading with an absolute difference below 0.2. Thus, CCpD was discarded from consideration, and another iteration was done to confirm the final outcome.

3.1.6. Iteration 8 (final iteration)

The PCA solution converged in 8 iterations, and 7 variables were discarded in all, leaving 10 variables in the final model that emerged from the PCA. The final KMO value was a mediocre 0.640, and the solution was deemed significant based on the Bartlett's test. The final anti-image correlation table (see Table 10) maintained acceptable correlation values (from 0.565 to 0.761 on the diagonal).

Table 10. Anti-image correlation matrix (iteration 8)

Anti-image matrices

	AqCp	EFbk	CFbk	UCFbk	CRD	TSIP	PRD	NIdMg	NIdCFbk	CCpB
Anti-image Correlation										
AqCp	0.596 ^a	0.231	-0.353	-0.521	0.009	-0.029	0.278	0.056	-0.175	-0.036
EFbk		0.642 ^a	-0.390	-0.378	-0.046	0.000	0.185	-0.127	0.133	0.094
CFbk			0.761 ^a	-0.195	0.049	-0.040	-0.199	0.103	0.030	0.028
UCFbk				0.696 ^a	-0.077	0.124	-0.230	-0.019	0.015	-0.073
CRD					0.715 ^a	-0.144	-0.437	-0.041	0.204	-0.188
TSIP						0.650 ^a	-0.484	0.201	-0.093	-0.307
PRD							0.565 ^a	0.003	-0.167	0.190
NIdMg								0.571 ^a	-0.690	-0.605
NIdCFbk									0.617 ^a	0.115
CCpB										0.634 ^a

^aMeasures of sampling adequacy (MSA).

Table 11. Total variance explained (iteration 8)

Component	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.757	27.571	27.571	2.757	27.571	27.571	2.630	26.305	26.305
2	2.576	25.760	53.331	2.576	25.760	53.331	2.465	24.647	50.952
3	2.033	20.329	73.661	2.033	20.329	73.661	2.271	22.709	73.661
4	0.702	7.025	80.685						
5	0.547	5.468	86.153						
6	0.463	4.629	90.782						
7	0.313	3.130	93.911						
8	0.287	2.870	96.781						
9	0.189	1.892	98.673						
10	0.133	1.327	100.000						

Note: Extraction method: principal component analysis.

Table 12. Communalities for variables in the final model

	Initial	Extraction
AqCp	1.000	0.668
EFbk	1.000	0.556
CFbk	1.000	0.768
UCFbk	1.000	0.806
CRD	1.000	0.686
TSIP	1.000	0.718
PRD	1.000	0.786
NIdMg	1.000	0.886
NIdCFbk	1.000	0.767
CCpB	1.000	0.726

Note: Extraction method: principal component analysis.

Component correlation values remained under the 0.32 value so, as explained in Section 3.1.4, the Varimax rotation option was applied when performing extraction. The final solution retained only 3 components with eigenvalues exceeding 1, (see Table 11). The eigenvalues from this iteration attributed 27.571% of the variance to the first component, 25.76% of the variance to the second and 20.329% of the variance to the third. This resulted in 73.661% of the total variance being cumulatively explained by the three components.

Table 12 illustrates that all variable communalities were acceptable, ranging from a moderate value of 0.556 to a high value of 0.886. Having extraction communalities that are moderate to high values is a good outcome considering that the analysis was done using a relatively small sample size. This opinion is supported by practitioners who contend that sample sizes less than 50 can produce acceptable results as long as there are high communality values and a high ratio of variables per factor (de Winter, Dodou, & Wieringa, 2009). Furthermore, the Kaiser Criterion can be considered suitable for tests with less than 30 variables when the average of the extracted communalities is greater than 0.70 (Field, 2009). In the final iteration, the average value of extracted communalities was 0.737.

Table 13. The rotated component matrix (iteration 8)

	Component		
	1	2	3
UCFbk	0.883		
CFbk	0.839		
AqCp	0.780		
EFbk	0.723		
NIdMg		0.940	
NIdCFbk		0.875	
CCpB		0.829	
PRD			0.884
TSIP			0.840
CRD			0.823 ^a

Notes: Extraction method: principal component analysis.

Rotation method: Varimax with Kaiser Normalization^a.

^aRotation converged in 5 iterations.

Table 14. Cronbach alpha values for the component scales

Scale items evaluated	N of items	Cronbach's Alpha
Full scale (all variables in derived model)	10	0.674
Component 1 variables	4	0.812
Component 2 variables	3	0.861
Component 3 variables	3	0.774

Also, the Varimax rotation was applied in determining the rotated component matrix (see Table 13). This time, the 10 retained variables settled neatly into three components, with no need for further iterating. Component 1 contains 4 variables, namely UCFbk, CFbk, AqCp and EFbk. Component 2 has variables NIdMg, NIdCFbk and CCpB, and Component 3 has the variables PRD, TSIP and CRD.

A final check was made on the components and variables, in order to ascertain reliability of the variables and scales. Cronbach's Alpha measures the internal consistency of a scale. Good Cronbach's Alpha values range from 0.7 to 0.95 (Tavakol & Dennick, 2011). Table 14 summarises the relevant Cronbach Alpha values to support the PCA outcomes. The alpha was evaluated for the whole scale and also for each component, since it has been recommended that reliability should be based on a unidimensional sample of test items (de Winter et al., 2009). Overall, the results are very promising.

3.2. Understanding the groupings

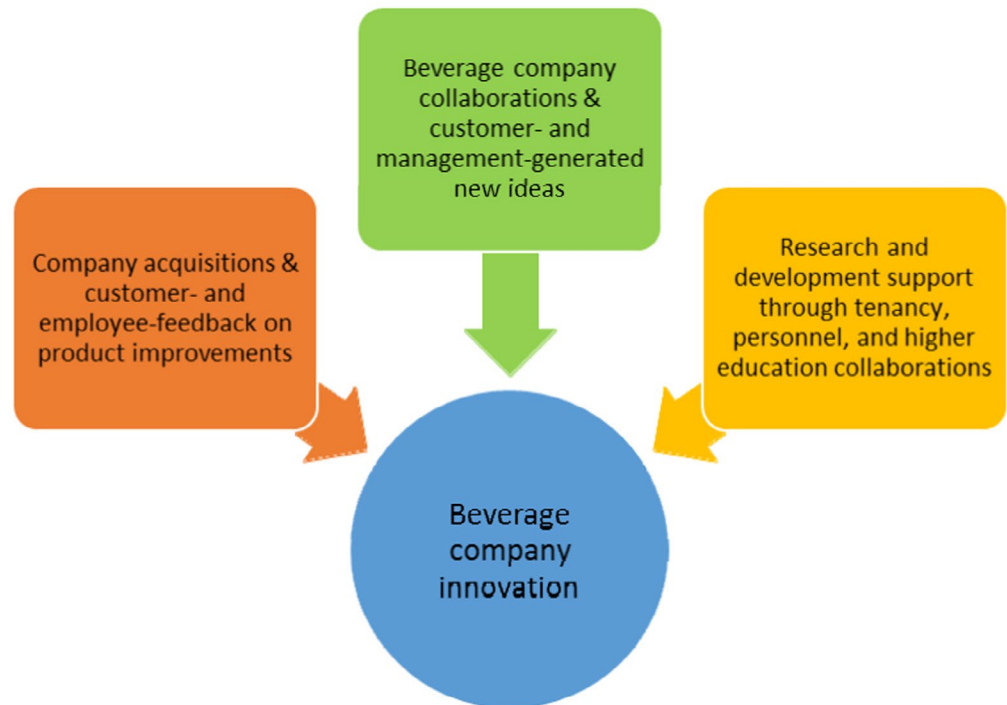
Next, it became necessary to make sense of the component groupings extracted from the data. Reviewing the variable descriptions made this task possible. Table 15 reflects the names assigned to each component, along with their constituent variables.

As Component 1 comprised of variables related to customer and employee feedback and company capital acquisitions, it was titled "Company acquisitions and customer- and employee-feedback on product improvements". Component 2 was called "Beverage company collaborations and customer- and management-generated new ideas" since it included management- and customer-driven new ideas as well as collaborations with other beverage companies. Finally, Component 3 included supporting research and development through hiring and collaboration as well as tenancy

Table 15. Table of factor groupings with variable descriptions

Factor	Factor name	Variable	Description
1	Company acquisitions and Customer- and employee-feedback on product improvements	UCFbk	Utilisation of customer feedback concerning product improvement
		CFbk	Customer feedback concerning product improvement
		AqCp	Acquisitions by the company within the last 2 years
		EFbk	Employee feedback concerning product improvement
2	Beverage company collaborations and customer- and management-generated new ideas	NIdMg	Number of new ideas generated by management within last 2 years
		NIdCFbk	Number of new ideas generated due to customer feedback within last 2 years
		CCpB	Number of collaborations with companies in the beverage industry within last 2 years
3	Research and development support through tenancy, personnel and collaborations	PRD	Personnel for research and development
		TSIP	Tenancy status at industrial parks
		CRD	Collaborations with higher education institutions for research and development

Figure 1. The proposed PCA framework.



in an industry park, so it was assigned the caption “Research and development support through tenancy, personnel, and collaborations”. The PCA relationship is represented in Figure 1.

4. Discussion

It is likely that a large number of companies in a developing nation would be SMEs, with Nasiri, Alleyne, and Yihui (2016) noting that SMEs are too often cash-strapped and unable to make large financial investments to promote their innovation efforts. It is hoped that the components (or their constituent variables) put forward in this section could be leveraged to bolster company innovation efforts without demanding large initial financial outlays, so as to be affordable to SMEs.

This study was limited by the small number of companies surveyed. However, the identified components do give some food for thought to researchers interested in investigating these ideas in the Caribbean and beyond. For T&T and other developing nations in particular, good preliminary insights have been obtained in the three component areas highlighted.

4.1. Component 1

Component 1 accounts for over 27% of the variance of the overall scale (see Table 11), underscoring the value of collecting and using *product improvement* feedback from customers and employees and making acquisitions that would enhance the company’s capability and capacity to undertake innovation. This seems intuitively right, given the modern focus on customers (Sang Long, Abdul Aziz, Owee Kowang, & Wan Ismail, 2015) and on heightened levels of employee involvement (El-Ella, Stoetzel, Bessant, Pinkwart, & Schrenker, 2013). This is an opportune finding, as Swift (2017b) reported that T&T companies source most of their innovation ideas from customers, employees and suppliers. Furthermore, it is notable that, for Trinidad and Tobago, the majority of companies were reported to merely be implementing changes that were new to the company, but not new to the industry or the world (Swift, 2017b). This would mean that a large proportion of companies might be practicing copycat improvements, or continual improvement of an incremental nature, but not enough radical improvement, which is addressed in Component 2.

4.1.1. Customer and employee roles

It is logical that customers would be able to validate good features of products in the market (so that companies can implement more of the desirable attributes), as well as provide complaints or critique about products that are being marketed to them, whether these products have been improved, or the customers perceive that they should be improved in the future (Meik & Brock, 2016; Verleye, 2015). Since a majority of innovation is incremental, as opposed to radical, this component is critical in the model for how to enhance company innovation (Laurson & Salter, 2006). As Chen and Huang (2009) noted, employees are central to idea exchange and generation, so it is critical for companies to hire the right staff, and develop their ability to take risks, remain flexible and stay engaged to ensure success of innovation projects. Hamel and Tennant (2015) advise that innovation can be effectively enhanced when employees: (1) challenge the status quo, (2) keep an eye on how less-obvious trends can be leveraged, (3) leverage capabilities already resident in the company and (4) pick up on customers' needs and frustrations, even those that have not yet been recognised by the customers themselves. Aas, Jentoft, and Vasstrøm (2016) highlight the way employees innovate on the go in response to challenges and other issues that arise from day to day, a process that is labelled "bricolage". Employees experience greater levels of job satisfaction when they perform enriched roles (de Menezes, 2012) so it is likely that employees will value the opportunity to share ideas once they recognise that the company truly trusts in, values and operationalises those ideas. Unfortunately, this study did not seek to learn whether supplier ideas also drove innovation, so the scale has neither excluded nor included this element.

Allowing stakeholders such as employees and customers to assume some of the central functions in the company innovation system would ensure that the system works constantly and consistently, while resting on the shoulders of multiple stakeholder groups. Furthermore, in T&T, the manufacturing sector has been recognised as employing a higher proportion of the population than any other sector (Sookoo, 2013), and so it is important to make use of the ideas of this large group of persons. With regard to customers, it has been noted that T&T citizens purchase a high proportion of imported products, creating competitive challenges for some local manufacturers. If customers perceive that a company values and uses customer feedback to improve company offerings and benefit customers, this may grow customer loyalty, increase market share and boost company viability.

4.1.2. Company acquisitions

Company acquisitions have been recognised as promoters of innovation, and the importance of addressing technology improvement as a part of company investment has perhaps been highlighted most of all (Adams, Bessant, & Phelps, 2006; Garcia Martinez & Briz, 2000; Nasiri et al., 2016). It is likely that company acquisitions would boost product improvement efforts, whether simply because capacity or availability could be increased, or even because improved technological capability could change products or packaging for the better.

4.2. Component 2

Component 2 accounts for over 25% of the variance of the innovation scale (See Table 11). This component speaks specifically to new-idea generation which supports radical innovation as opposed to product improvement, and points to managers and customers as having specific value in proposing *new* ideas. Collaboration with other beverage companies also adds value in this component.

In T&T, many companies make continual improvements within quality management systems, whether formally or informally structured. Though such improvements could lead to radical innovation, most companies seem to incrementally innovate by tweaking their products, processes, or systems (Miranda Silva, Gomes, Filipe Lages, & Lopes Pereira, 2014). Sometimes, incremental improvements can be distinctly underwhelming and unlikely to boost customer confidence and loyalty that lasts into the long term.

Radical innovation, including innovation that develops entirely new ideas, approaches, and products, plays a major role in engaging new customers, growing markets and drawing new income for the company (Anderson & Tushman, 1990). Architectural innovation (where technology is significantly updated, reconfigured or replaced) and discontinuous innovation (where processes are revolutionised or significantly altered) can initially be disruptive to the status quo of an organisation, but can actually breathe new life into the organisation as well (Innovation on Tap, 2013). Indeed, it is this type of innovation that is often celebrated in discussing blue ocean strategy, where companies develop a new offering or new approach that sets them apart from the competition, wins them a dedicated part of the market, and locks out competitors for periods established in related patents and contracts.

4.2.1. *Customer roles in new idea generation*

It makes sense that customers were found to be valuable contributors to innovation; their expertise gained from use of actual products would give them insights about the strengths and shortcomings of such products and allow companies to react by making incremental improvements to a product (Menguc, Auh, & Yannopoulos, 2014). Engaging customers more proactively would drive radical improvement by eliminating problems, closing gaps or even redirecting products to a new customer niche, potentially previously unrecognised by company personnel (Joshi, 2016). Furthermore, innovative products will not only draw greater interest locally, but could become more attractive internationally.

4.2.2. *Manager roles in new-idea generation*

It is interesting that this component included the proposal of new product ideas by managers, but did not include managers' involvement in product generation (a variable that was eliminated during the PCA iterations). Managers' new product ideas would be reliably informed by strategic and comparative insights about competing companies and products as well as other aspects of the external environment of the company. This finding aligns with traditionally held management theory that encourages managers to take more active roles at higher task levels like idea generation and foresight, but allows employees greater autonomy and heightened participation in operational work, which would include product development.

El-Ella et al. (2013) point out that innovation thrives in companies where there is heightened employee involvement but as employee involvement increases, systems become more complex, necessitating more management effort and improved infrastructures in turn. Furthermore, costly and advanced technology often plays a role in the smooth operation of excellent innovation systems. In comparison, the environment that would exist in a T&T manufacturing SME is likely to be less high-tech and companies would have considerable cost constraints to contend with. Additionally, both managers and employees would have to work towards the ideal of less autocratic management and more participative, intrinsically motivated employees.

Kleinschmidt and Cooper (1995) cautioned that when innovation systems are too heavily dependent on management involvement, they are as likely to fail as to succeed. Instead of managers keeping a choke hold on idea-generation, they should become innovation enablers. The recommendations of Hamel and Tennant (2015) align with this perspective; they observed that innovation thrives when managers: (1) understand what counts as innovation and what counts as a minor product enhancement at the company, (2) focus on measuring innovation, (3) competently enable innovation via their attitudes and behaviours and (4) continually improve company management systems to be pro-innovation.

4.2.3. *Beverage company collaboration*

Another element that boosts innovation is collaboration with other beverage companies, and this seems reasonable since like companies might target similar markets, and have both shared aims and challenges (Laursen & Salter, 2006). In T&T, like companies tend to be reluctant to collaborate as they perceive one another only as competitors to whom they might lose resident knowledge and

ideas. They should also take into account that partnering could yield synergistic benefits such as improved processes and efficiencies that result from strengthened knowledge bases and organisational learning for all collaborating companies (Pun & Nathai-Balkissoon, 2011). Companies should begin to take advantage of the opportunities that their similarities could open up for all involved. As Michael Porter pointed out, companies should shift their mind-set from seeing the market as finite and therefore limiting every company to a small, fixed piece of a pie. Instead, they should collaborate to figure out ways to increase the size of the pie. This way, although every company may still target a similar percentage of the whole market, the volume of sales can grow significantly for everyone in the industry (Porter, 2008).

4.3. Component 3

Nasiri et al. (2016) point out that innovation does not only reside in the R&D function or staff itself. In this vein, Components 1 and 2 have pointed to the ability to source innovative ideas from a wide range of stakeholders. Component 3 rounds out the innovation scale, accounting for about 20% of the total variance (see Table 11), by touting the importance of designing structures that specifically address research and development. These must include a community with an R&D mind-set, including R&D personnel, location within an industrial park and higher education collaborations that would enable innovation to flourish.

4.3.1. R&D personnel

According to Component 3, it is important to provide personnel allocated specifically to supporting R&D work. The company employees tasked with managing and supporting R&D would ideally be tasked with coordinating in-house as well as collaborative work with higher education institutions to support R&D efforts. These collaborations would not only move the R&D effort forward faster than if the company works alone, but it would provide cost-advantages, as well as enhanced benchmarking possibilities, as companies compare their own objectives, systems, and performance with one another (Laursen & Salter, 2006). In terms of gross expenditure on R&D (measured as a percent of GDP), the 2017 Global Innovation Index ranks T&T at 107 out of 120 countries, and highlights this as an area of weakness for the country (Dutta et al., 2017). Thus, it appears likely that the majority of companies in T&T do not invest sufficiently in personnel to support R&D work, so that R&D may be ad hoc and very limited there.

4.3.2. Industrial park tenancy

While this study has not investigated the specific role of industrial parks, it did find that membership in an industrial park enhanced innovation. In T&T, ETeck parks provide industrial park opportunities, but many SMEs may instead use NEDCO events to build their networks with a community of like-minded entrepreneurs. Interestingly, it has been recognised that symbiotic benefits may be achieved for all companies in the park (Xie, Wu, & Ma, 2016). Further, when a company is a tenant in an industrial park, Qiu, Jang, and Zhang (2016) found that not only do companies have better access to supportive R&D facilities that boost their innovativeness, but also the example set by highly innovative member companies tend to inspire/challenge others to innovate causing innovation-favouring environments to be established within other companies in the park.

4.3.3. Collaboration with higher education institutions

There is a lack of connectivity between T&T's companies and its higher education institutions. This lack may well stem from insufficient trust; there may be a perception that product and process strengths (or weaknesses) and improvement ideas might be leaked and compromise competitive position. It is possible that companies do not feel confident in the ability of higher education institutions to boost their innovative abilities. Among other things, academic innovation research would bolster such confidence. Research should seek to distil best practices from the broad range of real-world practices, identify models and frameworks that can boost understanding of innovation mechanisms, and enhance innovation at the industry as well as national levels. Based on the low research publication numbers, it is felt that there is very little empirical research on innovation in T&T. It is notable that both research competencies and innovation capacity/capability will grow in companies

as well as higher education institutions that undertake well-designed and -implemented collaborative research projects.

4.3.4. *Related considerations*

Swift (2017b) reported that in T&T, not only did innovative companies have better finances and better-skilled people (both managers and technical staff), but they also seemed to set higher standards for themselves, as evidenced by international standard certification, enhanced ICT application, more sophisticated products, and personnel who were focused on innovation. Perhaps, as a result of this long list of enhanced conditions, large companies were found to be the predominant innovators in T&T. However, there are some policies in place to support micro-business start-ups and encourage entrepreneurial activities by small business owners. As shared in the Introduction, NEDCO has supported micro-businesses through incubator support, small loans and short training programmes to build managerial and strategic competencies in new business owners. Additionally, the National Innovation Policy includes better skills development and financial access for companies within its objectives (Swift, 2017a).

While collaboration with innovation-support agencies was eliminated in one of the analysis iterations, the authors recognise that government must play a critical role in enabling national innovation. Indeed, T&T's National Innovation Policy incorporates several of the elements addressed within this component. It calls for support systems and structures that will enable investments and modernisation of technology, two requirements that are widely recognised as enablers of innovation. Other government documents, including the Draft National Development Strategy, have detailed the need for investment to include a focus on education, in order to develop pro-innovation values, attitudes and behaviours (Trinidad and Tobago. Ministry of Planning and Sustainable Development, 2017).

The concept of the triple helix fits well here, as collaboration between government, academia and industry is critical to enhance industry innovation (Ranga & Etzkowitz, 2013). According to Copeland (2017), government would ideally shape a conducive environment (e.g. via innovation incentives and systems; and funding for research, development, and innovation), industry could fund projects and internships, support business development and improvement and provide expertise, and academia could shape the workforce (including entrepreneurs), provide technical know-how, and collaborate on progressive projects. The government continues to target innovation as a priority destination for T&T, with a myriad of efforts and ideas having been proposed and/or implemented over the past decades (see Introduction for several examples). However, T&T has remained relatively weak in its innovation capabilities and performance, as reflected in its mediocre position on the Global Innovation Indices mentioned in the Introduction. As stronger collaboration with the other two helix players would bring about improved effectiveness of innovation policy and practice, it is no surprise that the National Innovation Policy includes an objective focused on strengthening innovation quality, research, and triple helix connectivity (Swift, 2017a).

5. Conclusions and recommendations

5.1. *Conclusions*

This pilot study set out to perform a PCA on data from a group of SME beverage manufacturing companies in order to develop initial innovation scales. Three innovation components were established based on the innovation data supplied by the companies studied. Component 1 highlighted the enabling role of company acquisitions as well as customer and employee feedback on product improvements.

Component 2 reflected that collaboration with other beverage companies and idea-generation by customers and managers would likely boost innovation. Component 3 pointed to the R&D-specific variables (hiring, collaboration with higher education institutions and tenancy in an industrial park) that positively influenced innovation.

Little empirical research has been done to look at innovation enablers in T&T manufacturing companies. This study furthered the understanding of how innovation could be supported in T&T beverage companies. The elements contained within the three components provide insights into ways in which national innovation policy might be translated into innovation practice in beverage companies. The literature explored in the course of the study can also inform management practices in order to boost incremental and radical innovation. While the literature cites developing nations like India and Malaysia as examples of good innovation performance, the study showed that their practices contrasted with the T&T companies, which are less inclined to high-tech operations, and have less active radical innovation systems. Specific recommendations for management practice are made in Section 5.2.

Finally, although the primary focus of the study was to identify factors pertinent to innovation, this paper can also provide a good tutorial for applying factor analysis with application to innovation scale development.

5.2. Recommendations

Arising from the study's findings, the following recommendations are put forward for beverage manufacturing companies:

- (1) Managers should structure innovation-focused management systems that make incremental innovation a part of the everyday operations of the company.
- (2) Managers should focus more of their efforts on generating ideas to drive radical innovation (including discontinuous innovation) that will help their companies to jump ahead and make greater competitive gains through new products and processes.
- (3) Managers should train and coach employees to develop an innovation mind-set.
- (4) Managers should embed customer ideas and feedback into management systems, as this will grow the company's competitive advantage.
- (5) Managers should regularly practice architectural innovation (i.e. acquire/update company technology) in order to stay abreast of emerging trends and changing needs of stakeholders such as customers, other companies, and collaborating agencies, and also in order to improve company capacity and/or capability to innovate.
- (6) Managers should explore opportunities for their companies to collaborate with other companies and higher education institutions, since partnering agencies/institutions might be willing to share their technology and resources in return for insights into SME context and practices.
- (7) Managers should take advantage of government policies (e.g. financing, funding for high tech acquisitions and industrial park accommodation) that could help them to boost company innovation capabilities.
- (8) Managers should boost innovation effectiveness by embedding innovation targets and performance measures into their companies' management systems.
- (9) For over two decades, T&T has sought advancement in the science, technology and innovation arena, but the Promised Land has remained elusive. T&T's innovation policy and strategy should be revisited to include well thought out leading and lagging indicators, since properly structured measurement approaches can help T&T to finally bridge the gap between reiterating innovation policy and implementing innovation practice for a brighter tomorrow.

5.3. Future research

This study has looked at how innovation may be supported by collaboration, idea-sharing and a focus on research and development, but it has not shed light on what specific financial or human capital characteristics might make companies more likely to create innovative products. The literature has pointed to these two considerations as having meaningful impact on innovation capability in firms (Capitiano, Coppola, & Pascucci, 2009). Also, Božić and Rajh (2016) point to the need for public funding and innovation support to enhance innovation performance in SMEs, but this pilot study has

not evaluated these elements. Therefore, further research into innovation in T&T SMEs should take a closer look at the capabilities and capacity of R&D and other company personnel as well as the extent and adequacy of public funding and innovation support provided by the government.

The authors surmise that developing nations may be less likely to see open collaboration between companies in a single industry, such as the beverage industry. There is a need to find out whether this is so and if it is, then what the repercussions of such a lack of collaboration would be. Does a lower degree of industry-wide collaboration correlate to lower competitiveness of the industry as a whole? Is low trust the reason for low levels of collaboration? Could lack of collaboration be a part of the reason for slower rates of development of developing vs. first-world nations? Furthering this line of thought highlights the need to understand how to enable and promote within-industry collaboration in the developing nation context.

Finally, the preliminary research done in this study should be deepened, using a larger sample of companies. As a larger sample was not possible in the single country studied, further study could target companies across several similar countries, such as across the Caribbean, or across a cross-section of developing nations. Comparative analysis could provide further insights about how innovation works depending on demographic differences, such as age or size of company, industry subsector/industry size, operation within industrial parks and existence of innovation-supporting systems from country to country.

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Source: Marcia Nathai-Balkissoon

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