Innovations

Performance indicators discriminating adopters and non-adopters of an enterprise upgrading program among micro-small-medium sized enterprises in Cameroon

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Abstract
Empirical observations in Cameroon suggest that only a few enterprises (~9%) have adhered to the enterprise upgrade program. This poses the question of whether adopters of the program have a competitive advantage over non-adopters. To attempt an answer to this question, a quantitative approach using web-based structured questionnaires was used. Fifty local enterprises—adopters (24) and non-adopters (26)—were purposefully selected. The independent variables consisted of nine performance indicators measured on an interval scale, while the dependent variable was the enterprise's adoption of the program. Both descriptive and inferential statistics were used for data analysis. The findings indicate that the canonical correlation, an index of discrimination (R = 0.788), was significant (Wilks' =.380, Chi-square = 42.126, df = 9, P =.000), and the function explained 62.1% of the discrimination between the groups. The mean differences were in the expected direction: 1.304 for adopters and -1.204 for non-adopters, indicating that adopters are more competitive. The rank order of importance, as determined by the relative magnitude of the canonical loadings, suggests that non-financial indicators were more important discriminators. From a policy point of view, the overall result shows a need for local enterprises to be upgraded. Other classification models have been successfully applied to solve similar problems in the past. It is possible that these models can also be applied to solve the current problem if a good mapping of the problem to appropriate network architecture is found. These could be an interesting area for research in the future.

Key words: 1.*Enterprise upgrading program, 2.performance measures, 3.adopters, 4.non-adopters, 5.discriminant analysis.*

Introduction

While globalization provides new opportunities for growth in developing countries, it also poses risks to these countries, whose growth and development are hampered by both internal and external factors (Mandjem, 2015). This dynamic of the business environment necessitates changes in public policy in favour of local enterprises (micro-small-medium sized enterprises, MSE) in order to increase their flexibility, innovative capacities, and operational costs, thereby improving performance and competitiveness, and adapting enterprises to their environment (Moati, 2001). It is worth noting that these enterprises constitute the majority of the industrial fabric in developing countries and are among the most important social development agents. They offer a variety of services to the state, including training, work experience, and job opportunities. However, empirical evidence indicates that the majority of small businesses never grow beyond a certain size, and only a small percentage of them advance to the next level of productivity, income, and employment. (Berner, 2008).

To increase theirperformance and gain a competitive advantage of these enterprises, the entire supply chain management has to be effective as well as efficient (Dubey et al., 2021). As a result, industrial restructuring and upgrading have emerged as priority programs for the majority of developing countries and countries in transition. Interestingly, the ripple effect is considered a crucial performance measure for assessing and adjudging adopters and non-adopters of the program. When the ripple effect is reduced, the firms can retort to the uncertainties of the external environment, including market conditions and consumer expectations (Hosseini & Ivanov, 2019).

There are several competing interpretations of what the term "enterprise upgrading" means, as it is frequently used interchangeably with "graduation." The term 'growth through innovation' is defined and qualified in this study. As a result, we consider 'Upgraders' as those entrepreneurs whose businesses have progressed from micro to small to medium-sized over a specific time period as a result of the implementation of various innovation strategies(Loewe et al. 2013). These strategies may include product compliance, process improvements, and new market innovations. The availability and utilisation of apposite information, optimum management of the materials, and proper planning and execution that comes with the enterprise upgrading program leads to a reduction of overall cost, which aids supply chain effectiveness.

According to the United Nations Industrial Development Organisation(UNIDO, 2002, the enterprise upgrading program, is a continuous process aimed at preparing and adapting companies and their environments to the requirements of free trade by: (i) assisting in the removal of certain constraints that alter the business climate (institutions, regulations, etc.); and (ii) assisting companies in becoming competitive in terms of price, quality, innovation, and the ability to follow and master the evolution of techniques and markets. On a conceptual level, enterprise upgrading is comprised of both quantitative and qualitative elements.The former includes a transition from being a business with stagnant or declining income, productivity, and employment to becoming a growing business with constantly increasing income, productivity, and the number of paid workers. The latter includes improvements in products, processes, and production methods (Schmitz and Knorringa 2000). These qualitative changes enable the enterprise to reap innovation rents, increase overall value added, and become long-term competitive (Porter 1998). Because of this idiosyncratic complexity, developing a universal model or a comprehensive theory of firm development has proven difficult.

Various upgrading programs have been adopted in favour of the growth and development of small and medium sized enterprises (SMEs) in the above context. According to Konopielko and Bell (1998), in Poland, the actions of the upgrading program focused on assistance for structural development, identification of markets for the SME sector, financial assistance in the form of loans or loan guarantees to finance the

investment and expansion of SMEs, the provision of advisory services, and the granting of training on good business and management practices. This has resulted in a great impetus to the creation of the "job." Away from Poland, Romania (Anton et al., 1996) and Hungary (Smallbone and Welter, 2001), both in Eastern Europe, and Malaysia (Habaradas, 2008), Indonesia (Tambunan, 2007), China (White and Linden, 2002), India (Shridhar, 2006), and Taiwan (Lin and Chen, 2007) in south-east Asia also adopted the program.

Liedholm and Mead (1987) discovered that only 1% of businesses with four or fewer employees managed to advance to the next size category in Sierra Leone, Bangladesh, Jamaica, Honduras, Thailand, and Egypt. Cotter (1996) discovered that enterprise upgrading rates in Kenya are either zero or so low that no policy intervention could improve the situation. These findings highlight the importance of targeted policy interventions based on empirical evidence, particularly to stimulate MSEs and harness the private sector's potential to be engines of economic growth in developing countries.

In Africa, Algeria, Morocco, Tunisia, and Egypt are good examples of how to institute "scaling up" adaptation programs to support their SME sectors. In Tunisia, the upgrading program explicitly includes a component devoted to improving the business environment and infrastructure. Other countries have embarked on policies to improve institutions and the legal framework for business in addition to improving infrastructure without this component initially being included in the project. The implementation of upgrading programs served as a stimulus for other aspects of economic policy and had a positive effect on economic reforms in general (Bennaceur et al., 2007). In sub-Saharan Africa, especially in the central African sub-region of which Cameroon is a part, restructuring and upgrading programs have been financed by the European Union (EU) and implemented by the United Nations Industrial Development Organization (UNIDO).

In Cameroon, a relatively young SME sector is growing rapidly in terms of overall customer acquisition, however, constraint by regulations. The customer base of SME customers is quite small, thereby reducing government revenues and not creating enough employments for the million job seekers, and government believes that this could be improved upon through enterprise upgrading so that they can become more competitive/performant. It was in this regard that the government created the Enterprise Upgrading Office (Order No. 221/CAB/PM dated December 16, 2011). Although this program has started gaining the attention of many economies, there is a dearth of its adoption, especially in small-scale firms. For example,according to Cameroon's national institute of statistics (NIS 2010), only 8.3% of businesses are interested in purchasing innovative machinery and equipment, 5.9% for software-related innovations, only 4.7% of businesses train their employees in innovation, and only 11% of companies use research center results to create innovations. There is therefore to increase the discussion on this program, especially in emerging economies such as Cameroon, to increase its inclusion in small businesses.

This research study with dual objectives is a novel attempt in this regard. The authors wish to decipher its impact on the performance of local enterprises by suggesting a classification modelthatpredictsthe performance of enterprise adoption of the upgrading program in Cameroon. A key question is, “do adopters/adherers to the program perform on average, better than non-adopters/no-adherers?” The answer can assist policymakers in designing possible motivational measures that can improve adherence rates. Using Cameroon as a case study, this study investigates whether MSEs that implement this program outperform non-adopters on average. Specifically, the research aims to answer the following questions:

- What are the distinguishing characteristics of enterprises that have adhered/not adhered to the upgrading program?
- In terms of performance, which predictors are most important in predicting adherence of enterprises to the program?

The discriminant-analysis procedure was appropriate for this use because of the nature of the predefined categorical groups (adherers and non-adherers) and the interval scales used to generate individual factor scores.

2. Materials and Methods

The objective of the study was to analyze the general characteristics of adhered and non-adhered enterprises to the enterprise upgrading program with respect to selected performance measures, and to develop and evaluate a discriminant function that best discriminates between the dependent variable (groups), whether significant differences exist among them, in terms of the predictor variables.The identified performance measures were included in the proposed conceptual model (Figure 1).

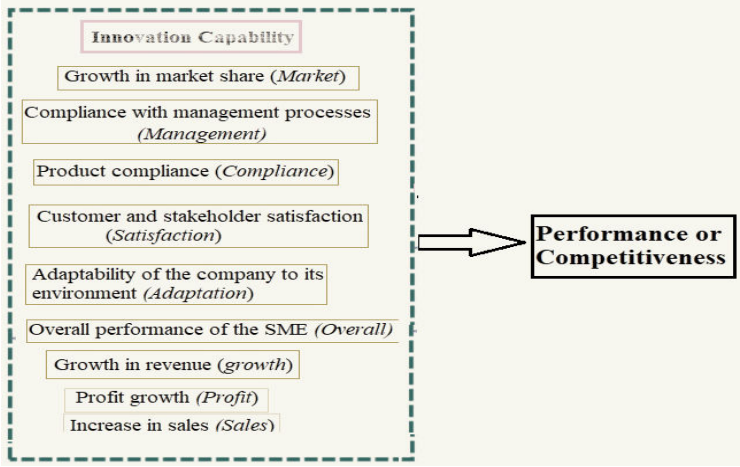

Figure 1: Research framework

These performance measures were shortlisted based on their anticipated implications for managerial decision-making in accordance with their significance in the literature. It is projected that obliviousness towards any of these measures can lead to resistance to the adoption of the program by MSEs. Optimum management of these measures is prerequisite and imperative for the analytical transition of the enterprises. Therefore, these are vital performance measures for facilitating the adoption of the program.

2.1. Survey Design and Sampling

This cross sectional design comprises a total of fifty (50) purposefully selected from the world of SMEs in Cameroon. The enterprises were similar in terms of business profile: size and capital, and created between 2010 and 2015. SMEs were targeted because they have been found to be an important factor in driving the economy and are one of the indicators of the economic development of a country (Myslimi, and Kaçani 2016). All over the world, they are considered labour intensive, so their existence can reduce unemployment, especially because of the economic impact of the economic crisis due to the pandemic (Myslimi and Kaçani 2016). Therefore, the performance of SMEs adherence to an upgrading program is an important thing to study at all times to improving the business environment and infrastructure.

2.2. Research tool

Despite the limitations of data collection by questionnaire, the tool was employed in this study because of its efficiency, the possibility of standardization and comparability of measurement, and the fact that it preserves the anonymity of data sources. In developing the questionnaire, the operational definitions of the variables were first of all identified, followed by the measurement scales. It was divided into two main sections:the first section was reserved for the characterizing the enterprises and the entrepreneurs, while the second section was devoted to performance measures. Because no generally established instrument to measure performance was found when reviewing the literature, this measure was designed by consulting the members of the enterprise upgrade office, and extracting from them the essentials of performance. Following this, nine (09) performance measure relating to the various aspects of business performance (three financial elements and six non-financial elements), were identified and operationalized (Table 1).

Table 1: Variables measured

ID	Name	Label	Variable type	Scale
		a) *General information on the company*		
1	Age	Age of enterprise		
2	Sector	Sector of activities	String	Nominal
3	Adhered	Whether enterprise is adhered to the program	Numeric/dependent	Nominal
4	Employee	Number of employees	Numeric	Ratio
5	Location	Location	String	Nominal
6	Status	Status of enterprise	Numeric	Nominal
		b) Performance measures		
		i) Financial elements		
5	Revenue	Revenue growth	Numeric/independent	Ordinal (1-7)
6	Profit	Profit growth	Numeric/independent	Ordinal(1-7)
7	Sales	Profit on sales	Numeric/independent	Ordinal(1-7)
		ii) **Non-financial items**		
8	Market	Growth in market share	Numeric/independent	Ordinal(1-7)
9	Management	Compliance of management processes	Numeric/independent	Ordinal(1-7)
10	Compliance	Product compliance	Numeric/independent	Ordinal(1-7)
11	Satisfaction	Customer and stakeholder satisfaction	Numeric/independent	Ordinal(1-7)
12	Adaptation	Adaptability of the company to its environment	Numeric/independent	Ordinal(1-7)
13	Overall	Overall performance of the SME	Numeric/independent	Ordinal(1-7)

1 Very much below average;2. Below average; 3 Slightly below average; 4 Average; 5 Slightly above average; 6 Above average; 7 Far above average

The questions were quantified on a continuous 7-point Likert scale as indicated in the above table. It was a question about the respondent's perception of each of the variables over time. The assumption is that if humans operate in a good work environment that is safe, healthy, ergonomically sound, creative, etc., these beneficial factors will be reflected in the performance of the company. However, it is not easy to demonstrate such a relationship, and the direction of causality could be debated.

2.3. Data Collection

Between March and May of 2022, relevant primary and secondary data were collected. Secondary data were gathered through document analyses in order to understand the current state-of-the-art performance literature and the most effective approaches in place. To collect primary data, a specially designed web-based questionnaire was used. First, a pretest on ten city businesses was carried out to identify any misinterpretations of the questions. The actual administration of the questionnaire followed. The targeted

respondents of the questionnaireseither the entrepreneurs or the head of the enterprise's finance division as they are more endowed with more knowledge on enterprise performance.

2.4. Data Analysis

After compiling the data on the statistical software SPSS 20, it was explored to understand its structure and to ensure that the right statistic is selected for responding to the research questions. Cronbach's α was used to measure the internal consistency. Descriptive statistics was used to describe the general information on the company, while the machine learning algorithm, a two-group discriminant analysis function analysis was used to determine which weightings of quantitative variables or predictors best discriminate between the two groups of cases and do so better than by chance (Cramer, 2003) .

2.5. Overview of Discriminant Analysis

Discriminant Analysis (DA) is a parametric technique to determine which weightings of quantitative variables or predictors' best discriminates between two or more than two categories of dependent variables and does so better than chance (Balakrishnama and Ganapathiraju, 1998).When three or more categories are involved, the technique is referred to as multiple discriminant analysis. The main distinction is that in the two-group case it is possible to derive only one discriminant function, but in multiple discriminant analysis more than one function may be computed (Johnson, and Wichern, 1998). The discriminant analysis model involves linear combinations of the following form:

$$D_{jk} = b_0 + b_1 X_{1k} + b_2 X_{2k} + \cdots + b_k X_{nk} \quad (1)$$

Where D = Discriminant Z score of discriminant function j for object k. or discriminant score

b_0 = the intercept

b_k = Discriminant coefficient for the Independent variable i.

X_{nk}= Independent variable i for object k.

The coefficients or weights (b) are estimated so that the groups differ as much as possible on the values of the discriminant function.

Five steps were adopted in conducting the discriminant analysis starting from problem formulation and ending with the assessment of the discriminant function (Fig. 2).

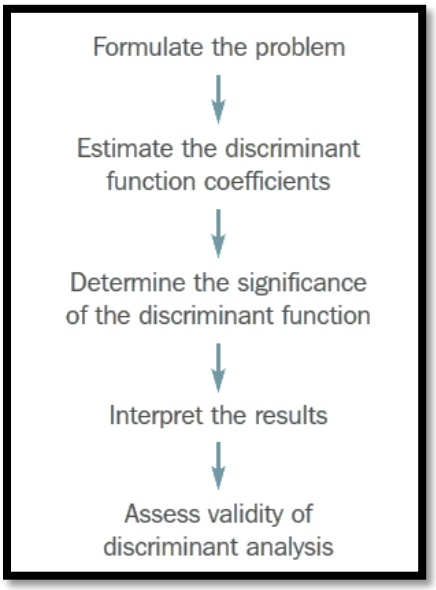

Figure 2: The Algorithm of discriminant analysis

These steps are discussed and illustrated within the context of two-group discriminant analysis. The first step in discriminant analysis is to formulate the problem by identifying the objectives, the criterion variable and the independent variables. The criterion variable must consist of two or more mutually exclusive and collectively exhaustive categories. In this paper, the discriminant problem is whether enterprise performance significantly discriminates between enterprises (groups) that have adhered to the program and those that have not adhered to the program.

In the second step, the discriminant function was developed so that the groups differ as much as possible on the predictor values. From the dataset with n = 50 samples $\{x_i, y_i\}_{i=1}^{n}$ and K classes, where $x_i \in R^p$,and

$$Y_i \in \{0,1\}^k . y_i(K) = \begin{cases} 1, \text{if } x_i \in \text{kth class} \\ = 0 \text{ otherwise} \end{cases}$$

The input data was partitioned into K = 2 groups as $\{\pi_k\}_{k=1}^{n}$,where π_k denotes the sample set of the k-th class with n_k data points. We write $X = [x_1, \dots, x_k]$ and

$$Y = [y_1, \dots, y_n]^T = [y(1), \dots, y(k)], \qquad (2)$$

Where $y(k) \in \{0,1\}^n$ is the classwise label indication vector for the k-th class.

In a classical linear discriminant analysis, we seek for alinear transformation, G = G= R^{pxr}that maps $\mathbf{x}_i$, in the high p-dimensional space to a vector $q_i \in R^r$ in a lower r(<p)-dimensional space by $q_i = G^T \mathbf{x}_i$. The between class (S_b), within class (S_w), and total class (S_t) scatter matrices are defined as in equations (3 – 4) :

$$S_b = \sum_{k=1}^{K} n_k (m_k - m)(m_k - m)^T, \qquad (3)$$

$$S_w = \sum_{k=1}^{K} \sum_{x_i \in \pi_k} (x_i - m_k)(x_i - m_k)^T, \qquad (4)$$

$$S_t = \sum_{i=1}^{n} (x_i - m)(x_i - m)^T, \qquad (5)$$

Where

m_k = mean vector = $\frac{1}{n_k} \sum_{x_i \in x_k} x_i$ is the class mean(class centroid)of the k-th class,

$m = \frac{1}{n} \sum_{i=1}^{n} \boldsymbol{x}_i$, is the global mean (global centroid), and

$S_t = S_b + S_w$.

The optimal G is chosen such that the between−class distance is maximum whilst the within class distance is minimized in in the low-dimensional projected space, which leads to the standard LDA optimisation objective [Ding, Wang, and Huang 2010)] as follows:

$$\text{argmax}_G J = \text{tr}\left(\frac{G^T S_b G}{G^T S_w G}\right) = S_w^{-1}(\mu_1 - \mu_2) \qquad (6)$$

The problem reduces to one of finding the weights which, when applied to the data, best discriminate among groups according to some criterion. The solution reduces to finding the eigenvectors, eigenvector(s), V, of:

$$Av = \lambda v$$

$$S_x = S_w^{-1} . S_B. \qquad (7)$$

Where

$$A = S_x = S_w^{-1} . S_B$$

V =Eigenvector

λ =Eigenvalue

The canonical coefficients are the elements of these eigenvectors. The canonical correlation r (Rencher 2002) which serves as a means of measuring the association between the groups in the dependent variable and the discriminant function was used to know how well the variables separate the groups (Equation 8).

$$r = \sqrt{\frac{\lambda_1}{1+\lambda_1}} \qquad (8)$$

A high level of r within the range of values (0 < r < 1) indicates a high level of association between the groups in the dependent variable and the discriminant function.

In the third step, the statistical significance of the model was evaluated. It involved testing the null hypothesis that, in the population, the means of all discriminant functions in all groups are equal. If the null hypothesis is rejected, it is meaningful to interpret the results. Significance of the discriminant function was determined using determined using the Wilk's λ test (0 <λ< 1) for two group case. The closer this is to 0, the more significance is the discriminant function.

In the fourth step, we interpreted the discriminant weights or coefficients. Given the multicollinearity in the predictor variables, there is no unambiguous measure of the relative importance of the predictors in discriminating between the groups. We examined the absolute magnitude of the standardized discriminant function coefficients and the structure correlations or discriminant loadings to understand the variance that the predictor shares with the function.

Finally, in the fifth step, the model is validated. The discriminant weights estimated by using the analysis sample are multiplied by the values of the predictor variables in the holdout sample to generate discriminant scores for the cases in the holdout sample. As this was a two-group discriminant function, the cutting score (Equation 9) was used to classify the two groups uniquely.

$$Z_{cs} = \frac{N_A Z_B + N_B Z_A}{N_A + N_B} \quad (9)$$

Where,

Z_{cs} = Optimal cutoff value between group A and B.
N_A = Number of observations in group A.
N_B = Number of observations in group B.
Z_A = Centroid for group A.
Z_B = Centroid for group B.

Optimal cutting score depends on sizes of groups. In the special case where the two groups are equal, $N_A = N_B$,

$$Z_{cs} = \frac{Z_A + Z_B}{2} \quad (10)$$

3. Results and Discussions

What are the distinguishing characteristics of enterprises that have adhered/not adhered to the upgrading program? The overall performance subscale consisted of 9 items (α = .88), suggesting a good scale reliability.

3.1. Demographic characteristics differentiating the sampled groups

Of the 50 enterprises that were sampled, 11(22%) were Medium Sized, 14(28%) were microenterprises, while 25(50%) were small enterprises. Of the 11 medium sized enterprises, 11(54.5%) adhered to the program while 5(45.5%), not adhered. For the microenterprises, 7(50%) were not adhered (adopted)to the program while the rest were adhered/adopted, while, of the 25 small enterprises, 14 (56.0%) were not adhered while 11(44.0%) were adhered (Fig. 3)

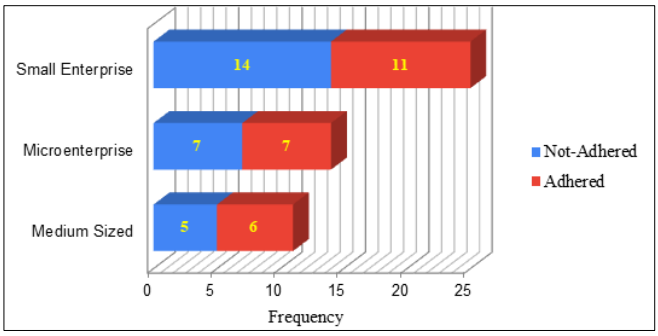

Figure 3: Relationship between regimes of enterprise adhesion status

The enterprises were sole proprietors (34%), partnership (48%), or private limited(18%) (Fig. 4)

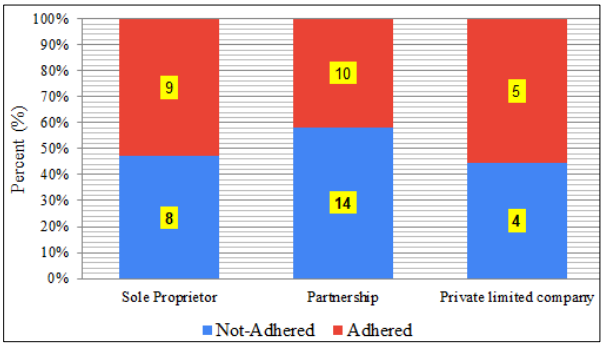

Figure 4: Relationship between category of enterprise and adhesion status

The enterprises were of three main sectors of activities: the industrial sector (Agri-food, Chemicals and pharmaceuticals, Mechanics and metallurgy, Electrics-electronics and household appliances, Building materials, ceramics and glass), the commercial sector (General Trade), and the service sector (Banks and Microfinance Institutions, Business Services) (Fig 5)

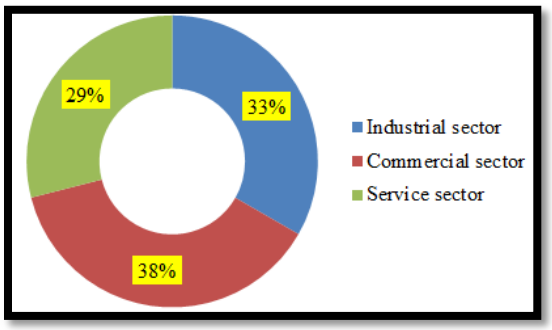

Figure 5: Sector of activities of the selected enterprises

Firms in various sectors face different product demands and costs, such as input prices or the amount of competition, which influence their proclivity to upgrade. Several researchers, for example, have discovered that 'trading' businesses and retail shops are less likely to upgrade than businesses in the manufacturing and service sectors (Mead and Liedholm 1998).

Most of the enterprises that had adopted the program were younger enterprises (Fig. 6)

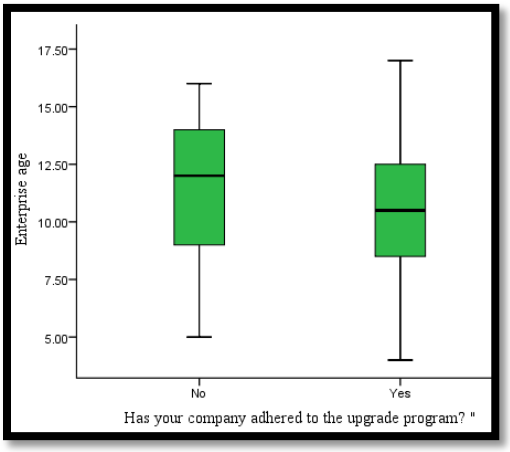

Figure 6: Relationship between age of enterprise and adoption of the upgrade program

The above findings correlate with empirical evidence from developed and developing countries which have repeatedly demonstrated that enterprise employment growth rates tend to decrease with enterprise age (Mead and Liedholm 1998). According to Banerjee and Duflo (2000), older firms benefit from reputation effects, stable contracts, and higher productivity. Generally, enterprises are thought to go through intense processes of organizational learning, bureaucratization, and structural change that eventually lead to the optimization of their productive performance. However, empirical evidence suggests that in developing countries, the ability of firm owners to modernize their businesses, rather than the firm's age, drives employment and productivity growth (Mead and Liedholm 1998).

The number of employees range from 4 to 1854 (Mean 35.85±40.61). Sectors with large numbers of employee's agriculture, manufacturing, and service sectors (Fig.7)

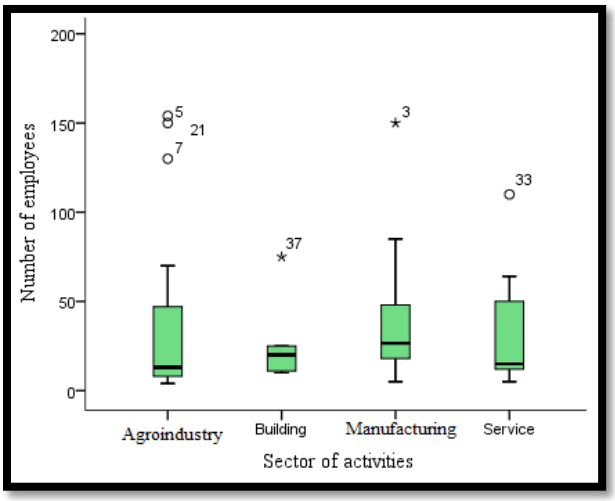

Figure 7: Distribution of enterprises according to sectors of activities

In an era of competition many employers are willing to go in for the most competent employees so as to obtain the best results. Therefore we decided to know the educational status of the respondents (Fig. 8).

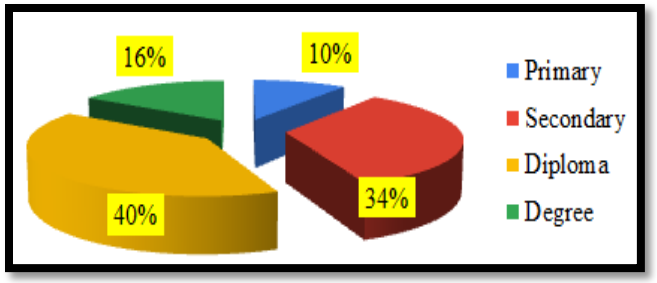

Figure 8: Level of education of the respondents

The nexus between educational level and management techniques is understandable given that enterprise management is a long term phenomenon that can only be apprehended and understood with time and practical experience. Education is linked to the entrepreneur's skills, motivation, self-confidence, problem-solving ability, commitment and discipline. Education is believed to enhance the individual's research and communication skills, foresight and imagination. Also, literacy permits access to modern/strategic management information not usually available to non-literates.

3.2. Discriminant Analysis

The question of interest in this study was whether enterprises that have adhered to the upgrading program perform on average, better than those that have not adhered to the program in terms of non-financial items: market shares (market), compliance of management processes (Management), Product compliance (Compliance), customer and stakeholdersatisfaction(Satisfaction), adaptability of the company to its environment (Adaptation), overall performance of the SME (Overall), and financial items: revenue growth (Revenue), profit growth (Profit), and profit on sales (Sales)?. Such knowledge is important to policy makers as this can help in the design of possible improved measures that can optimize the adherence rate.

The observations were a random sample from different populations characterized by different probability distributions**.**.Each predictor variable in the study was assumed to be normally distributed, and each of the allocations for the dependent categories in the initial classification is correctly classified and groups or categories were well defined before data was collected. Each case of the two groups was designed to belong to only one group so as to make them mutually exclusive and collectively exhaustive (all casescan be placed in a group). Finally, precautions were taken to ensure that the group sizes of the dependent arenot grosslydifferent and be at least five times the number of independent variables. Table 2 shows that mean differences between all the predictor variables are large suggesting that these variablesmay be gooddiscriminators.

Table 2 Group wise statistics

Has your company adhered to the upgrade program? "		Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
No	Market	2.77	1.423	26	26.000
	Management	2.92	1.468	26	26.000
	Compliance	3.08	1.440	26	26.000
	Overall	3.42	1.653	26	26.000
	Revenue	3.35	1.623	26	26.000
	Profit	3.00	1.386	26	26.000
	Sales	2.81	1.201	26	26.000
	Satisfaction	3.38	1.499	26	26.000
	Adaptation	2.77	1.210	26	26.000

Yes	Market	4.71	1.122	24	24.000
	Management	4.38	1.279	24	24.000
	Compliance	4.63	1.408	24	24.000
	Overall	4.63	1.765	24	24.000
	Revenue	4.29	1.574	24	24.000
	Profit	4.50	1.383	24	24.000
	Sales	4.33	1.606	24	24.000
	Satisfaction	4.46	1.769	24	24.000
	Adaptation	4.67	1.685	24	24.000
Total	Market	3.70	1.607	50	50.000
	Management	3.62	1.550	50	50.000
	Compliance	3.82	1.612	50	50.000
	Overall	4.00	1.796	50	50.000
	Revenue	3.80	1.654	50	50.000
	Profit	3.72	1.565	50	50.000
	Sales	3.54	1.593	50	50.000
	Satisfaction	3.90	1.705	50	50.000
	Adaptation	3.68	1.731	50	50.000

On a linear combination of performance measures, a discriminant analysis was performed to test the hypothesis that enterprises that adhered to the upgrading program differed from those that did not. Since we had a somewhat small sample size, determining the distribution of the variable "performance" was important for choosing an appropriate statistical method. So a Shapiro-Wilk test was performed and did not show evidence of non-normality, Market (W = .917, p > 0.05), Compliance (W = .886, p > 0.05), Satisfaction(W = 0.894, p > 0.05), Adaptation (W = .777, p > 0.05), Overall (W = 0.861, p > 0.05), Revenue (W = 0.897, p > 0.05), Profit (W = 0.901, p > 0.05), and Sales (W = 0.899, p > 0.05).

The dependent variable was the dichotomy between those enterprises that have adhered and those that haven't.The discriminant equation for the analysis was estimated by using a sub-sample of 25 enterprises respondents from the sample of 50. Of the remaining respondents, all were used as a validation sub-sample in a cross-validation of the equation. The pooled within-groups correlation matrix indicated low correlations between the predictors suggesting that multicollinearity is unlikely to be a problem. The significance of the univariate F ratios indicates that, when the predictors are considered individually, all significantly differentiate between enterprises that have adhered and those that haven't adhered to the program.

3.3. Determination of the significance of the discriminant function

Table 3 provides statistical evidence of significant differences between means of the adhered and non-adhered groups for all the predictor variables.

Table 3 Tests of equality of group means

	Wilks' Lambda	F	df1	df2	Sig.
Market	.629	28.307	1	48	.000
Management	.777	13.806	1	48	.001
Compliance	.765	14.729	1	48	.000
Overall	.886	6.183	1	48	.016
Revenue	.917	4.360	1	48	.042
Profit	.766	14.650	1	48	.000
Sales	.767	14.620	1	48	.000
Satisfaction	.899	5.391	1	48	.025
Adaptation	.694	21.155	1	48	.000

The results suggest that all the predictors are good to discriminate between adhered and non-adhered groups. Inspection of Q-Q Plots revealed that all the independent variables were normally distributed for both groups and that there was homogeneity of variance as assessed by Levene's Test for Equality of Variances. Therefore, an independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. The null hypothesis for the independent t-test is that the population means from the two unrelated groups are equal:

H_0: $u_1 = u_2$

In most cases, we are looking to see if we can show that we can reject the null hypothesis and accept the alternative hypothesis, which is that the population means are not equal:

H_A: $u_1 \neq u_2$

It was found the 24 enterprises which adhered to the program compared to the 26 participants in the control group perceived significant performance of their enterprises (Table 4).

Table 4: Results of independent-samples t-test comparing the means between two unrelated groups

ID	Independent variables	Adhered?	N	Mean	SD	t	df	P-value
1	Adaptation of our enterprise to its contextual environment	No	26	2.77	1.423	-	48	.000
		Yes	24	4.71	1.122	5.32	48	
2	Increase in market share	No	26	2.77	1.423	-	48	.000
		Yes	24	4.71	1.122	5.32	48	
3	Compliance of management processes in the operation of our business	No	26	2.92	1.468	-	48	.001
		Yes	24	4.38	1.279	3.84	48	
4	Overall performance of our enterprise	No	26	3.08	1.440	-	48	.016
		Yes	24	4.63	1.408	2.48	48	
5	Conformity of our products with those of our competitors	No	26	3.42	1.653	-	48	. 042
		Yes	24	4.63	1.765	2.09	48	
6	Growth in net profit on equity	No	26	3.35	1.623	-	48	..000
		Yes	24	4.29	1.574	3.83	48	
7	Growth in revue	No	26	3.00	1.386	-	48	.000
		Yes	24	4.50	1.383	3.82	48	.
8	Growth in benefits on sales	No	26	2.81	1.201	-	48	.000
		Yes	24	4.33	1.606	3.82	48	.
9	Satisfaction of our customers and partners of our enterprise	No	26	3.38	1.499	-	48	.000
		Yes	24	4.46	1.769	2.32	48	

In addition, a one-way between subjects ANOVA was conducted to compare the effects of the independent variables on the dependent variable. There was a significant effect of adherence to the program at $p<.05$ level for adaptation of the enterprise to its contextual environment [$F(1, 48) = 21.55$, $p = .000$], Increase in market share[$F(1, 48) = 28.307$, $p = .000$], Compliance of management processes in the operation of our business [$F(1, 48) = 13.806$, $p = .001$], Overall performance of the enterprise [$F(1, 48) = 14.72$, $p = .016$], Conformity of products with those of our competitors [$F(1, 48) = 6.183$, $p = .000$], Growth in net profit on equity [$F(1, 48) = 4.360$, $p = .042$], Growth in revue [$F(1, 48) = 14.650$, $p = .000$], Growth in benefits on sales [$F(1, 48) = 14.620$, $p = .000$], and Satisfaction of customers and partners of the enterprise [$F(1, 48) = 5.391$, $p = .025$], suggesting that adhered enterprises tend to have a competitive advantage over the non-adhered enterprises with respect to the selected performance measures.

Multivariate analysis revealed a significant difference between the two feedback groups (Wilks' $\lambda = .380$, Chi-square = 42.126, df = 8, P = .000). This model therefore, does work better than would be expected by chance

for this sample size. Again, the canonical correlation, which determines how much in percentage the function explains the discrimination between groups was 0.788 (r^2=.621), suggesting that the function explained 62.1% of the between group variance. Furthermore, the eigenvalue is 1.634 (>1) indicating that the function is a good model.Figure 9 shows the standardized canonical coefficients and the structure weights, revealing that both of the variables contributed to the multivariate effect.

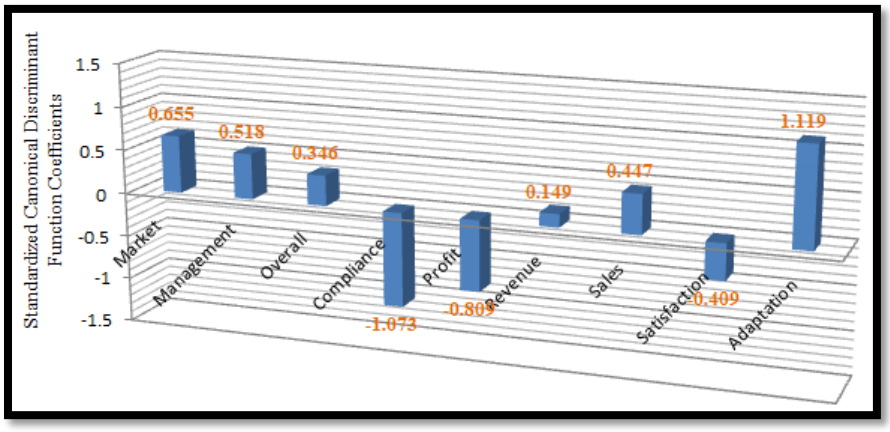

Figure 9: Standardized canonical coefficients and the structure weights

The absolute value of the standardized function coefficients shows that "adaptation of our enterprise to its contextual environment", and "Conformity of our products with those of our competitors "are the most important variables in enterprise upgrading. The next important predictors are "Growth in net profit on equity ", "Increase in market share", and "Compliance of management processes in the operation of our business". The least predictor is "Growth in revue ". In modern economy, entrepreneurs are interested in minimizing cost and maximizing profits. They will hardly want to engage in programs that will not significantly lead to the growth of their revenues. This probably explains why most entrepreneurs might not be willing to adhere to the program. The low revenue in this case could be the result of the operational costs in penetrating new markets, including adverts, certifications, taxes, and so on.

To create the discriminant equation, unstandardized coefficients (b) have been calculated for all the predictors.

D1 = -3.105 + 0.768*Adaptation + 0.5.8*Market + 0.375*Management + 0.243*Overall – 0.629*Compliance – 0.506*Profit + 0.108*Revenue + 0.317*Sales – 0.250*Satisfaction

The model suggests that adhering to the program may improve enterprise ability to adjust and respond to changes brought about by the dynamic external environment. Organizations should always be adaptable to be successful, as the market dynamics are constantly changing.

A business must be adaptable in order to gain a competitive advantage. The model also predicts that adhered enterprises' market share will grow. Market share is an important indicator of a company's competitiveness because it represents a company's percentage of total industry sales. It is an indicator of how large a company is and the amount of influence it has in its industry. It can also be a sign of progress and success. Profitability improves when a company increases its market share, but this is not the case here. This could be due to recent costs associated with increasing their market share, such as implementing new technologies, delivering a higher-quality product, implementing good marketing, and generating customer loyalty. Our arguments agree with those of Hult*et al.* (2004), who, from a sample of 181 American companies, concluded that enterprise upgrading positively influences performance in all its forms (profitability, growth, market

share, general performance). Other studies conducted among senior executives of 113 companies operating in the automotive sector considered to be the most innovative in Turkey, Atalaya et al. (2013), found that technological innovation has a significant and positive impact on firm performance.

Compliance management is a continuous process in which managers monitor and assess systems as well as organize, plan, control, and lead activities to ensure legal, regulatory, and industry compliance. A good management style will lead to good business results. Businesses must manage both internal and external challenges (Eklund, 2020), whether they are the result of a changing working-age population, market volatility, or intense and complicated competition (Muller, 2019). As a result, businesses must develop specific strategies and action plans to mitigate the risks associated with these operations. Furthermore, in order to improve operational efficiency, situations must be examined from every angle (Kyal et al., 2022). Businesses will be able to operate more efficiently and effectively as a result of these (Gosnik and Stubelj, 2021).

Product compliance, on the other hand, appears to come at a cost to adherent businesses. However, meeting product compliance is a difficult task, resulting in low stakeholder satisfaction. Product compliance refers to a set of regulatory requirements, constraints, rules, and standards that a product must meet in order to be legally placed on the market. Stakeholder satisfaction, on the other hand, is important because it influences the decisions that stakeholders make about their involvement in an organization. Overall, adhered SMEs perceived a slight improvement in financial health and ability to produce goods and services, i.e., operational performance. Businesses have engaged external parties to leverage internal capabilities as part of their innovation strategy.Innovation is critical in determining an organization's longevity and growth, and it is essential for upgraded businesses. It is a multifaceted process by which a company develops new products, processes, and systems in order to adapt to changes in the market, technology, and competition mode (Zhou et al. 2021). Its activities include among other things, the creation, dissemination, and translation of knowledge in the form of new or modified products or services, as well as the development of new manufacturing or processing techniques (Francis and Bessant 2005).

The discriminant function coefficients *b* or standardized form *beta* both indicate the partial contribution of each variable to the discriminate function controlling for all other variables in the equation. We infer from the figure that compliance, profit and satisfaction might be major setbacks to enterprise upgrading. Given the multicollinearity in the predictor variables, there is no unambiguous measure of the relative importance of the predictors in discriminating between the groups (Dant et al. 1990). With this caveat in mind, we can obtain some idea of the relative importance of the variables by examining the absolute magnitude of the standardised discriminant function coefficients. Generally, predictors with relatively large standardized coefficients contribute more to the discriminating power of the function, as compared with predictors with smaller coefficients.

The group means of the predictor variables (centroids) further revealed that adhered enterprises have a mean of 1.304 while non-adhered enterprises produce a mean of –1.203, suggesting better group discriminability. Cases with scores near to a centroid are predicted as belonging to that group. Figure 10 gives a graphical depiction of the multivariate results. As can be seen, enterprises that have adhered to the upgrading program

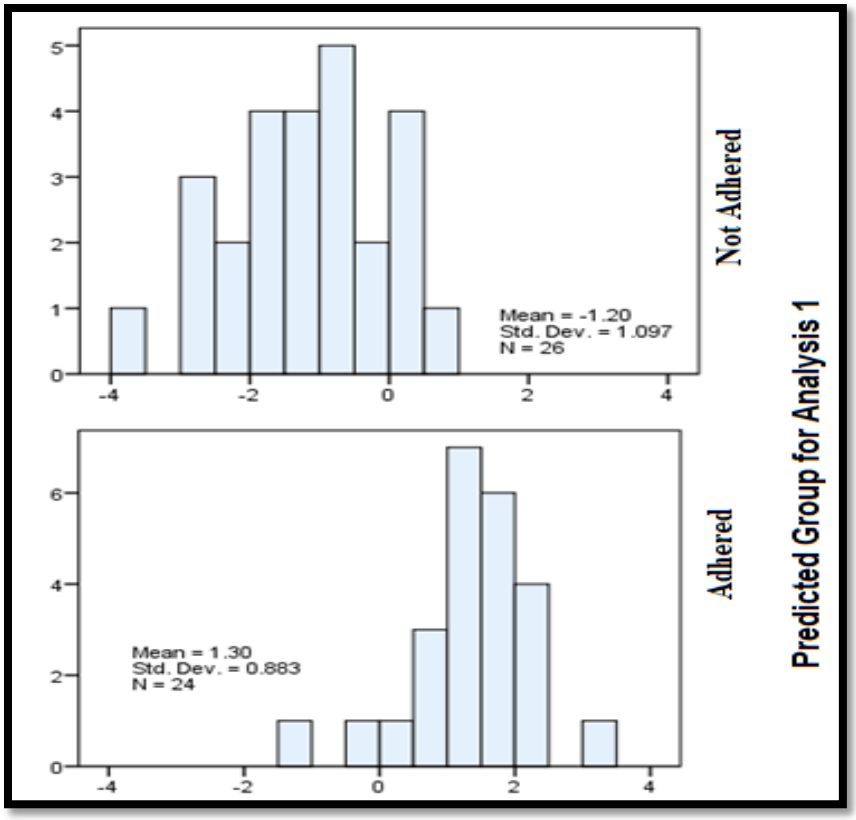

Figure 10:Separate-Groups Graphs: discriminant scores from Function1 for Analysis 1

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Clearly, adhered enterprises perceived greater performance than the non-adhered enterprises.

3.4. Predictive accuracy of the model:

The classification table/confusion table (Table 5), reveal that 86.0% of respondents were classified correctly into 'Adhered (Yes)' or 'not-adhered (No)' groups. Adhered enterprises were classified with slightly better accuracy (91.7%) than the non-adhered (80.8%). Cross-validation of the results was performed that found similar to original classificationresults.

Table 5: Cross Validated Classification Results[a,c]

		Adhered?	Predicted Group Membership		Total
			No	Yes	
Original	Count	No	21(80.8%)	5(19.2%)	26(100%)
		Yes	2(8.3%)	22(91.7%)	24(100%)
Cross-validated[b]	Count	No	20(76.9%)	6(23.1%)	26100%)
		Yes	3(12.5%)	21(87.5%)	24100%)

a. 86.0% of original grouped cases correctly classified.
b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
c. 82.0% of cross-validated grouped cases correctly classified.

This cross-validation prediction of group membership provides a summary of how well the analysis would be at classifying new performance measures that have not been included in the original sample of the

companies. So far, we can deduce that the discriminant analysis validates the initial grouping of performance measures according to the categorical dependent variable before we started the analysis.

4. Conclusion and Recommendations

Because of the benefits inherent in the program, adhering to it has been one of the most important government policies in developing countries, including Cameroon. Non-adherence might jeopardize international trade security, including performance and competitiveness. Hence, this paper examined performance measures for both adherent and non-adherent enterprises using a machine learning algorithm, the linear discriminant analysis, in order to better understand the parameters contributing to the added values that the program brings to local enterprises. A good heuristic model or solution to the problem has been developed. A cross-validation prediction accuracy of 86.0% clearly indicates that the model can be reliably generalized to companies of unknown group membership. Entrepreneurs with a more positive attitude and a perception of a strong reciprocal relationship and subjective norm will be more likely to adhere. However, there is no discernible difference in financial performance between adhered and non-adhered enterprises probably because the evaluation period is not long enough. We encourage the Bureau of Enterprise Upgrade to step up their educational seminars and sensitization programs to inform enterprise owners on the importance of this program. The process of enterprise upgrading also seems to be long and involves considerable operational costs. Added to an already hostile business environment, these appear to be uphill tasks for many businesses. Therefore, further research into the factors influencing enterprise adherence to the upgrade program could be important. Other machine learning algorithms such as the neural networks have been successfully applied to solve many optimization problems in the past. It is possible that these techniques can also be applied to solve the current problem if a good mapping of the problem to appropriate network architecture is found. These could be an interesting area for research in the future.

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