The role of incubator classification on performance of incubators in Kenya

Miriti Jane Kinya ^{(a)*} Wanjau Kenneth Lawrence ^(b) Nyagweth Ebenezer Odeyo ^(c)

^(a) Ph.D., School of Business, Karatina University, P.O Box 1957-10101, Karatina, Nyeri, Kenya.

^(b) Associate Professor, School of Business, Karatina University, P.O Box 1957-10101, Karatina, Nyeri, Kenya.

^(c) School of Pure and Applied Sciences, Kenyatta University, P.O. Box 43844-00100 Nairobi, Kenya

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ABSTRACT

The study sought to assess the importance of classifying incubators based on the programs offered for optimum performance. Client selection criteria were assessed through three constructs namely: models that fit program goals, uniqueness of ideas, and standard selection tool. A mixed cross-sectional and causal design was adopted and a census was carried out targeting all the 51 incubators. Primary data was collected with an incubator program as a grouping/ cluster variable yielding a multilevel data structure with incubator centres nested in programs. Linear mixed effect models were fitted using Stata to assess the study objective taking into account the fixed effects for the incubator centre level (level-1) and random effects for the program level (level-2). The uniqueness of ideas was found to have a significant fixed effect on performance at level one while at level two, the study found significant random intercepts of incubator centre performance across the programs. Models that match program goals and standard selection tools were also found to have significant random slopes as level two random covariates in the model. Based on the findings of significant random slopes, the study concluded that incubator classification is key for client selection criteria and enhances incubator performance.

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Introduction

The economic future of firms is pegged on the firm's ability to create and preserve wealth by advancing creativity harnessing innovation and promoting entrepreneurship (Eshun, 2009). The scholar purports that, the business environment is complex and dynamic, calling for firms to restructure their organizational environment to respond to the complexity and dynamism of the new and emerging economic order by embracing and adopting business incubation strategy, which will drive the firm's effort to create value for firm's stakeholders and improving the country's Gross Domestic Product (GDP).

To achieve the desired value, there is a need to identify the specific contribution made by incubators in the various sectors of the economy through nurturing early stage innovative business because these particular businesses have high growth potential to become competitive businesses (Info Dev, 2011). This report provides ten reviews of agribusiness incubators in Africa, Asia, and Latin America on the impact of the incubators and the cost-benefit effectiveness of their interventions. Such a review, can only be possible if data is readily available, hence the need to document this information and make it readily available. The other challenge that is likely to hinder such data to be collected is the failure to avail data on the different incubation models found in different countries Kenya included (Kinya, Wanjau, and Omondi, 2018). It's upon this backdrop that this study sought to assess the importance of classifying incubators based on the programs offered for optimum performance through their client selection criteria.

Situated Learning theory (SLT) expounded by Jean Lave and Etienne Wenger in the early 1990s. The theory purports that learning is a function activity, context, and culture in which it is situated (Lave, 1996). The scholar further states that learners form a

* Corresponding author. ORCID ID: 0000-0002-5918-3433

community of practice embodying certain beliefs and behaviour acquired. It is also envisaged that learners get engaged within the culture and assume the role of experts. The proponents of the theory argue that learning is normally unintentional rather than deliberate. This view contradicts the purpose of learning in an incubator since incubatees seek admission into an incubator to deliberately seek knowledge for superior performance.

The ideas expressed in this theory are referred to as the process of legitimate peripheral participation (Lave & Wenger, 1991) this indicates that, newcomers become experienced members within a community of practice through collaboration in a project. The principles advocated for in this theory show that, authentic context of knowledge and learning to take place, it calls for social interaction and collaboration (Lave, 1988).

Wachira (2017) in his study, viewed University based incubators as community of practice because these incubators are avenues where entrepreneurial learning and development is enhanced. In this study the scholar enlisted three factors that will facilitate these incubators to develop communities of practice. First, is the strength of the community in achieving common purpose, second, quality of the boundary (i.e. spaces where the incubator manager's community interfaces with other communities of practice). Third, health of the community identity that allows for creation of new meaning, learning and development. This study justifies universities exploiting the opportunities that exists in creating communities of practice and eradicate the problem of unemployment among youth and especially young graduates from universities.

The theory is relevant to the study because clients are admitted into an incubator to acquire knowledge and skills gradually as novices learning from experience and in the context of everyday activities to solve problems (Cognition and technology group at Vanderbilt, 1993). It is also evident from the theory that for optimum performance of incubators, there is need to group incubators into communities of practice and client selection be based upon that criterion. Classification will assist in getting the incubator model right hence the right definition, it will also ground the concept (Theodorakopoulos, Kakabadse and McGowan, 2014). This will encourage incubator managers to collect data for the category of their incubators, and data that is currently missing will be availed and make it possible to evaluate incubator effectiveness which is a challenge at the moment.

Business incubators are entrepreneurial development tools that promote innovation, economic growth, and employment creation for countries (Theodorakopoulos, et al., 2014). But despite this contribution, there is still lack of a comprehensive framework to measure the effectiveness of incubators. The other challenges that compounds the scenario is the heterogeneity of business incubators, definitional incongruences, and broad assessment criteria for incubator effectiveness (Dee, Livesey, Gill, and Minshall, 2012). There is an issue with the multiplicity of incubator and incubation concept. The term is used interchangeably to fit varying local needs and conditions (Kuratko and Lafollette, 1987). These include science parks (Link and Scott, 2017) industrial park (Albahari et al, 2019), knowledge parks (Bugliarello, 1998), innovation centres (Smilor, 1987), business accelerator (Barrow, 2001) and networked incubator (Bollingtoft and Ulhoi, 2005; McAdam and McAdam, 2006). All these terms refer to the same concept. Failure to categorize incubators and draw a distinction between the various models will hinder the generalizing of findings from incubators. The other challenge is the lack of consensus on what constitutes success in terms of quality and efficiency measures or indicators with greater impact (Albort-Morant and Ribeiro-Soriano, 2016)

Different incubators are supported by different stakeholders who have different objectives, therefore incubators not classified will offer challenges in embracing the documented best practices to achieve the stakeholders objectives (Hannon and Chaplin, 2003). The scholars singled out a university incubator's parameters of success. Survival rate alone is not sufficient but this should be accompanied by the high level of graduates employed. Universities would accept this as a satisfactory measure of success. To overcome this challenge, there is need to classify incubators, and correctly identify the model, standardize parameters of evaluating the effectiveness of an incubator. Once the categories are identified, different incubators will come up with client selection criteria for admission and what parameters to use to gauge the performance of the incubator for prudent utilization of resources.

This paper thus assesses the role of Incubator Classification on the effect of Client Selection Criteria on the Performance of Incubators in Kenya. Based on the sub dimensions of the client selection criteria as shown in Figure 1. The following hypotheses were tested;

H₀₁ Model that matches program goals has no significant effect on Incubator centre performance across incubator categories in Kenya.

H₀₂ Uniqueness of ideas has no significant effect on Incubator centre performance across incubator categories in Kenya.

H₀₃ Standard selection tool has no significant effect on Incubator centre performance across incubator categories in Kenya.

Client selection criteria were measured using a multi-dimensional scale based on three sub-dimensions which were considered as independent variables in this study. The variables for this study, therefore, consisted of three independent variables (X1 to X3) and one dependent variable (Y) while considering incubator categories as a cluster variable grouping the incubators studied based on programs offered by the incubators.

Figure 1: Conceptual Framework.

Research & Methodology

The research design adopted in this study was mixed considering non-experimental, cross-sectional and a causal approach. Cross-sectional data was collected and the researcher did not have any control of the research environment as in experimental research designs. The causal approach was adopted so as to help meet the research objective of determining the influence of client selection criteria on incubator performance. A population of 51 start-up business incubators were considered grouped by the business programs they incubate. A census approach proposed by Israel (2012) as a cost-effective approach was used to determine the elements to include in the study. This approach was used considering the small population of 51 incubator managers that target SME start-ups. All the 51 incubator managers were therefore included in the study without sampling. A semi-structured questionnaire was used to collect the primary data from the incubator managers as respondents. Likert scale was used on the indicators of the variables as it is a widely used measure in social research (Chimi & Russel, 2009). This scale, examines how strongly subjects agree or disagree with a statement (Cooper & Schindler, 2011). The use of Likert scale was best suited when the value sought is a belief or opinion, and the effect or value sought cannot be given with definite precision, or it is considered sensitive. The questionnaire was focused around client selection criteria involving the main areas of models that match program goals, uniqueness of ideas and standard selection tool.

The study adopted a causal approach which required the use of statistical estimation techniques to fit the model used to draw conclusions on the objectives of the study. To address the effect of objectives, the data collected considered multi-level with variation across entities within program clusters as level-1 and variation across program clusters as level-2.

The observations at level-1 are not expected to be independent as the incubators and the respondents (managers) within a category (program clusters) of level-2 are expected to share the characteristics that the group has (Nezlek, 2008). The objective was assessed by fitting linear mixed effect models (LME) to address the multi-level structure of the data. The development of LME models involves fitting the model in hierarchies with level-1 components reflecting fixed effect parameters and level-2 reflecting random effect parameters such that level-1 residuals depend on the estimate used for the fixed effects parameters (Loy & Hofmann, 2017).

Analysis and Discussion

The entire population of incubators in Kenya were targeted thus 51 questionnaires were distributed to the respondents. Out of these 51, only 41 (80.39%) questionnaires were successfully filled and returned. The response rate of 80.30% was considered to be very good basing on proposals by Edward et al (2002), who stated that a response rate between 60% and 80% is adequate while that below 60% is considered poor. Babbie (1990) on the other hand proposed that a response rate of 50% is adequate. The measurements for each construct were examined for construct validity by assessing for convergent and discriminant validity basing on factor analysis results. All the indicators were found to all have loadings above 0.4 on the latent variables. Average variance extractions for each latent variable were computed which were all found to be above 0.5 implying convergent validity. All the square multiple correlations for each variable were found to be less than the respective average variance extracted (AVE) implying discriminant validity.

The results therefore confirmed construct validity and reliability of the measurements to the latent variables. Reliability was examined using Cronbach alpha statistics where reliability of each latent variable is attributed to a Cronbach alpha above 0.7. All the variables in this study had Cronbach alpha statistics above 0.7 which showed that the indicators were reliable measurements for the constructs as shown in Table 1.

Table 1: Validity and reliability

Construct	Average extracted variances	Multiple correlations	KMO	Bartlett's Stats		Cronbach's Alpha
				χ^2	P-value	
X1	0.834	0.197	0.432	39.815	0.000	.729
X2	0.939	0.441	0.604	15.054	0.002	.763
X3	0.883	0.524	0.523	42.002	0.000	.762
Y	0.923	0.419	0.522	15.479	0.001	.905

Descriptive analysis

The indicators used to measure the constructs were measured on an ordinal Likert scale of 5 and were the summary descriptive analysis was carried out using frequency tables. The frequency tables analyses carried out however reflected the multiple levels to capture distribution based on variations across the incubators (level-1/ within level) and the variations across the grouping programs (level-2/ between level). Table 2 is a display of the descriptive analysis results for the sub-construct models that match program goals.

For the indicator based on the question as to whether management only selects ideas that match the centre resource base, majority (46%) of the respondents strongly agreed while 31% of the respondents either agreed that management only selects ideas that match the centre resource base, 15% of the respondents were neutral and 8% either disagreed or strongly disagreed. The between results show that, for some (0%) of the programs, there were at least some incubator respondents who strongly disagreed that management only selects ideas that match the centre resource base while some (33%) of the programs, there were at least some incubator respondents who were neutral. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the statement. On average, within the 5 programs that at least had neutral incubator respondents, only 69% of the respondents were neutral that management only selects ideas that match the centre resource base.

The overall distribution of the indicator is that ideas selected are those with economic value. Majority (56%) of the respondents agreed, 31% of the respondents strongly agreed that ideas selected are those with economic value, 5% of the respondents were neutral while 5% disagreed or strongly disagreed. The results show that, in most (83%) of the programs, there were at least some incubator respondents who agreed that the ideas selected are those with economic value while for some (0%) of the programs, there were at least some respondents who disagreed. On average, within the 5 programs that at least had respondents who agreed, only 71% of the studied incubator respondents agreed that the ideas selected are those with economic value.

The study also sought what the respondents perceived of the question that ideas selected are those with a multiplier effect, Majority (44%) of the respondents strongly agreed, 38% of the respondents agreed that ideas selected are those with a multiplier effect, 23% of the respondents were neutral while 5% disagreed or strongly disagreed. The between results show that in most (67%) of the programs, there were at least some incubator respondents who agreed that ideas selected are those with a multiplier effect while for some (0%) of the programs, there were at least some incubator respondents who disagreed that ideas selected are those with a multiplier effect. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 4 programs that at least had incubator respondents who agreed, only 61% of the studied incubator respondents agreed that ideas selected are those with a multiplier effect.

Table 2: Models that match program goals

			1	2	3	4	5	Total
Management only selects ideas that match the centre resource base. (varMPG001)	Overall	Freq.		3	6	12	18	39
		Percent	0%	8%	15%	31%	46%	100%
	Between (n=6)	Freq.		1	2	2	5	10
		Percent	0%	17%	33%	33%	83%	167%
	Within	Percent	0%	25%	69%	55%	66%	60%
Ideas selected are those with economic value (varMPG003)	Overall	Freq.	2		2	22	13	39
		Percent	5%	0%	5%	56%	33%	100%
	Between (n=6)	Freq.	1		1	5	4	11
		Percent	17%	0%	17%	83%	67%	183%
	Within	Percent	20%	0%	20%	71%	52%	55%
Ideas selected are those with a multiplier effect (varMPG004)	Overall	Freq.	2		9	11	17	39
		Percent	5%	0%	23%	28%	44%	100%
	Between (n=6)	Freq.	1		3	4	3	11
		Percent	17%	0%	50%	67%	50%	183%
	Within	Percent	20%	0%	54%	61%	58%	55%

The descriptive analysis of the sub-construct uniqueness of ideas was presented in table 3. On this, the majority (51%) of the respondents strongly agreed that the selection of ideas is based on the idea's potential in creating new markets while 8% of the respondents were neutral. Some 41% of the respondents agreed that the selection of ideas is based on the idea's potential in creating new markets while 0% of the respondents disagreed or strongly disagreed. The between results show that for some (0%) of the programs, there were at least some incubator respondents who strongly disagreed that the selection of ideas is based on the ideas potential in creating new markets while some (17%) of the programs, there were at least some incubator respondents who were neutral. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 5 programs that at least had incubator respondents who were neutral, only 100% of the studied incubator respondents were neutral that the selection of ideas is based on the idea's potential in creating new markets.

Regarding the question of whether the selection of ideas is based on the potential to attract investment participation from venture capitalists, the majority (62%) of the respondents strongly agreed, 31% of the respondents agreed that the selection of ideas is based on the potential to attract investment participation from venture capitalists, 8% of the respondents were neutral while 0% disagreed or strongly disagreed. The between results show that in most (50%) of the programs, there were at least some incubator respondents who agreed that the selection of ideas is based on the potential to attract investment participation from venture capitalists while for some (0%) of the programs, there were at least some incubator respondents who disagreed that the selection of ideas is based on the potential to attract investment participation from venture capitalists. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 3 programs that at least had neutral incubator respondents, only 100% of the studied incubator respondents were neutral that the selection of ideas is based on the potential to attract investment participation from venture capitalists.

The respondents were also asked about whether the model addresses the needs of the immediate community, Majority (41%) of the respondents agreed, 38% of the respondents strongly agreed that the model addresses the needs of the immediate community, 8% of the respondents were neutral while 5% strongly disagreed. The results show that in most (83%) of the programs, there were at least some incubator respondents who agreed that the model addresses the needs of the immediate community while some (17%) of the programs, there were at least some incubator respondents who were neutral. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 5 programs that at least had incubator respondents who disagreed, only 100% of the studied incubator respondents disagreed that the model addresses the needs of the immediate community.

Table 3: Uniqueness of Ideas

			1	2	3	4	5	Total
The selection of ideas is based on the ideas potential in creating new markets (varUI001)	Overall	Freq.			3	16	20	39
		Percent	0%	0%	8%	41%	51%	100%
	Between (n=6)	Freq.			1	5	3	9
		Percent	0%	0%	17%	83%	50%	150%
	Within	Percent	0%	0%	100%	61%	66%	67%
The selection of ideas is based on potential to attract investment participation from venture capitalists (varUI002)	Overall	Freq.			3	12	24	39
		Percent	0%	0%	8%	31%	62%	100%
	Between (n=6)	Freq.			1	3	3	7
		Percent	0%	0%	17%	50%	50%	117%
	Within	Percent	0%	0%	100%	83%	83%	86%
The model addresses the needs of the immediate community. (varUI003)	Overall	Freq.	2	3	3	16	15	39
		Percent	5%	8%	8%	41%	38%	100%
	Between (n=6)	Freq.	1	1	1	5	3	11
		Percent	17%	17%	17%	83%	50%	183%
	Within	Percent	20%	100%	25%	61%	51%	55%

The descriptive analysis for the assessment of the standard selection tool sub-construct has been presented in table 4. The respondents were also asked about whether management has developed selection criteria targeting the specific sector. The majority (44%) of the respondents strongly agreed, 13% of the respondents agreed that management has developed selection criteria targeting the specific sector, 13% of the respondents were neutral while 31% disagreed. The between results show that in most (67%) of the programs, there were at least some incubator respondents who disagreed that management has developed a selection criterion targeting specific sector while for some (0%) of the programs, there were at least some incubator respondents who strongly disagreed that management has developed selection criteria targeting the specific sector. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 4 programs that at least had incubator

respondents who disagreed, only 66% of the studied incubator respondents disagreed that management has developed a selection criterion targeting a specific sector.

The majority (36%) of the respondents agreed that the tool targets innovative ideas that have the potential to change the immediate community while 28% of the respondents were neutral. Some 72% of the respondents agreed or strongly agreed that the tool targets innovative ideas that have the potential to change the immediate community while 0% of the respondents disagreed or strongly disagreed. The between results show that in most (67%) of the programs, there were at least some incubator respondents who were neutral that the tool targets innovative ideas that have the potential to change the immediate community while for some (0%) of the programs, there were at least some incubator respondents who disagreed. On average, within the 4 programs that at least had neutral incubator respondents, only 61% of the studied incubator respondents were neutral that the tool targets innovative ideas that have the potential to change the immediate community while.

Also sought was the respondent's perception of the question that management adheres to the tool for standardization, Majority (33%) of the respondents agreed, 31% of the respondents strongly agreed that management adheres to the tool for standardization, 28% of the respondents were neutral. The results show that in most (67%) of the programs, there were at least some incubator respondents who agreed that management adheres to the tool for standardization while for some (17%) of the programs, there were at least some incubator respondents who disagreed. On average, within the 4 programs that at least had incubator respondents who disagreed. Only 100% of the studied incubator respondents disagreed that management adheres to the tool for standardization.

Table 4: Standard Selection Tool

			1	2	3	4	5	Total
Management has developed a selection criterion targeting specific sector. (varSST001)	Overall	Freq.		12	5	5	17	39
		Percent	0%	31%	13%	13%	44%	100%
	Between (n=6)	Freq.		4	2	2	3	11
		Percent	0%	67%	33%	33%	50%	183%
	Within	Percent	0%	66%	23%	60%	58%	55%
The tool targets innovative ideas that have potential to change the immediate community. (varSST002)	Overall	Freq.			11	14	14	39
		Percent	0%	0%	28%	36%	36%	100%
	Between (n=6)	Freq.			4	4	3	11
		Percent	0%	0%	67%	67%	50%	183%
	Within	Percent	0%	0%	61%	52%	49%	55%
Management adheres to the tool for standardization. (varSST03)	Overall	Freq.		3	11	13	12	39
		Percent	0%	8%	28%	33%	31%	100%
	Between (n=6)	Freq.		1	3	4	3	11
		Percent	0%	17%	50%	67%	50%	183%
	Within	Percent	0%	100%	40%	66%	38%	55%

The performance of the incubators was the dependent variable and was assessed by the numbers of graduating firms, the number of firms that failed, and the number of operating businesses after graduation. The descriptive analysis results for the indicators of performance areas are displayed in table 5. The first indicator of the variable sought to find out the perception of the respondents that for the past five years, the number of graduating firms has. 23.10% of the respondents believe that it has been reducing, 25.60% of the respondents that it remained the same and 51.30% of the respondents believe that for the past five years, the number of graduating firms has been increasing. The between results show that in most (66.70%) of the programs, there were at least some incubator respondents who believe that for the past five years, the number of graduating firms has been increasing while in some (33.30%) of the programs, there were at least some incubator respondents who believe that for the past five years, the number of graduating firms has been reducing. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 4 programs that at least had incubator respondents who believed that for the past five years, the number of graduating firms has been reducing, only 75% of the studied incubator respondents believed that it has been reducing.

Another 53.85% of the respondents believe that for the past five years, the number of firms that failed and left incubation has been reducing, some 20.50% of the respondents believe that it has been increasing, while 25.60% of the respondents that it has remained the same. The between results show that in most (66.70%) of the programs, there were at least some incubator respondents who believe that for the past five years, the number of firms that failed and left incubation has been reducing while in some (50%) of the programs, there were at least some incubator respondents who believe that for the past five years, the number of firms that failed and

left incubation has been increasing. The within results show the proportion of incubator respondents within a program that agreed, disagreed, or was neutral with the perception. On average, within the 4 programs that at least had incubator respondents who believed that for the past five years, the number of firms that failed and left incubation has been reducing, only 68.10% of the studied incubator respondents believed that it has been reducing.

Another indicator of the variable sought to find out the perception of the respondents that for the past five years, the number of operating business after graduation has. 23.10% of the respondents believe that it has been reducing, 20.50% of the respondents that it remained the same and 56.40% of the respondents believe that for the past five years, the number of operating business after graduation has been increasing. The between results show that in most (83.30%) of the programs, there were at least some incubator respondents who believe that for the past five years, the number of operating business after graduation has been increasing while in some (33.30%) of the programs, there were at least some incubator respondents who believe that for the past five years, number of operating business after graduation has remained the same. On average, within the 5 programs that at least had incubator respondents who believed that for the past five years, the number of operating business after graduation has been increasing, only 73.5% of the studied incubator respondents believed that it has been increasing.

Table 5: Performance of Incubators

			1	2	3	Total
The number of graduating firms (varPERF001)	Overall	Freq.	9	10	20	39
		Percent	23.10%	25.60%	51.30%	100.00%
	Between (n=6)	Freq.	2	3	4	9
		Percent	33.30%	50.00%	66.70%	150.00%
	Within	Freq.	75.00%	55.00%	71.30%	66.70%
		Percent	75.00%	55.00%	71.30%	66.70%
The number of firms that failed and left incubation (varPERF002)	Overall	Freq.	21	10	8	39
		Percent	53.90%	25.60%	20.50%	100.00%
	Between (n=6)	Freq.	4	4	3	11
		Percent	66.70%	66.70%	50.00%	183.30%
	Within	Freq.	68.10%	42.50%	52.50%	54.60%
		Percent	68.10%	42.50%	52.50%	54.60%
Number of operating business after graduation (varPERF03)	Overall	Freq.	9	8	22	39
		Percent	23.10%	20.50%	56.40%	100.00%
	Between (n=6)	Freq.	3	2	5	10
		Percent	50.00%	33.30%	83.30%	166.70%
	Within	Freq.	54.20%	35.00%	73.50%	60.00%
		Percent	54.20%	35.00%	73.50%	60.00%

Inferential Analysis

Factor analysis was used for dimension reduction of the observed indicators to the latent sub-constructs of client selection criteria and incubator performance. Factor scores were generated for each sub-constructs and used as latent variables for statistical model fitting. Mixed effect models were fitted using restricted maximum likelihood. As the REML technique is used under classical assumptions of linear regression, the assumptions of normality and homoscedasticity of the model residuals and that of non-multicollinearity of the predictors were assessed and confirmed to be met.

The objective was to assess the effect of client selection criteria on the performance of incubators considering the possible categorization of the incubators. The factor scores measure of performance reflected homogeneity across the programs as depicted in the CI plot for heterogeneity in figure 2. The 6 groups (programs portray differing mean performances that also have varying confidence intervals. Varying CIs is a reflection of non-constant variances across the groups which are an indication of heterogeneity across the groups.

Figure 2: Confidence Interval (CI) plots (Heterogeneity of Performance)

Table 6 is a presentation of a one way analysis of variance (ANOVA) which confirmed that the mean performance differed across the program groups. The p-value of the F-statistic is less than 0.05 implying significantly different mean performances at different programs. The Bartlett's chi-square statistic is 7.594 with a p-value of 0.022 which shows significant heterogeneity of performance across groups (programs).

Table 6: One way Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	19.38171	5	3.876342	7.45	0.0001
Within groups	15.61829	30	0.52061		
Total	35.00001	35	1		

Bartlett's test for equal variances: $\chi^2(2) = 7.5941$ Prob> $\chi^2 = 0.022$

A null model was used to assess random intercept effects at level-2. The null model does not include the predictors thus in mixed effect is an intercept only model with the constant term in the fixed effect component and random intercept in the random effect component of the model. As shown in table 7 the fixed effect constant term is insignificant with a p-value greater than 0.05. The random effect component of the model is however significant even without the inclusion of the client selection criteria sub-constructs as random covariates. The intra-class correlation (ICC) was found to be 0.592 implying that based on the null model, 59.2% of the variation in performance of incubators is due to variations in the random effects component (random intercepts). The variance due to the random components is significant as shown by the p-value of the LR statistic which was less than 0.05. This shows that variations in performance at level-2 are due to differences across the program groups as the performance of incubators significantly differs between the groups. Having standard categorization of the incubators would be relevant to maximize the performance of incubators based on the programs they incubate. A model was fitted including the effects of client selection criteria in the fixed effect component of the model. Further, step wise additions of the sub-constructs as random covariates to assess the significance of random slopes were carried out.

Table 7: Null Model of Incubator Centre Performance

Mixed-effects REML regression				Number of obs	=	36
Group variable: program				Number of groups	=	6
Obs per group:				Min	=	3
				Avg	=	6
				Max	=	10
				Wald chi2(1)	=	.
				Prob > chi2	=	.
Log restricted-likelihood = 46.036219						
Performance (y)	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
_cons	-0.109	0.383	-0.280	0.777	-0.859	0.642
Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]		
program						
var(_cons)		0.766	0.545	0.190	3.086	
var(Residual)		0.527	0.138	0.316	0.881	
LR test vs. linear regression: chibar2 (01) = 9.08 Prob >= chibar2 = 0.0013						
Level	ICC	Std. Err.	[95% Conf.		Interval]	

program	0.592	0.190	0.238	0.871
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Table 8 shows summary statistics of the fixed effect and random effect components of each of the models (M1 to M4) including likelihood ratio (LR) tests to assess the significance of the random slopes of each construct on the step wise addition by nesting the models. The specification of the fixed effect components of the model was kept the same for all models including all the 3 variables. M1 was the base model with the 3 sub-constructs in the fixed effect component, random intercept but no random covariates in the re component. The model showed a generally significant ($\chi^2 = 18.64, p - value = 0.000$). The re component in this model only explained 18.4% of variation in incubator performance (ICC=0.184). In M2, X₁ covariate (models matching program goals) was added to the re component. The ICC of the model improved to explain up to 57.8% of the performance variance. The LR test of M1 nested in M2 shows that inclusion of the X₁ random covariates had a significant improvement ($\Delta in \chi^2 = 16.66, p - value = 0.000$). The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) of M1 are both less than that of M2 implying that M2 is a better model thus an improvement of M2. Model M3 was due to the inclusion of covariate X₂ (Uniqueness of Ideas) into the re component. In this addition, the fe component becomes insignificant, the ICC (1.53×10^{21}) reduces to a value that tends to 0% explained variation, M2 nested in M3 shows that M3 is not a significant improvement of the preceding model ($\Delta in \chi^2 = 1.86, p - value = 0.172$). The AIC and BIC of M3 are also greater than those of the preceding model M2 confirming that M2 is a better model than M3. This further implies that X₂ is not a significant level-2 (re component) variable whose effect on performance does not affect the programs. In M4, the covariate X₃ (Standard selection tool) was added to the model specification M2 because M3 had been determined to be of no significant improvement to M2. Nesting M2 in M4 showed a significant improvement in M4. The ICC showed a 99% variance of performance explained. The LR test of the nesting confirmed that M4 is an improvement to M2 ($\Delta in \chi^2 = 186.12, p - value = 0.000$) with the AIC and BIC of M4 being much less than M2. Overall, the best model with the lowest AIC and BIC was M4 which was thus adopted. These results showed that X₁ and X₃ had significant random covariates and should be considered as level-2 (program level) variables with significant random slopes while X₂ is not a significant level-2 variable.

Table 8: Model Summary and Likelihood Ratio Tests

	M1	M2	M3	M4
fe pars	X ₁ to X ₃	X ₁ to X ₃	X ₁ to X ₃	X ₁ to X ₃
re pars	random intercept	+ X ₁	+ X ₁ & X ₂	+ X ₁ & X ₃
Obs	36	36	36	36
ICC	0.1840	0.578	1.53e-21	0.999
fe model	chi2(3)=18.64,	chi2(3)= 13.67,	chi2(3)=4.47,	chi2(3)=23014.58,
sign.	p-v=0.000	p-v=0.003	p-v=0.215	p-v=0.000
ll(null)	.	.	.	.
ll(model)	-40.608	-32.278	-31.346	60.781
df	5	6	7	7
AIC	91.216	76.556	76.692	-107.561
BIC	99.133	86.057	87.777	-96.477
M1 nested in		LR chi2(1) = 16.66, Prob > chi2= 0.000	LR chi2(2) = 18.52, Prob > chi2= 0.0001	LR chi2(2) = 202.78, Prob > chi2= 0.000
M2 nested in			LR chi2(1) = 1.86, Prob > chi2= 0.1722	LR chi2(1) = 186.12, Prob > chi2= 0.000

Table 9 presents the full results of M4 detailing the fixed effect and the random effect components. The results show a significant fe component ($\chi^2 = 23014.58, p - value = 0.000$) but assessing the significance of the individual variables shows that, X₁ and X₃ have no significant influences at level-1 (the incubator centre level). The p-values of their coefficients are both greater than 0.05. X₂ on the other hand is a significant level-1 variable ($\beta = 0.902, Z = 151.70, p - value = 0.000$). This implies that improving the uniqueness of ideas of any incubator is expected to improve the level of performance by 0.902. The ICC however shows that much (99.9%) of the variance in incubator centre performance is explained by variations at level-2 (program level). Of the variance, very little 0.065 is due to random intercepts while the random slopes due to X₁ and X₃ are 9.420 and 1.330 respectively. This shows that, Models matching program goals and standard selection tools also have a lot of influence on the performance of incubators depending on the program. Figures 3 and 4 present the random slopes detailing the effects that X₁ and X₃ have on incubator performance that differ for different programs. This is shown by lines with different slopes for each program.

Table 9: Mixed Effect Model of Client Selection Criteria on Incubator Performance

Mixed-effects REML regression	Number of obs	= 364
Group variable: program	Number of groups	= 17
	Min	= 2
	Avg	= 21.4
	Max	= 108
	Wald chi2(1)	= 23014.58

Log restricted-likelihood = 60.780618				Prob > chi2 = 0.000	
Performance (y)	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
x_1 (Models matching goals)	0.300	1.345	0.220	0.823	-2.336 2.936
x_2 (Uniqueness of ideas)	0.902	0.006	151.70	0.000	0.891 0.914
x_3 (Standard selection tool)	0.853	0.601	1.420	0.156	-0.325 2.032
Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]	
program					
var(_x1)		9.420	6.274	2.553	34.755
var(_x3)		1.330	0.989	0.310	5.711
var(_cons)		0.065	0.058	0.011	0.373
var(Residual)		0.000	0.000	0.000	0.000
LR test vs. linear regression: chibar2 (01) = 203.19 Prob >= chibar2 = 0.000					
Level	ICC	Std. Err.	[95% Conf. Interval]		
program	0.999	0.001	0.997	1.000

Figure 3: Random Slopes of Models than match Program Goals

Figure 4: Random Slopes of Standard Selection Criteria

Conclusions

It was found that all the 3 components of client selection criteria influence incubator performance. The study however sought to assess the influence on incubator performance considering categories of the incubators by programs offered. It was concluded that uniqueness of ideas has an influence on incubator performance at the incubator centre level. This implies that regardless of proper categorization of incubators to target MSEs of specific programs, incubator centres can improve their performances by just improving their uniqueness of ideas. It was however noted that, considering the construct on client selection criteria, the variance in performance of the incubators is explained much more in the program category level. A conclusion was also drawn about 2 variable Models that match program goals and standard selection tool have significant influences on incubator performance at the program categories level. Depending on the category of incubators and incubators that improve their models to match program goals and standard selection tools would achieve a lot of improvement. With proper categories, incubators can concentrate on an adequate selection of MSEs Clients in line with the programs they incubate to maximize their performance.

It is therefore recommended that the incubators in Kenya be properly and formally categorized based on the programs of the MSEs they purpose to incubate as it is of uttermost importance to maximize the effects of their client selection criteria on their performances to assist MSEs.

Government and private sector partnership should be encouraged in the areas of incubation to enable sharing of information and resources. The National Government, County Government and Kenya Private Sector Alliance (KEPSA) should develop a tripartite partnership that will assist in creating innovation hubs or incubators in every county. This will encourage counties to create an entrepreneurial environment that will allow start-ups to grow exponentially fast and be able to utilize the resources within to develop products and services that are valuable, rare, inimitable and non-substitutable. Incubators are considered risky ventures by most financial institutions. Solution to this problem is for incubators and other MSEs be de-risked. This will be achieved by putting proper structures and policy of incubation in place to streamline the incubation activities in the country to gain investor confidence that their money is safe, otherwise without proper structures and policy, most investors will shy away from seeking partnerships with local start-ups.

The study recommends that Incubator Centres be pragmatic by incubating solution based ideas that address societal needs. The Centres should be fast in interpreting Kenya's blue print Vision 2030 targeting economic, political and societal pillars with the aim of transforming the country into a globally competitive and prosperous nation. Also, the Centres can be a source of actualizing the government's big four agenda whose aim is critical in uplifting the standard of living of Kenyans on the path of becoming an upper middle income by 2030, through manufacturing, universal healthcare, affordable housing and food security sectors. The current Incubator Centres in Kenya can strategically re-organize its resources and capabilities in order to enhance their entrepreneurial performance.

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