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Influence of organization learning on innovation output in manufacturing firms in Kenya

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ABSTRACT

Knowledge entrepreneurship is increasingly becoming important in driving innovation for high levels of competitiveness. The purpose of this study was to investigate the relationship between Organization Learning (OL) and Innovation Output (IO) for improved performance in manufacturing firms in Kenya. The theoretical underpinnings on this study are the Schumpeter's (1934) innovation theory of and the Gleick (1987) complexity theory. The methodology used was mixed method research because it provides a more holistic understanding of a thematic area. The research design that was used is cross-sectional design because it allows for making observations on different characteristics that exist within a group at a particular time. The target population was manufacturing firms across the country. Multi-stage sampling strategy was used to sample 303 respondents from 101 firms. Primary and secondary data were used to collect both qualitative and quantitative data. The questionnaire, interview schedule and a checklist of key informants were used to collect data. Content validity was used to ascertain the credibility of the research procedure and internal consistency technique was used to test for reliability. Correlation and linear regression were used to determine the relationship between OL and IO. Work disruptions were avoided by making prior arrangements and appointments. The findings indicate that OL has a significant influence on IO. It is recommended that lifelong learning, management support and risk tolerance should be encouraged to improve creativity. High creativity is important in raising the capacity to integrate internal and external knowledge for greater levels of IO. Further research should be carried out to find how customers and suppliers information can be utilized to enriched OL.

1. Introduction

Innovation utilizes knowledge which is important in raising creativity and capacity development for enterprise prosperity. Many countries have developed their National Innovation Systems (NIS) and have a comprehensive innovation policy framework, but most firms have not leveraged on these opportunities to raise their Innovation Output (IO). This has been contributed by the disjointed relationship between research institutions and industry. The situation has been brought about by multiplicity of new institutions that have become a barrier to knowledge sharing and thus firms are shying away from

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intense collaboration with research institutions and universities which has led to declining knowledge absorption, creation and diffusion which are key components of innovation performance (Cornell University, INSEAD & WIPO, 2015). The situation can be addressed by rallying firms to develop their knowledge capacities by focusing on Organization Learning (OL) for greater IO.

Previous researchers have not managed to unravel the puzzle of how to transform knowledge into innovation output that improves competitiveness in the manufacturing sector. This has been partly attributed to by the failure of incorporating local knowledge in the innovation process (Sambuli & Whitt, 2017). The complexity of blending internal and external knowledge and reconfiguring new insight for greater innovation has also not been adequately addressed in Kenya. Furthermore, the linkages within the innovation system are weak and the manufacturing sector has the highest abandoned innovation activities at about 40% (Ongwae, Mukulu, & Odhiambo, 2013). The quagmire of striking a balance between sharing knowledge, guarding against knowledge leakages, diffusion of tension and mistrust that emanates from the competition while interacting with the NIS to improve IO has not been resolved. The study will attempt to address these gaps by investigating the influence of OL on IO.

The objective of the study is therefore to examine the influence of OL on IO in manufacturing firms in Kenya. The null hypothesis is that OL has no significant influence on IO in manufacturing firms in Kenya while the alternative hypothesis is that OL has a significant influence on IO. The hypothesis will be subjected for a test. The study will contribute to the value of OL on the firms' competitiveness. It will provide insights on how firms can blend internal and external knowledge in the process of OL to improve IO which contributes to their competitive advantage.

2. Literature review

This section begins with review of previous empirical work on OL and IO. Theoretical underpinnings are then discussed leading to a development of conceptual framework.

2.1. Innovation output

Innovation output is the end product of an innovation activity. The end products of innovation are; new products, new process, new enterprise and new markets. Andreeva and Kianto (2011) believe that IO is the degree to which enterprises develop novelty in terms of processes, management and marketing. Innovation output can therefore be defined as the increase in novel products, creative processes, and development of new ventures and discovery of new markets.

Innovation output depicts the result of an innovation effort. It can be measured as the summation of increased new products as a result of innovation, patents acquired, new innovation process and unique enterprises created to cater for innovation activities. Innovation output can be enhanced by improving the innovation capacity of a firm.

Innovation capacity is paramount in realizing and identifying the need for change, thus leading to new ideas. It provides the capability of seizing up opportunities (Teece, 2009) leading into a new business configuration which helps in attaining and maintaining high competitive levels (Saenz & Perez-Bouvier, 2014). Innovation capacity can be optimized through OL which leads to continuous improvement in firm performance particularly in the manufacturing sector. Manufacturing firms are faced with myriad of challenges such as; the ever-changing taste and preferences of customers, rapid change in technology, increasing competitions, dynamic operating environment and changing global trends. This calls for OL for firms to adequately navigate in the turbulence.

2.2. Organization Learning

Organization Learning is one of the key aspects of knowledge entrepreneurship which is crucial in determining innovation output. Desai (2010) defined OL as the process of acquiring, absorbing, sharing, modifying and transferring knowledge within an entity. The context in which OL is used in this study is a mechanism for discovering new ways of improving operations through knowledge acquisition, absorption, sharing and transfer for improved performance. The salient feature that distinguishes OL from learning organization is its diversity and extensiveness. This forms the bases of generating internal knowledge that is peculiar to an Organization.

The capacities developed in OL provide an opportunity for the integration of internal and external knowledge. This requires collective input and knowledge sharing (Granerud & Rocha, 2011). Organization learning therefore involves development of internal knowledge capacities that integrates external knowledge from other organizations within and without the sector. This is beneficial to the firm because it allows continuous improvement, adaptability and value addition Granerud and Rocha (2011) argues that OL is the foundation from which the base of improved practices is laid.

Organization Learning can be measured in different ways. Jain and Moreno (2015) posited that the factors attributing to OL are; collaboration, teamwork, performance management, autonomy and freedom, reward, recognition and achievement orientation. The Global Innovation Index utilizes Knowledge absorption, creation, impact and diffusion which can be measured by the level of royalties, patents, number of new firms, royalties and license fees receipts or web presence respectively in measuring OL (Cornell University, INSEAD & WIPO, 2016). Tohidi and Jabbari (2012) believe that the strategic elements of OL are experimentation, knowledge transfer, developing learning capacity, teamwork and problem-solving. Chiva and Alegre (2007) are of the opinion that development of learning capacity can be enhanced by empowerment to generate new ideas, managerial commitment to support creativity, continued learning, openness and interaction with external environment and risk tolerance.

The study thus adopted and improved on the measures of OL used by Chiva and Alegre (2007) and Tohidi and Jabbari (2012) because the parameters are more comprehensive in measuring OL. This was done by incorporating openness and knowledge integration on OL. The measures that were used to measure OL in this study are therefore; liberty of experiment, empowerment to generate new ideas, managerial commitment to support creativity, knowledge transfer and integration, openness and interaction with external environment, continued learning and risk tolerance.

Nevertheless, absorptive capacity is important in OL because it improves the ability of the human resource within the firm to acquire and assimilate new and external knowledge for improved performance. Supportive Learning Environment (SLE) increases the absorptive capacity of the firm thus enhancing OL while a turbulent learning environment lowers the OL (Cohen & Levinthal, 1990). The SLE therefore moderates the influence of OL on IO. The SLE provides a conducive atmosphere for employee to engage each other and with the management freely and constructively which may lead to review of firms operations and processes (Garvin, Edmondson, & Gino, 2008).

The appropriate SLE promotes OL and enhances the innovative ability of a firm. The parameters for measuring SLE are availability of accelerators and incubators, trade organization support and business services (Majava, Leviakangas, Kinnumen, Kess, & Foit, 2016). These parameters facilitates dynamic networking within an economy and accelerates technological spill over which is important in boastering innovation.

2.3. Relationship between organization leaning and innovation output

There have been several attempts to highlight the relationship between OL and IO. To begin with, Hung, Lien, Yang, Wu, and Kuo (2011) found that an analysis of OL and IO model showed the goodness of fit and a significantly positive relationship, thus promoting a culture of sharing and trust which is necessary for enterprise success. However, there is a gap in linking learning process and IO in empirical studies (Lau & Lo, 2015). The study addressed this gap by demonstrating the aspects of OL that influences IO and which do not. Calisir, Gumussoy, and Guzelsov (2013) found that open-mindedness in OL has a positive association with innovation output. Open-mindedness is one of the measures of OL which is incorporated in this study as openness. Zhou, Hu, and Shi (2015) found that OL significantly influences innovation output. Furthermore, Ghasemzadeh, Nazari, Farzaneh, and Mehralian (2019) found a significant influence of OL on IO. This study replicated those studies in manufacturing firms in Kenya. The study was anchored on two theories.

2.4. Theoretical underpinnings

The first theory that is relevant in this study is Schumpeter's (1934) theory of innovation. The theory is of the view that the transformation of the economy comes through innovations which bring about creative destructions which lead to improved performance. The dimensions of this theory are the creation of novelties which includes new products, new process, new enterprises, new raw materials and new markets. However, the theory failed to address the required organizational capacity to innovate. This necessitated the adoption of a theory that has a more holistic approach and takes cognizant of the OL as an input in the innovation process. This can be addressed by interrogation of complexity theory.

The second theory that is related to this study is Gleick (1987) complexity theory. The theory recognizes the intricacies involved in developing innovation capacity. It advocates for an emergent learning that transcends from the industrial era to the knowledge era that produces ideas that provide complex interplay of different interactions. The complex interactions of internal and external knowledge bring about OL which is crucial in enhancing IO. This led to the development of a conceptual framework.

The Gleick (1987) complexity is linked to the OL because of the intricacies entailed while Schumpeter's (1934) theory of innovation is applicable in IO because of the concept of novelties. The relationship between OL and IO is indicated in the conceptual framework where the independent variable is depicted as OL and the dependent variable as IO. The conceptual framework shows the parameters of measuring OL as; liberty of experimentation and autonomy, empowerment to generate new ideas and to apply them, managerial commitment for support creativity, allowed to take risks, an opportunity for knowledge transfer and integration, openness and interaction with the external environment and lifelong learning. The parameters of measuring IO are also depicted in the conceptual framework as; new products, patents acquired, new process and unique enterprises created. Alegre, Sengupta, and Lapiedra (2011) argues that it is paramount control for prior experience in IP. The work experience of employees was, therefore, used as the control variable. Moderating effect of SLE between OL and IO is then introduced as indicted in Fig. 1.

3. Methodology

Cross-sectional design was used because it helps in making observations on characteristics that exist within a group. The target population was 828 manufacturing firms. The sampling frame was the listed companies in Kenya Association of Manufacturer as of 2018.

The multi-stage sampling strategy was used. Purposive sampling was used select the major industrial counties in Kenya. Random sampling was then applied to sample 101 firms from the major industrial counties according to their proportionate

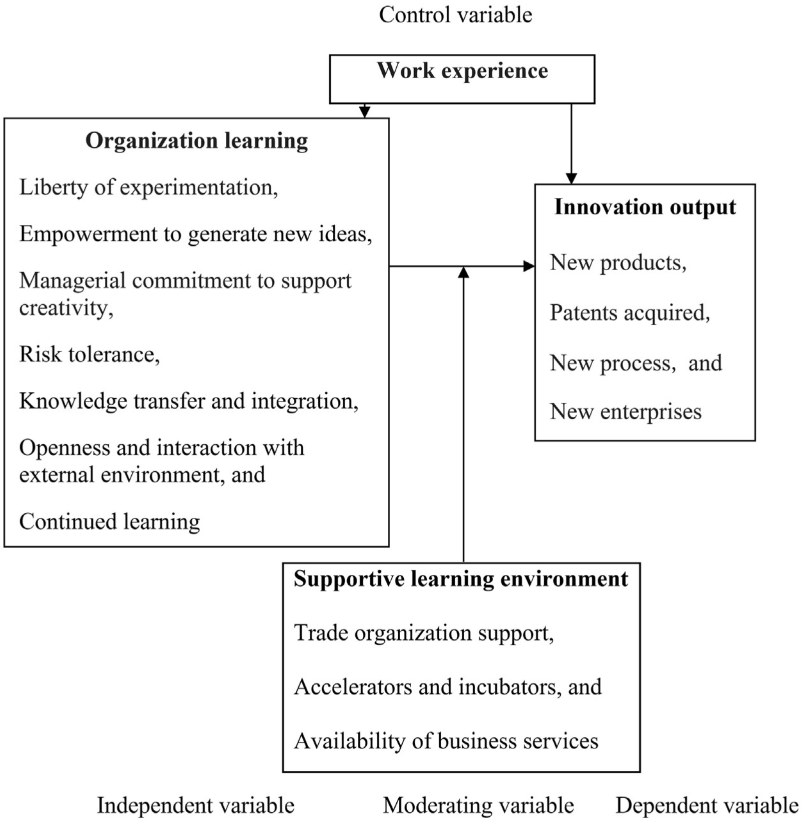

Fig. 1. The conceptual framework.

representation in terms of location and sub-sector. Purposive sampling was later used to select 3 respondents who were from the sampled 101 firms. The respondents comprised of section heads from operations, marketing and innovation. The total sample size of the respondent was therefore 303. Primary and secondary data were used to collect both qualitative and quantitative data. The questionnaire with Likert scale items o OL and IO, interview schedule and a checklist of key informants were used to collect data.

Diagnostics test on multicollinearity, reliability, validity and normality were carried out before the relationship between LO and IO was established. The multicollinearity among and between items in OL and IO were tested through the Variance Inflation Factor (VIF). The overall VIF of OL and IO was one as indicated in Table 1.

The items which could have had a VIF of more than 10 could be deleted since that is the recommended upper limit (Creswell, 2014), but in this case no item was deleted since the VIF were less than 10. This test was important in authenticating the findings.

Validity of the data collected was tested through content validity method. This is where the criteria used to access quality regarding the procedure and results to enhance credibility, transferability, dependability and conformability was addressed by constructing the measuring scale in line with the literature and pre-testing the research instruments during piloting. The questionnaire was designed in line with the constructs and parameters of OL and IO as brought out in literature review.

The normality test of data for both OL and IO was done. This was done by plotting the curve of OL and IO. The curve of OL and IO is normally distributed as indicated in Fig. 2.

Table 1
The results showing the variance inflation factor of OL and IO.

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	−15.465	1.149		−13.464	0.000		
	OL	0.968	0.042	0.805	23.087	0.000	1.000	1.000

Note: B means Beta which represents the slope of the line between OL and IO.

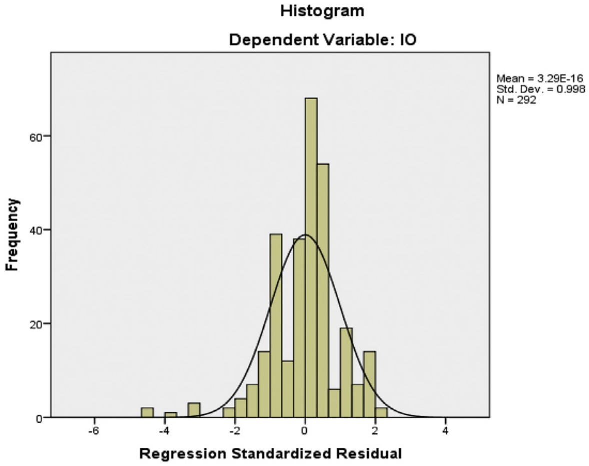

Fig. 2. The curve of the relationship between OL and IO.

The curve is bell shaped implying that the variables of the study are equally distributed. This means that the OL and IO are not skewed to either side and that the data collected is homogenous. The internal consistency technique was used to test for reliability. This was conducted on each of the items in OL using Cronbach's Alpha. The Cronbach's Alpha value for the items in OL was 0.901. The value is above the recommended threshold of 0.700. It means that the scale used to measure OL is reliable and can be replicated in other trial with similar outcomes. The internal consistency reliability was therefore confirmed. Content validity was used to ascertain the credibility of the research procedure. This was done by developing the research instruments in tandem with the literature review.

Correlation and linear regression were used to determine the relationship between OL & IO. Data approval was sought from the National Commission for Science, Technology and Innovation and the respondents' management before embarking on data collection. Work disruptions were avoided by making prior arrangements and appointments. Respondents' confidentiality and anonymity were guaranteed, respected and protected.

The questionnaires received and filled up were 295 against 345 issued representing a response rate of 86% from 101 firms out 115 firms representing 88% of the firms sampled. The respondents' working experience was also captured in terms of years worked in the firm and grouped into four categories which were; less than 1, 1–5, 5–10, and over ten years. The majority of the respondents had over ten years of experience. This implies that manufacturing firms consider work experience before one is promoted to a section head. It therefore means that work experience is valued in manufacturing sector.

4. Results and discussions

The Innovation Output (IO) across the manufacturing firms was compared by observing the mean, variance and standard deviation of the new products, patents, new process and new enterprises. Comparative descriptive statistics depicted that there was a wide range of 13 and high level of variance in new products at 8.82 than any other form of novelty as indicated in Table 2.

This implies more new products were manufactured as opposed to other forms of novelty. This means that the general form of innovation in manufacturing firms in Kenya is the creation of new products relative to other forms of innovations such as new processes and enterprises. However, the maximum number of new product was 13 while those that were patented were only 5. It means that majority of new products were not patented. Manufacturing firms should therefore strive to register their patent rights to avoid escalation of counterfeits.

The notable new products brought about by innovation were; nitrocellulose paints, hydro-pool, computerized painting machines, nova legs, sodium hypo-chloride, Clorox bleach, adjustable pallet racking and castellated beam for constructing cranes. New products had also a higher standard deviation as compared to other forms of novelty. This implies that there was

Table 2
Comparison of variance in novelty across the manufacturing firm.

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
New Products	101	13.00	0.00	13.00	4.802	2.970	8.820
Patents	101	5.00	0.00	5.00	2.149	1.652	2.728
New process	101	5.00	0.00	5.00	1.555	1.375	1.890
New enterprise	101	10.00	0.00	10.00	2.257	2.152	4.633
Valid N	101						

a widespread of new products created within the manufacturing firms hence a low level of uniformity in new products created and thus a low degree of homogeneity across the firms.

The aggregation of new products, patent, new processes and new enterprises constituted the innovation output. The sum of the total innovation output was 1071, a mean of 10 and a range of between 1 and 19 as indicated in Table 3.

This implies that there were innovation activities that generated innovation output. It means that the outcome of innovation activities was observable and can be quantified. The standard deviation of 6.2 implies that there was a widespread within the manufacturing firms. This means that there was a low level of uniformity in innovation output across manufacturing firms and thus a low degree of homogeneity in the sample.

The innovation output within the various sub-sectors was examined. This was done through comparison of means and the standard deviation. The highest mean was in plastics and rubber at 15 while the highest standard deviation was 7.25 in motor vehicle assemblers and accessories as indicated in Table 4.

This implies that there were more novelties created in the plastics and rubber sub-sector than any other. It means that on average, there were more new products, patents, new process and new enterprises created in the textile and apparels sub-sector. The highest standard deviation of 7.250 was recorded in vehicle assemblers and accessories sub-sector. This implies that the spread of novelties was widest in vehicle assemblers and accessories than other sub-sectors. This means that there was a high variety of IO produced and thus a low level of uniformity in novelties in vehicle assemblers and accessories sub-sector and thus low degree of homogeneity.

The comparison of innovation output and innovation intensity across the various sub-sectors in the manufacturing sector was also done. This was done by running explore descriptive statistics. The innovation output was highest in the plastics and rubber sub-sector while the intensity of innovation output is highest in the food and beverages sub-sector as indicated in Fig. 3.

The highest innovation output in the plastics and rubber sub-sector implies that the sector has more innovation activities as compared to other sub-sector, but innovation efforts were concentrated more on new products. The highest innovation intensity in the food and beverages sub-sector means that there were concerted innovation efforts that were spread across the four novelties and thus diversified IO. This is important because diversified innovation mitigates the risk of over reliance on single or few innovations that may that can be rendered absolute with emergence of other superior innovations.

The parameters for measuring OL were experimentation, knowledge transfer, integration and openness. The responses were captured in a Likert scale which had seven items with a scale of 1–5 and therefore the maximum expected score was 35. The score on each of the item was then added up to form the composite value of OL. The scores of OL were ranked in terms of their frequency of occurrence. The highest frequency of OL is a score of 31 as indicated in Fig. 4.

This implies that OL took place in most firms. It means that most of the manufacturing firms have embraced new knowledge acquisition, absorption, sharing and transfer for improved performance. The effectiveness of the input of OL can be determined by its contribution to IO.

Table 3
Innovation Output distribution across the manufacturing firms for the last three years.

N	Valid	101
	Missing	0
Mean		10.604
Std. Deviation		6.216
Variance		38.642
Range		19.000
Sum		1071.000

Note: The value 0 means that there was no respond whose input was not valid.

Table 4
Innovation Output within the various sub-sectors in manufacturing sector.

	Sub-sector	Mean	Standard Deviation
1	Building mining and construction	12.0000	5.431
2	Chemical and allied	9.8000	5.865
3	Energy, electrical and electronics	13.4000	6.465
4	Food and beverages	13.0909	6.109
5	Leather and footwear	4.0000	0.000
6	Metal and allied	13.5000	5.713
7	Vehicle assemblers and accessories	10.1667	7.250
8	Paper and board	10.8182	5.689
9	Pharmacy and medical equipment	4.0000	2.828
10	Plastics and rubber	15.0000	6.426
11	Timber, wood and furniture	6.5000	6.686
12	Textile and apparels	4.0000	7.071

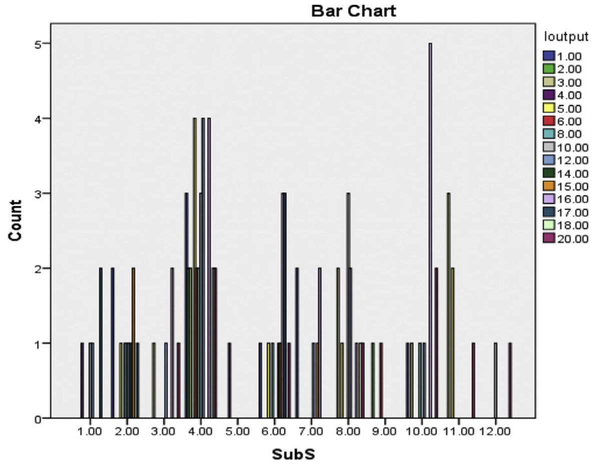

Fig. 3. Comparison of innovation output and intensity across the various sub-sectors in the manufacturing sector.

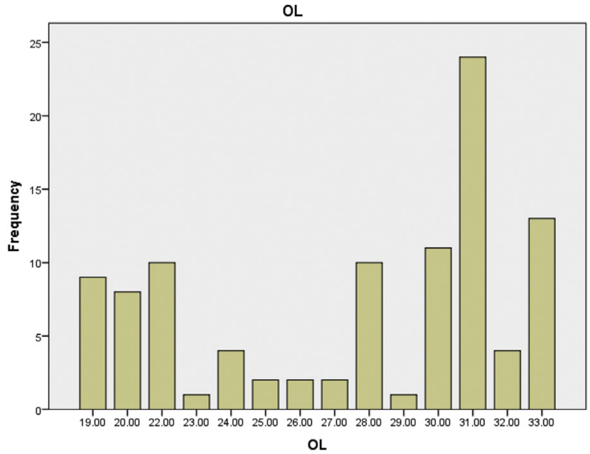

Fig. 4. Frequency distribution of OL score in manufacturing firms.

The analysis of how manufacturing firms faired in terms of OL was conducted through the mean, range and standard deviation. The mean score of OL was 27.386, the minimum score was 19, while the maximum score was 33 giving a range of 14 and the standard deviation was 4.827 as indicated in Table 5.

The mean score of 27 implies that generally, OL took place in the manufacturing sector. However, the minimum score of 19 implies that some firms were indifferent whether OL took place. The standard deviation of 4.827 implies that there was a wide variance in terms of OL. It means that there was a low degree of uniformity in OL across manufacturing firms and therefore a low level of homogeneity in the sample. This led to a further analysis of how different sub-sectors performed in terms of OL.

The comparison of how the various sub-sectors performed was carried out using explore descriptive statistics. The sub-sectors which portrayed a high variance of OL score was textile and apparels as indicated in Fig. 5.

This implies that there was indifference whether OL took place in the firms within textile and apparels sub-sector. It means that OL took place in some firms while in others within the sector did not take place. However, there was a narrow gap in energy, electrical and electronics as well as vehicle assemblers and accessories. There was a high level of concurrence that OL took place in those two sub-sectors. The two sub-sectors are technology driven which means that the firms in the sub-sectors have to encourage continuous learning to keep up with the ever changing technology trends.

The respondents were asked to state the factors that affect OL in their firm concerning IO. The main factors that were given out in descending order of frequency are; management support, Organization culture, technology, level of manpower skills, availability of resources, continued improvement, exchange of ideas, seminars and workshops, competition and employee attitudes. The other factors that were mentioned are; market trends, induction, mentoring, coaching, remuneration, work experience, teamwork, partnerships and collaborations, networking, knowledge sharing, open forums, product life cycle, Organization politics, training, knowledge management, research and development and membership associations. It was observed that firms with high levels of OL had functional customer relations management systems which provided feedback

Table 5
The score of OL in manufacturing firms in Kenya.

N	Valid	101
	Missing	0
Mean		27.386
Std. Deviation		4.827
Variance		23.299
Range		14.000
Minimum		19.000
Maximum		33.000

Note: The value 0 means that there was no respond whose input was not valid.

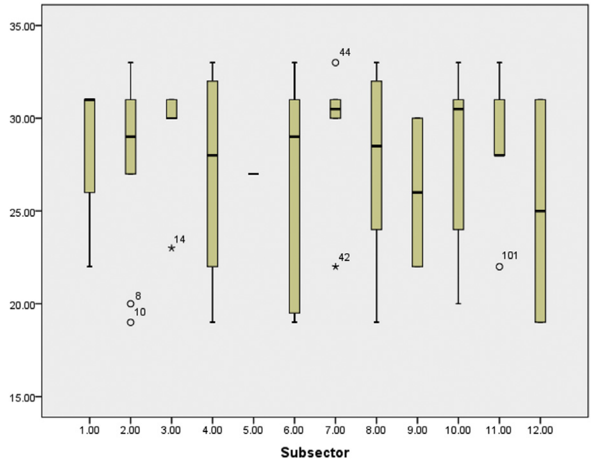

Fig. 5. Comparison of sub-sectors scores on OL. Notes: The asterisk means read. It implies the number to be read which is represented by the bar. The circle indicates the outliers.

on customers' needs, documented training programs and schedules, robust research and development headed by top management and valued hands on experience.

The correlation between OL and IO was sought to determine their relationship. This was done by testing for Pearson correlation between OL and IO. The Pearson coefficient between OL and IO was 0.805 as indicated in Table 6.

The coefficient value of 0.805 implies that there is a strong relationship between OL and IO since the value is closer to one than zero. This means that there is a direct relationship between OL and IO meaning that as OL within a firm increases, so does IO and vice versa. The direct relationship between OL and IO meaning that as OL can be depicted graphically as indicated in Fig. 6.

The graph shows a nearly linear relationship between OL and IO with no major outliers. The line of best fit implies that there is a direct relationship between OL and IO. It confirms that as OL improves, so does IO and vice versa.

Influence of OL on IO was also sought by testing for analysis of variance between OL and IO. The analysis of variance between OL and IO depicted a P value of zero as indicated in Table 7.

The P value of zero is less than 0.05 which led to the rejection of the null hypothesis and acceptance of the alternative hypothesis. It means that there is a significant influence of OL on IO.

Table 6
Correlations between organization learning and innovation output.

		OL	IO
OL	Pearson Correlation	1	0.805**
	Sig. (2-tailed)		0.000
	N	295	292
IO	Pearson Correlation	0.805**	1
	Sig. (2-tailed)	0.000	
	N	292	292

Note: ** Indicates two levels of the statistical significance of the regression coefficient.

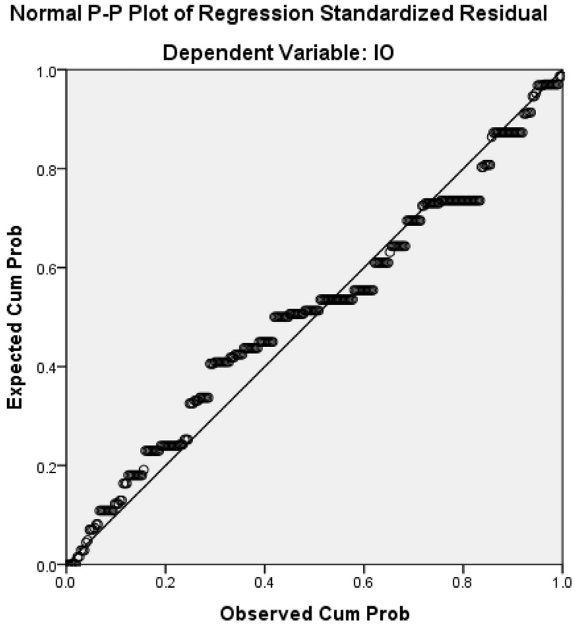

Fig. 6. The relationship between OL and IO.

Table 7
The analysis of variance between OL and IO.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8222.999	1	8222.999	533.016	0.000[b]
	Residual	4473.915	290	15.427		
	Total	12696.914	291			

Note: The letter b indicates the second value that has been repeated in the regression output.

The next step was to investigate the extent of contribution of OL on IO. This was done by conducting a test on the strength of the linear relationship between OL and IO examining the value the coefficient of determination of R^2. The value of R^2 for the linear relationship between OL and IO was 0.838 as indicated in Table 8.

The R^2-value of 0.838 is equivalent to about 84%. This mean that 84% of a unit change in IO can be attributed to the change in OL. The finding indicates that OL plays a critical role in determining the IO in manufacturing firms in Kenya.

The moderating effect of SLE was later examined. Hierarchical moderated regression was used to test for moderating effect. This was done by first regressing SLE with IO and then regressing the product of SLE and OL with IO to identify the change of R square value. The R square value of the relationship between SLE and IO was 0.545 as indicated in Table 9.

This means that 55% of IO is contributed by SLE. The product of SLE and OL was then regressed against IO. The R square value was 0.657 as indicated in Table 10.

Table 8
The R square value of relationship between OL and IO.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.916[a]	0.838[b]	0.838	4.998

Notes: The letter a indicates the first value that has been repeated in the regression output. The letter b indicates the second value that has been repeated in the regression output.

Table 9
The R Square value of the relationship between SLE and IO.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.739[a]	0.545	0.544	4.461

Note: The letter a indicates the first value that has been repeated in the regression output.

Table 10
The R Square value of the relationship between the product of OL SLE and IO.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.811[a]	0.657	0.656	3.87543

Note: The letter a indicates the first value that has been repeated in the regression output.

This means that the combined OL and SLE contributed to about 66% of IO. This means that SLE has a moderating effect between OL and IO, but the value of R square is much lower than 84% which is the contribution of OL alone on IO. It therefore means that SLE in manufacturing firms in Kenya needs to be improved to enhance OL contribution to IO.

The study has thus established that OL has a significant influence on IO in manufacturing firms in Kenya. Manufacturing firms should, therefore, inculcate a culture of OL for grater IO for improved competitiveness. The findings are consistent with those of Hung et al. (2011) who found that OL have a significant influence on IO. Manufacturing firms should, therefore, embrace OL for utilization of scarce resources to provide value and provide society solutions sustainably. The findings are also in tandem with those Of Calisir et al. (2013) who found that firms with an Organizational practice that promote OL have higher value and IO levels. Higher IO is an indicator that a firm is generating novelties according to the changing needs of the market and hence the likelihood of being competitive leading to improved performance. The findings also concur with those of Hofstetter and Harpez (2015) who found that OL has an immense influence on firm's IO. Increased IO can lead to improved competitiveness of a firm within the industry, in the economy, the region and the global market. The findings are also in line with Cassiman and Veugelers (2006); Chen, Vanhaverbeke, and Du (2016); Radicic and Balavac (2019); Antonelli & Fassio, 2016 who found that internal and external learning has a positive influence on IO. It is therefore imperative that OL is promoted in the manufacturing sector in Kenya for greater outcomes in IO for enhanced competitiveness locally and internationally.

5. Conclusions and recommendations

It is concluded that the various aspects of OL which include; liberty of experimentation, empowerment to generate new ideas, managerial commitment to support creativity, risk tolerance, knowledge transfer and integration, openness and interaction with the external environment and continuous learning contributes to development of new products, patents acquired, new process and new enterprises. It is also observed that SLE has a significant moderating effect between OL and IO.

Management in manufacturing sector should, therefore, nurture and encourage OL for greater IO. Leaders in manufacturing firms should provide freedom to their employees to come up with new ideas and support them to try them out while at the same time be patient to accommodate failures that come with trials. They should also be receptive to divergent viewpoints, encourage problem solving and knowledge transfer. Leaders in manufacturing firms should also set up a robust Research and Development (R&D) by developing the policies that will enhance assimilation of external with internal knowledge for higher capacity to innovate. Policy makers and other relevant stakeholders such as government agencies, research institutions and investor lobby groups and associations should work jointly to address the bottlenecks in SLE.

The study enriches the theoretical understanding of how OL influences IO by contributing to new knowledge on how manufacturing firms can improve their competitiveness in Kenya and other parts of sub Saharan Africa.

It is recommended that lifelong learning should be encouraged because it improves creativity and develops the capacity to integrate internal and external knowledge which increases the level of IO. Management should also create an enabling culture for promoting creativity and risk tolerance to enhance IO. Manufacturing firms in Kenya should also set clear policies on R&D to enhance OL for increased innovation activities and thus higher IO.

Further research should be carried to determine ways in which customers and suppliers information can be utilized to enrich OL. Customers and suppliers are major stakeholders in manufacturing firms. Their input in OL is essential in improving the IO. Further study should also be carried out to examine how networking influences IO. The challenges of mitigating the risks that comes with experimentation and failure tolerance is also a futile ground for further study.

Conflicts of interest

The authors declare no conflicts of interest.

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