The Role of Management in University-Industry Linkage: *Focus on Innovation and Technology Transfer in Ethiopia*

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Abstract: Our world today is at the development stage where the exchange of knowledge and information becomes more of a necessity than an option. The current business environment demands organizations to undergo a paradigm shift in their business operations in such a way that they need to adopt a strategy of competing through collaboration. University-industry linkage (UIL) is a kind of collaboration that brings together higher education institutions (HEIs) and industries to a platform that facilitates the exchange of knowledge and skills so that promote business innovation and technology transfer. This study was thus conducted to assess the role of management in UIL implementation and its contribution to innovation and technology transfer taking the sample of selected science and technology universities and manufacturing firms in Ethiopia. The study was conducted mainly based on survey methods whereby primary data were collected using questionnaire and semi structured interview and analyzed using both descriptive and inferential statistics. A total sample of 365 (250 from university and 115 from industry) participated in the survey. The results revealed that the role of management in the implementation of UIL was significant in both cases though slight variations were there between universities and industries. However, the UIL implementation was found at its lower, particularly in terms innovation and technology transfer.

***Index Terms*:** management, innovation, university-industry linkage, technology transfer.

I. INTRODUCTION

Globalization and rapid growth of information technology have triggered a business environment to become more dynamic and competitive than ever before. Organizations, whether they are business or non-business type, need to update themselves on a regular basis in order to ensure their survival and sustainable growth in such a turbulent environment. Innovation and technology transfer are among the modern time approaches through which business organizations thrive to get into and succeed the highly competitive nature of today's marketplace (Mitasiunas, 2013; IKED, 2006). Thus, the very essence of innovation and technology transfer dictates that organizations, be they from the same domain or different context should forge an integration that will have mutual benefits to all the players. The issue of university-industry linkage therefore emanates from this concept of integration and interdependence for bilateral benefits. Effective management of UIL is among the critical factors that determine the success or failure of such collaboration. While a well-managed UIL will have high probability of success in the innovation and technology transfer, a poorly designed and implemented linkage will have high probability of leading the constituents to substantial amount of loss.

The collaboration between higher education institutions (i.e. universities) and industries can be taken as a vital strategy for promoting and exploiting innovation and technology transfer. Traditionally universities are the major sources of scientific knowledge whereas industries are the platforms for applying that knowledge in the production of goods and provision of services. It is also understandable that the knowledge and information generated through continuous and systematic development of theories and principles in HEIs are not supposed to remain with them as it was the case during the times of regarding universities as "Ivory tower." Rather, those scientific outputs are diffused to society at large through various forms of communication channels so that contribute to the economic development of a broader spectrum. In a sense, nowadays it apparently becomes common to observe a significant shift in paradigm that universities have begun to establish strong ties with industries and convert such linkages into practice (Guimon, 2013).

II. REVIEW OF LITERATURE

2.1 The Concept of University-Industry Linkage

Business firms often enter into collaboration with universities to get the overall benefits such as access to hire competent graduates, access to new technologies and expanding their knowledge beyond their ambitions to develop few marketable innovations (Perkman & Walsh, 2007). Today, there are increasing demands of collaboration between universities and industries all over the world not just because of the demand for skilled human power, but to make tangible contribution towards business innovation and technology transfer. Various authors have used different terms and approaches to such relationship between academia and industries. Terms like collaboration, cooperation, partnership, interaction, etc. are frequently used to reflect the same theme which refers to interdependence between two or more entities for mutual benefits. The advent of a triple helix of innovation, with the university as one of the major players, is the fundamental change observed in the late 20th and early 21st century (Etzkowitz & Dzisah, 2008). It represents a paradigm shift from the conventional development model that has segregated the three institutional spheres-higher education, industry and government and has consistently left out universities from development strategies and policies.

The role of universities and public technological institutions goes beyond providing skilled human capital for the labor market. This indicates the crucial contribution of universities in the process of enhancing production and productivity of firms in addition to their primary purpose of knowledge creation and human capital development. Mowery and Sampat (2004) as quoted in Costa & Teixeira (2005) described universities as instruments of knowledge-based economic development and change. Consequently, according to Spencer (2001) as cited in Costa & Teixeira (2005) most member countries of OECD support interactions between universities and industry with the belief that such relationship would augment the rate of innovation in the economy.

University-industry linkages and their merits have now spread virtually all over the world as a result of high development in technology and globalization (Schiller, 2006). As a result of this growth in the familiarity of UIL, low income countries and newly emerging economies in Asia, Africa and Latin America have become aware of the importance of such networking among their universities and industries, and hence begun to formulate policies that promote the implementation steps forward. To capitalize on the potential capability of universities in this respect, governments and institutions are actively crafting strategies and guidelines to upgrade collaboration between their universities and industries (and for other productive sectors in general) through research and other forms of partnerships (Ssebuwufu, Ludwick & Beland, 2012). Ethiopia has also responded to such important need of the environment through its Ministry of Science and Technology (MoST) which has been authorized for the formulation and implementation of science, technology and innovation (STI) policy that promotes UIL (MoST, 2013). Accordingly, MoST has begun its responsibility of promoting UIL by defining it as a co-ordinated system of work among education and training, research institutions and industries to engage in a collaborative manner.

2.1.1 Innovation and Technology Transfer

A well-implemented UIL program can have several benefits to the parties involved as well as the society at large. Among the major outputs of UIL activities are innovation and technology transfer.

There has been high recognition of innovation as critical condition for business success because promotes and ensures growth, sustainability and competitiveness (Tomlinson, Zorlu &Langley, 2008). Innovation is a very broad concept that involves several various stakeholders ranging from governments and scientists to business executives, marketing specialists and consumers. Different authors have conceptualized innovation from perspectives. However, the common definition that is widely in use was given by Freeman (1987) who argued that there is a difference between invention and innovation. According to Freeman, an invention can be thought of as an idea, a sketch or model for a new or improved device, product, process or system; however, an innovation has an economic meaning that is realized only with the first commercial exchange that involves the new product, process, system or device. Thus, from the economic value-added point of view, innovation can be defined as the application of new ideas to the products, processes, or other aspects of the activities of a firm that lead to increased value. Galanakis, (2006) also defines innovation as "*the creation of new products, processes, knowledge or services by using new or existing scientific or technological knowledge, which provides a degree of novelty either to the developer, the industrial sector, the nation or the world and succeeds in the marketplace*." Therefore, innovation can be understood as an approach that combines knowledge, skills and technology into a value addition process with an objective of delivering new or significantly improved products, processes or systems with a potential of commercial transaction.

The other important and possible result of UIL which is highly related to innovation is technology transfer. Looking at the face value of technology transfer implies that there are at least two parties involved in the process one of which can be considered technology developer and supplier and the other receiver of

technology. But what is technology transfer? Literatures show that there are two major components of innovation process: knowledge and successful handover of that knowledge with new products or services being offered to customers. The second component is what can be denoted as technology transfer which is responsible to distribute the outputs of innovation to organizations that can deliver those products to the market (Rombach & Achatz, 2007). Hence, the following comprehensive definition of technology transfer has been used as cited in (Mitasiunas, 2013):

> *"Technology transfer can be defined as the process of sharing of or acquiring/providing/licensing skills, knowledge, technologies, intellectual property, technology development personnel or entire teams, methods of manufacturing between companies, research institutions and other organizations to enable the accessibility of scientific and technological developments to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services (*http://en.wikipedia.org/wiki/Technology_transfer*)."*

In the course of this research innovation and technology transfer have been treated as a package of UIL results in order to simplify the data analysis and draw a comprehensive conclusions relating to the context of the samples of the study. Therefore, the role of management in UIL implementation both in universities and industries has been examined to see how management is handling the contribution UIL to innovation and technology transfer.

2.1.2 The Role of Management in UIL

In the theory of organizations the concept of management is among the most popular disciplines that dominate a vast majority of literatures. Management is one of the top key success factors in the performance an organization, regardless of product type, size and age. Many authors and practitioners have defined the concept of management in different ways from pre-classical period to modern time management philosophy. However, the following definition has been used for this particular article:

> ***Management*** *is the attainment of organizational goals in an effective and efficient manner through planning, organizing, leading, and controlling organizational resources. (Daft, 2008).*

From the above definition of management we can observe two important points: (1) the basic managerial functions of planning, organizing, leading, and controlling, and (2) the purpose for which organization exists, i.e., the endeavor to achieve deliberately established goals in an effective and efficient manner. For accomplishing the organizational functions, people in the managerial positions apply several different types of skills, such as conceptual, human and technical skills. With respect to the UIL activities, the managements of both universities and industries are also expected to discharge their managerial responsibilities so that the intended results of the UIL program could be realized. The university management is supposed to ensure that the academic and research activities have been planned in such a manner that they can create an environment of knowledge generation that is relevant and transferable to the practical world, preferably industries. Likewise, the industry management needs to recognize the role of universities in their production processes and hence facilitate conditions for establishing links that will have multitude benefits to both of them, their customers and the society at large. This indicates that management plays a pivotal role in the productivity of its organization by capitalizing on its internal strengths and exploiting the external opportunities.

III. PROBLEM STATEMENT

In Ethiopia, it's a recent phenomenon since the concept of innovation and technology has come to the attention of industries, universities and government. Over the past two decades, the incumbent government has taken some practical steps to develop and implement the science, technology and innovation policy (The Ethiopian Science and Technology Agency, 2006). According to the policy of science, technology and innovation (STI) of the country, one of the underpinning objectives was to create national capability that could result in the utilization of indigenous knowledge and exploiting the opportunities of the global advancement in scientific knowledge and technology. This objective, in essence, emphasized that the role of public scientific and technological institutes at all levels such as, universities and private sector should be strengthened to cooperate in the generation, transfer and application of scientific knowledge and technologies within a framework of the country's national system of innovation. In fact, Ethiopia has revised its previous STI policy with a broader scope to include government, universities, public research institutes, TVET and industries as the major key players of the linkage (NSTI, 2012).

The very recent experiences of Ethiopian universities, particularly those which rely on the government budget, reveal that they have begun to design systems and structures for creating partnerships with local industries by setting various objectives, including student internships, staff externships, and innovation and technology transfer among others. Importanly, majority of those collaborations between universities and industries are formal, i.e., they are backed up by memorandums of understanding (MoUs). Nevertheless, only few or none of those partnership agreements have succeeded to materialize compared to the intended objectives.

The most common university-industry linkage that many Ethiopian universities are more often reporting to perform is a short term student attachment to industry (commonly known as internship program) as part of their curricula which even proves to be ineffective and unsatisfactory due to various constraints, such as lack of commitment from both sides and limited budget among others. Also university-industry linkages in Ethiopia are underperforming with regard to expected outcomes mainly because of lack of awareness and confidence on the side of industries and low commitment on the part of universities. The information about partnerships formed between universities and industries is not well communicated to stakeholders, such as faculties and employees. The agreements are usually made by very few representatives (i.e., the top level management) leaving the other concerned units and employees of the respective systems with little or no information regarding the content and scope of the agreement. Particularly, there are limited efforts that university management makes to communicate the multiple benefits of their collaborations with industry to their faculties and students rather than just signing the memorandums of understanding. Weak monitoring and evaluation system is the other problem of the current UIL practice in Ethiopia.

As far as the researcher's knowledge is concerned comprehensive empirical studies with a special reference to the role of management in university-industry linkages to promote innovation and technology transfer have been non-existent in Ethiopian context. Therefore, the researcher has been motivated to undertake this study which he believes fills the gap existing in the literature with respect to Ethiopian reality. To this end, the purpose of this study is to investigate the influence of top level management in the implementation of university-industry linkages in terms of its contribution to innovation and technology transfer using selected universities and manufacturing firms as the target population.

IV. RESEARCH QUESTION

The research question this posed for this study is:

- To what extent does top management in university and industry play its role in the implementation of UIL that can result in business innovation and technology transfer?

V. OBJECTIVES OF THE STUDY

The main objective of this study is to assess the role of management in the implementation of UIL with special reference to innovation and technology transfer between universities and industries in Ethiopia. The following are specific objectives pursued in the study:

- To examine how university top management is affecting UIL activities related to innovation and technology transfer.
- To analyze how industry managers influence UIL activities related to innovation and technology transfer.
- Compare universities and industries in terms of their managements in the implementation of UIL activities related to innovation and technology transfer

VI. HYPOTHESES

The following hypotheses have been developed for this study in line with the research question and specific objectives stated above:

H_{01}: There is no significant contribution of university top management in UIL implementation and its associated outputs (for university)

H_{02}: There is no significant contribution of industry top management in UIL implementation and its associated outputs (for industry)

H_{03}: There is no significant difference between universities and industries with regard to the role of management in the UIL practice and its contribution to innovation and technology transfer (comparison between the two).

VII. RESEARCH METHODOLOGY

While recognizing the existence of several types of research design (Kothari, 2004; Cooper, *et al*., 2012; Zikumund, et al., 2009), this particular study is a non-experimental research type whereby a combination of descriptive and explanatory approaches have been employed for the data collection, analysis and interpretation. This is because the nature of the study indicates the existence of dependent and independent variables whose relationship is to be described and explained. The role of management is an independent variable causing changes (effect) in innovation and technology transfer (UIL outputs) being treated as a dependent variable. The characteristics of research questions and objectives presented in the previous section also indicate that managerial behaviors in the case organizations are expected to influence the UIL practice its desired results expressed as innovation and technology transfer.

7.1 Type of Data

Data are the most critical requirements for answering the research question(s) and/or testing hypotheses. For the purpose of this study both primary and secondary data were utilized with primary data predominantly relied on. Self-administered survey questionnaire and semi-structured interview were utilized for collecting primary data while both published and unpublished

documents were used for accessing secondary data. Based on the nature of data, this study has employed the mixed methods type of research wherein, both quantitative and qualitative data are incorporated. In the course of applying this approach, quantitative data were predominantly utilized because the required data were gathered more through the use of survey instruments. Besides, a cross-sectional form of research was employed with regard to the data collection. That is, the study was conducted based on the relevant data gathered over a single specified period of time.

7.2 Population and Sampling

The survey data required for the study have been gathered from the academic staff of the target universities and industry officers. The university academic staff population has been defined based on their academic rank criterion so that those faculties with the rank of lecturer and above were included in the sampling frame. The university sampling frame also entailed all teaching officers who were eligible as per the criterion mentioned above. On the other hand, the industry population was framed to comprise those individuals who assumed managerial positions (specifically those at the middle and top levels of management) in the respective companies during the data collection period. The researcher has purposefully decided to limit the sampling frame to the aforementioned categories of the population because the sample participants selected from such frame were considered to be in a better position with regard to providing the data relating to the research topic.

For the purpose of gathering survey data from the sample universities, the sample frame was determined to constitute academic staff or faculties with academic ranks of lecturer and above as well as officers such as, heads of departments, associate deans, college deans and directors who assumed various management positions. In addition to the academic rank, participant's academic qualification has been used to set the sampling frame. Accordingly, the faculties identified for sampling purpose were those who have had a master's degree and above. For the industry population, the sampling frame set for the survey data was purposively limited to individuals in the managerial levels of the target firms. Therefore, those individuals who have been assigned to the positions of firm manager, head of production unit, head of quality control unit and R&D staff, if available were considered in the industry sampling frame.

For the university population, sample size was fixed using the formula presented below (Yemane, 1967). The total number of academic staff in all the three institutions who met the criterion of the sampling frame was 893 (i.e., 320 from ASTU, 365 from AASTU and 208 from AAiT). The number of respondents taken from this population size has been set as follows:

$$n = \frac{N}{1 + Ne^2}$$, Where: n = sample size, N = population size, e = error term (level of precision. At 95% level of confidence

Therefore, the number of research participants from university population is:

$$\mathbf{n = 893/ (1+893*0.05^2) = 276}$$

However, in order for improving the response rate of the data, 24 additional respondents were taken that added up the university sample size to 300 research participants to whom the questionnaires were distributed. Applying the proportionate stratified sampling technique to university population, the sample size from each institution is computed as shown in the following table:

Table 7.1: Sample size determination of university population

Institution	Population size of institution	Population proportion	Sample size of institution
AAiT	208	23%	69
AASTU	365	41%	123
ASTU	320	36%	108
Total	**893**	**100%**	**300**

Source: Researcher's own SPSS analysis of survey data 2017/8

For industry population, 50 firms that met the specific research criteria were identified first and then three participants in the managerial positions of each sample firm were purposively selected to participate in the survey. Therefore, a sample size of 150 respondents was taken from industry population.

VIII. RESULTS AND DISCUSSIONS

Data analysis and presentations were undertaken using both descriptive and inferential statistics. The descriptive analysis has been executed first for both university and industry and then followed by inferential analysis accordingly. Out of 300 questionnaires distributed to university respondents, 260 were collected of which 240 have been correctly filled out and found eligible for the data analysis. For the collected questionnaires 10 of them were significantly incomplete and excluded from the analysis, whereas the rest 10 had some minor errors and used in the analysis after adjustments have been done to them. Therefore, though the overall response rate is 86.7% (i.e. 260/300), the actual response rate based on the number of questionnaires used in the analysis is 83.3% (i.e. 250/300).

On the other hand, from the total number of questionnaires (i.e., 150) dispatched to the industry respondents, 130 were returned back of which 110 were correctly completed, 5 completed with minor errors and 15 were returned back with major flaws and left out from further use in the research. Thus, by making careful editing and necessary adjustments to the few errors committed in the 5 questionnaires, a total of 115 completed questionnaires have been used in the industry data analysis. The overall response rate based on the number of returned questionnaires is 86.7% (130/150) but the actual response rate based on the accurately completed number of questionnaires is 76.7% (115/150) which was significant enough to be utilized for the data analysis.

8.1 Descriptive Results on the Role Of Management in UIL Implementation

In this section the responses to the items on the role of management in UIL implementation based on five point Likert's scales have been summarized and discussed. First the mean, standard deviation and percentages to each item been computed, and then the overall average values of these parameters have been worked out and used in the discussion of both university and industry data. The five point Likert's have been condensed into three categories to simplify the analysis.

Table 7. 2: University Responses on the Role of Management in UIL Implementation

Items	Mean	SD	Agree (%)	Neutral (%)	Disagree (%)
UIL as a strategic priority	4.02	0.85	80.0	15.6	4.4
Clarity of UIL goals to the entire faculty	3.32	1.03	48.8	26.4	24.8
Benefits of UIL the entire faculty	3.29	1.00	46.4	30.0	23.6
Publicity of UIL status to stakeholders	3.10	0.96	36.0	39.2	24.8
UIL strategic plan cascaded to departments	2.94	1.02	34.4	29.6	36.0
Faculty awareness of UIL implementation	3.65	0.89	65.6	20.0	14.4
Promotion of the practice of innovation	2.99	0.95	32.4	38.8	28.8
Monitoring and evaluation	2.64	0.99	21.2	31.2	47.6
Innovation center with adequate capacity	3.07	1.05	38.4	31.2	30.4
Adequate resource allocation for UIL	2.84	0.97	27.2	37.6	35.2
Investment in R&D is increasing	3.40	0.87	52.0	36.0	12.0
Industry innovation needs assessed	2.88	1.00	26.8	35.6	37.6
UIL as an input in the review of curriculum	3.02	1.04	37.6	30.4	32.0
Faculties encouraged in UIL activities	3.42	0.87	54.0	30.4	15.6
An incentive system exists for individuals	2.40	1.05	14.0	29.6	56.4
Aggregated values	**3.13**	**0.97**	**41.0**	**30.8**	**28.2**

Source: Researcher's own SPSS analysis of survey data 2017/8

The values in the last row of Table No.2 above represent the summarized averages of the scores computed for individual questionnaire item and displayed in the body of the table. The aggregate mean value of 3.13 shows that the overall opinion of respondents regarding the role of management in UIL was positive. The overall standard deviation of 0.97 also indicates the scores given to each question item for the dimension under discussion were scattered within lower distances.

Looking at the aggregate percentage values for the agreement levels in the same row of the table, the positive side has got the highest point. That is, the overall percentage of respondents who agreed with the statements echoing the impactful contribution of university management to UIL is 41% followed by those respondents who were neutral (30.8%).

Some values computed for individual items and displayed in the body of Table No. 2 are worth considering here. For instance, looking at the item "UIL as a strategic priority," we can see that majority of the respondents agreed with a mean value of 4.02 and an 80% of agreement. The strategic plans of the sample universities have considered UIL as one of their key activities implying that UIL is in the management's attention at least in the plan document. On the other hand, the item "An incentive system exists for individuals," has the least average value (2.40) and the highest percentage of disagreement (56.2%). Taking the implication of this statement into account, one can see weak performance of top management in motivating faculties who come up with UIL initiatives that support innovation and technology transfer.

Table 7. 3: Industry Responses on the Role of Management in UIL Implementation

Items	Mean	SD	Agree (%)	Neutral (%)	Disagree (%)
UIL as a strategic priority	3.17	1.13	42.6	26.1	31.3
Management communicates UIL regularly	2.68	1.06	19.0	37.4	44.6
High awareness about UIL activities	2.80	0.99	29.5	19.1	51.3
UIL with a focus on innovation	2.97	1.03	33.0	35.7	31.3
Units supported to identify innovation needs	2.97	0.92	33.0	37.4	29.6
Sufficient budget for UIL implementation	2.88	1.08	28.7	33.0	38.3
Strong monitoring and evaluation system	2.70	1.09	20.9	29.6	49.5
HR focuses on innovation during recruitment	2.52	1.13	25.2	27.8	47.0
Regularly evaluation of the UIL performance	2.54	0.97	17.4	35.7	46.9
Effective capacity building practice for UIL	2.57	0.83	9.6	50.4	40.0
R&D unit with required resources fulfilled	3.01	1.14	42.7	16.5	40.8
Incentive system for UIL performance of units	2.44	0.98	12.2	35.7	52.2
Incentives for employees participating UILs	2.63	1.09	20.9	27.8	51.3
Incentives are motivating	2.81	1.05	25.3	31.3	43.5
Aggregated values	**2.76**	**1.04**	**25.7**	**31.7**	**42.7**

Source: Researcher's own SPSS analysis of survey data 2017/8

Table No. 3 above displays the overall mean values, standard deviations and percentages of the responses collected about the role of management in UIL activities of manufacturing firms. As the summarized SPSS data in the table exhibit, most of the respondents felt that their management was performing less than expected of them in UIL implementation and capitalizing on the opportunities thereof for enhancing their business innovation. As we can observe from the table, the aggregate mean value for this dimension is 2.76 (SD = 1.04) which is far below the expected value, i. e., 3.0. Similarly, the overall percentages as shown in the table are 25.7 % for the combined agreement and 42.7 % for the combined disagreement. However, the mean values and percentage of few individual items in the table indicated that there were some efforts made by industry management to incorporate UIL in their business activities. For instance, positive reactions of respondents shown the mean value of 3.17 and 42.6% agreement to the item "UIL treated as a strategic priority" and the mean value of 3.01 with 42.7% agreement to the item "R&D unit with required resources fulfilled" signified that management was doing better in including UIL in the strategic plan and giving attention to R&D units. But generally speaking, the role of management in the implementation of UIL from industry perspective appears to be unsatisfactory.

8.1.1 Comparison of Descriptive Results

The aggregate results displayed in the previous two descriptive tables revealed that there are clear variations in the perceptions of university and industry respondents regarding the role of management in UIL practice and associated results such as innovation and technology transfer. We can observe that the mean value of university responses (X = 3.13) for role of management in UIL is higher than that of manufacturing firms (X = 2.76) for the same variable. Also the overall variation of responses for university (SD = 0.97) was narrower than that of industry (SD = 1.04). The results show that university top management was comparatively performing better than their industry counterpart in the implementation of UIL activities to promote innovation and technology transfer. Similar results have been observed for individual items reported in the two tables.

8.2 Correlation and Regression Analyses

8.2.1 Correlation for University

Correlation is a common measure of association that shows the relationship between two variables. By using this data analysis technique, we can examine whether or not two variables vary together and also measure the extent of their relationship. Table No. 4 below presents the associations between the overall means of the items describing the role of management in UIL and those describing UIL results in terms of innovation and technology transfer. The table presenting the report of responses regarding the UIL results is attached as an annex to the paper.

Table 8.1: Correlation between Role of Management and UIL Results: University

	Mgt role	UIL Results
Mgt role	1	.820**
UIL Results	.820**	1

Source: SPSS University Data Analysis 2018

As we can see in Table No. 4, the role of management and the UIL results have strong positive relationship with a correlation coefficient of 0.820. This correlation result portrays that as management improves its commitment and engagement in UIL implementation, the likelihood of the desired results manifested in business innovation and technology transfer will also increase and vice versa.

8.3 Correlation Analysis: Industry

Table 8.2: Correlation between Role of Management and UIL Results: Industry

	Mgtrole	UIL Results
Mgtrole	1	0.808**
UIL Results	.808**	1

**. Correlation is significant at the 0.01 level (2-tailed)

Source: *SPSS University Data Analysis 2018*

Like the case of universities, Table No. 5 above portrays that the role of management and the UIL results have strong positive relationship with a correlation coefficient of 0.808 in the industry perspective. This result indicates that as the management increases its performance to UIL implementation, the expected results of UIL in terms of business innovation and technology transfer will also get enhanced and vice versa.

8.2.2 Regression for University

Regression analysis measures the dependence linear relationship between dependent and predictor variables (Zikumund, 2009; Cooper, Schindler & Sharma, 2012). Therefore, for this research a simple regression analysis has been run where role of management was the independent variable used to predict the changes in the dependent variable (UIL results).

Table 8.3: Simple Regression Coefficient: University

Model		Unstandardized Coefficients	Standardized Coefficients		t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.728	.109		6.684	.000
	Mgtrole	.803	.036	.820	22.574	.000

a. Dependent Variable: Results

Source: SPSS University Data Analysis 2018

Table No. 6 above shows the output of simple regression analysis. As we can see in Table No. 5 above, the role of management has significant positive contribution to the changes in the UIL results. That is, a one unit change in the role of management will bring about a 0.803 improvements in the UIL results. This predictive relationship can also be shown by the following regression equation developed based on SPSS results for university data:

$$\hat{y} = 0.728 + 0.803x \text{ …….. University}$$

Where: $\hat{y}$ = estimated value of the dependent variable (UIL results)
x = the independent variable (university management)

8.2.3 Regression for Industry

Table 8.4: Simple Regression Coefficient: Industry

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.178	.134		8.819	.000
	Mgtrole	.681	.047	.808	14.556	.000

a. Dependent Variable: Results

Source: SPSS University Data Analysis 2018

Table No. 7 above exhibits the SPSS output of simple regression analysis displaying the predictive relationship between role of management and UIL results for industry. The results in the table revealed that the role of management significantly predicts the variation in the UIL results, that is, a one unit improvement in the role management will increase the UIL results by 0.681 units. Accordingly, the regression equation below can be used to estimate the predicted values of UIL results from industry perspective:

$$\hat{y} = 1.178 + 0.681x \text{ ……..Industry}$$

Where: $\hat{y}$ = estimated value of the dependent variable (UIL results)
x = the independent variable (industry management)

8.3 Hypothesis Testing

The study was concerned with investigating the influence of management on the UIL implementation and its contribution to innovation and technology transfer. The study aimed at examining how university and industry top managements affected the UIL outputs in line with their respective organizational goals as well as their common benefits. To this end the following hypotheses have been formulated and tested:

- **For University**

H_{01}: There is no significant contribution of university top management in UIL implementation and its associated outputs.

The result of simple regression analysis run for university and reported in Table 12.3 above showed that the t value of 6.684 is significant at $p < 0.01$ indicating that the null hypothesis is not supported. Therefore, the hypothesis test for the university revealed that the top management significantly contributes in the implementation of UIL that can lead to innovation and technology transfer.

- **For Industry**

H_{02}: There is no significant contribution of industry top management in UIL implementation and its associated outputs.

The result of simple regression analysis conducted for industry and reported in Table 12.4 above indicated that the t value of 8.819 is significant at $p < 0.01$ leading us to judge that the null hypothesis is not accepted. Therefore, the hypothesis test for the industry revealed that top management in industries significantly contributes to the execution of UIL that can promote innovation and technology transfer.

❖ **Comparison between University and Industry**

A comprehensive hypothesis has also been formulated to compare the perceptions of universities with those of industries regarding the role of management in the UIL implementation and its associated outputs. An independent samples t-test was undertaken to verify this hypothesis as presented on the next page.

H_{03}: There is no difference between universities and industries with regard to the role of management in the UIL practice and its contribution to innovation and technology transfer.

The independent sample t-test for the above hypothesis has been run through SPSS and presented in the table below.

Table 8.5: Independent Samples t-Test for Role of Management in UIL

		Levene's Test for Equality of Variances		t-test for Equality of Means				
Mean of role of mgt	Equal variance assumption	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
	Equal variances assumed	5.664	0.018	4.941	363	0.000	0.36790	.07445
	Equal variances not assumed			4.680	194.998	0.000	0.36790	.07861

Source: SPSS University Data Analysis 2018

From Table No. 7 above we can notice that the independent t-test results are based on two tailed data distribution because the null hypothesis states that there is no difference between university and industry means, indicating that it is two directional test, hence two tailed. The significance levels of t-test for equality of means in the table will help us to decide whether to accept or reject the null hypothesis. The third column of the table, labeled as the Levene's test states that if the F-value is significant at $p < 0.05$, the t-test value and its significance level associated with the assumption of equal variances are not considered for judging the hypothesis. On the other hand, it suggests the use of t-value and significance level corresponding to the case where equal variances are not assumed. In Table No. 7, because the F value of 5.66 is significant at $p < 0.05$, we have taken the second row t-value and its significance for judging the hypothesis. Hence, the t-value of 4.68 at $p < 0.05$ is statistically significant, leading us to a decision that the null hypothesis stated above is not supported. This means that there is a significant difference between the means of universities and industries with respect to the role of management in UIL implementation.

8.4 Analysis of Qualitative Data

Qualitative data were the second major type of primary data used in this study next to self-administered survey questionnaire. The purpose of qualitative data was to access the relevant information that the self-reported items may be unable to address.

I.4.1 Opinions of Respondents on the Role of Management in UIL

The main issues covered by the interview and open-ended items regarding the role of management in UIL were strategic planning, awareness creation among internal stakeholders, benefits of UIL, management support and capacity building practices. The opinions gathered from both universities and industries indicated management was underperforming with regard to considering UIL as one of the strategic priorities, creating awareness among their communities about UIL and its benefits, commitment to UIL implementation and supplying the necessary resources to the units established in the name of UIL. The results showed that universities were relatively performing better than their counterpart industries.

IX. SUMMARY OF THE MAJOR FINDINGS, CONCLUSIONS AND SUGGESTIONS

This article has aimed at investigating the role of management in the implementation of UIL with expected results of promoting business innovation and technology transfer as evidenced from the practices of selected universities and industries in Ethiopia. With regard to the target population, science and technology universities and institutes, and manufacturing firms were considered as the sources of data. Though both primary and secondary data were employed the former type of data was predominantly used for conducting this study. The data have been analyzed using both descriptive and inferential data analysis techniques.

9.1 Summary of the Major Findings

- The aggregate mean value of ‧ = 3.13 (*SD* = 0.97) and the aggregate percentage of agreement (41%) in the descriptive results of university data showed that the overall opinions of respondents regarding the role of management in UIL

implementation were positive. On the other hand, the equivalent results obtained from industry were an overall mean of ▪ = 2.76 (*SD* = 1.04) and an overall percentage of 25.7% of respondents who had positive opinions about the role of management in the UIL activities. Universities showed more favor to the items on the role of management in UIL implementation than industries.

- The correlation analysis revealed that the role of management and the UIL results have strong positive relationships with correlation coefficients of (r = 0.820) and (r = 0.808) for universities and industries respectively. These results indicated that as the management increases its commitment to UIL implementation, the expected results of UIL in terms of business innovation and technology transfer will also get enhanced and vice versa.

- The regression analyses for both university and industry data brought out positive results as to the contribution of the role of management in the variation of UIL outputs. The unstandardized coefficients of the role of management variable in the simple regression models of both samples were found to be 0.803 and 0.681 respectively. These results have also been used for testing the individual hypotheses set for university and industry. Because the t values have become significant for both university and industry, i.e., t = 6.684 ($p < 0.01$) and t = 8.819 ($p < 0.01$) respectively, the null hypotheses in both cases were not supported.

- Also the hypothesis testing using the independent samples t-test revealed the t-value of 4.68 (df = 195) at $p < 0.05$ which was statistically significant and led us to a decision that the null hypothesis is not supported. The degrees of freedom for the t-test was based on the assumption that equal variances not assumed because the results of Levene's test for equality of variances showed that F (1, 363) = 5.66 at $p < 0.05$ which was significant and directed us to the use of the second option of the t-values. Therefore, the statistical hypothesis which claims the absence of significant difference between universities and industries regarding the role of management was not supported.

- Last, but not least, the qualitative data gathered through interviews and open-ended items from both universities and industries indicated management was underperforming with regard to promoting UIL as one of its strategic priorities; creating awareness among their staff members about UIL and its benefits, commitment to UIL implementation and providing the necessary support to the units established in the name of UIL function. The results showed that comparatively universities were performing better than their partner industries.

9.2 Conclusions

Based on the findings presented above the following conclusions have been drawn:

- From the descriptive results of the data analysis we can conclude that university respondents had more positive opinions about the role of management in UIL activities, whereas the industry respondents had more negative reactions toward the performance in their firm's UIL activities. Looking into the opinions given to certain specific items, however, it can be said that management was performing less than what was expected of it in both university and industry.

- As evidenced by the results of correlation analysis, the role of management has a strong positive relationship with the desired results of UIL. Hence, the researcher can deduce that there is high probability that better achievement of the UIL activities are linked to increased commitment and engagement of management both in universities and industries.

- The null hypotheses that claimed the absence of significant role of management in the UIL implementation in both universities and industries as well as the absence of difference between university and industry with respect to the function of management were rejected on the results of individual simple regressions and the independent samples t-test which were all found to be statistically significant. Hence, top management, if committed, has got significant contribution in the UIL activities both in universities and industries. It was also evident that there was a significant difference in the perceptions of universities and industries toward the role of management in UIL and its outputs.

- The information obtained from qualitative data also implied that there were some visible efforts being exerted by management to promote the UIL functions. However, the opinions obtained indicated that the expected results were not satisfactory in both cases.

9.3 Suggestions

The following suggestions have been provided based on the conclusions reached and stated above.

- Though the opinions gathered from university and industry generally revealed the contribution to the implementation of UIL, it was found that the management had visible limitations in crafting a strategic plan that clearly addressed UIL as one of the crucial functions that could result in innovation and technology transfer. Therefore, individuals and groups

authorized to play the managerial responsibilities in both universities and industries should revise their respective strategic plans in such a manner that the function of UIL is given proper attention. In addition, the management should be committed to improve the implementation of UIL through effective monitoring and evaluation system.

- The other important issue the respondents showed reservations in was the limited information they had about UIL because of poor communication from the management. As communication is the lifeblood of any organization, and management is primarily responsible to facilitate such an infrastructure, individuals and teams managing the sample universities and industries have to build a system of communication that provides timely information about the main tasks of their organizations including UIL to all stakeholders. Particularly, all faculties and employees of the universities and industries under consideration should have adequate information as to the objectives and benefits of the UIL so that they could contribute to the success of the program.

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