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Hiran, Kamal Kant

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# Impact of Driving Factors on Cloud Computing Adoption in the Higher Education

**Kamal Kant Hiran**

Research Fellow, Aalborg University, Copenhagen, Denmark

kkh@es.aau.dk

**Abstract.** The aim of this research is to explore the sociocultural and economic factors involved in the adoption of emerging technology, i.e., the cloud at the University in Ethiopia. Organizations' growth and development depend on the various factors that influence productivity and efficiency to improve the work culture. The data collected from the relevant key actors or stakeholders from the higher education system i.e., University of Gondar, Ethiopia, and compiled in a purposive way. The researcher identified the most inducing factors under the sociocultural categories are societal belief with regression weight  $SoCF_1=0.821$ , followed by ideologies or value of individual towards CC, language barrier, and awareness towards the cloud. Similarly, the most inducing economic factors were high investment cost with regression weight  $EcoF_1=1.096$ , followed by per capita income, government grants and infrastructure development. The framework from the full-scale analysis will theoretically lead to the creation of a discussion model that can be used to examine cloud adoption in higher education.

Keywords: sociocultural, economic factors, stakeholders, government grants

## 1. Introduction

The fast-moving technological age gives institutions unprecedented potential for improving their productivity (Ali & Osmanaj, 2020). By using the emerging technologies, the efficiency and services can be improved in the institutions. Cloud Computing has evolved as technology enables businesses to operate independently on demand and IT capabilities without costly upfront investments, regular software upgrades and staff retraining (Dadgar, Vithayathil, & Osiri, 2017).

As the technologies are growing day by day such as Cloud computing, Edge computing, Machine learning, Deep learning, Internet of Things, Intelligent Cloud, etc. which are widely adopted by individuals and institutions to perform their operations (Shi, 2017). For the effective adoption of any emerging technologies, several factors must be examined before its adoption. Out of several predictive factor's researcher focus in this study on sociocultural and economic factors in higher education (Yani Supriani, Giyanti, & Tb. Sofwan Hadi, 2020). The area of the study is the adoption of CC in higher education in the underdeveloped country of Ethiopia (Hanlon, Whitley, Wondimagegn, Alem, & Prince, 2009). There is a limited research on the application of technology in the developing economics, along with social and economic concepts. As has been reiterated, developing countries face various challenges in technological innovation. Ethiopia, like other developing countries, lags developed nations weak infrastructure, costly investment, lack of awareness and slow response to



technocrats (Hiran & Henten, 2020). It is therefore necessary to develop a comprehensive scientific understanding of adoption predictors in different cognitive development and geographic contexts. The economic and social development change in many developed nations and the awareness may also help to shape the successful adoption of CC policies in Ethiopia (Chaiklin & Hedegaard, 2013).

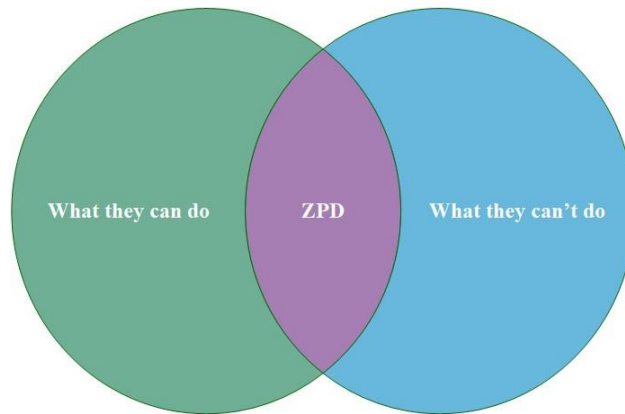
The objective of the research is to find out the most prominent sociocultural and economic factors for the cloud adoption in the higher education at the University in Ethiopia?

## 2. Review of Literature

According to Vygotsky (Sawyer & Stetsenko, 2018), at the beginning of the period, a major, rare, and highly unique relationship develops between the youngster and the realization. Vygotsky explained, "The social development measure shows the starting point in time for all complex changes occurring during the period in question". It decides absolutely the forms and the path the social becomes human. (Barrios, Guilera, Nuño, & Gómez-Benito, 2020) carried out a Delphi analysis of firm-level issues with certain IT specialists representing clients, suppliers, and scholars across a wide range of nations, sectors, and institutions, and found that economic construction was vital. Several other studies also indicated social, economic, customer behavior and regulatory factors were the obstructions. (Barrios et al., 2020) emphasizes that the positioning of social rather than human mechanisms is a primary element of socio-cultural theory in developing higher mental functions. It is correct that intellectual growth could not be seen in a genetically mediated pattern, but in experiences in a social and cultural context. Learning is therefore seen as going to lead or promoting academic success. (Lev Vygotsky, 1896) pointed to the solution of 2 (two) forms of biological reductionism, the natural maturation of the physiological and societal brain, the natural learning of the cultural assets of the language, community, etc. Roosevelt (Yani Supriani et al., 2020) argued that the primary goal of Vygotskian learning is to keep students in their ZPD (Zone of Proximal Development) as long as possible by presenting students with encouraging and culturally relevant teaching and solution activities. (Gajdamaschko, 2015) point to the emergence of skills and processes not inherent, stable, and observable in Vygotsky psychology, but rather because of the experience of social experiences of a person around the world.

### 2.1. Zone of Proximal Development (ZPD)

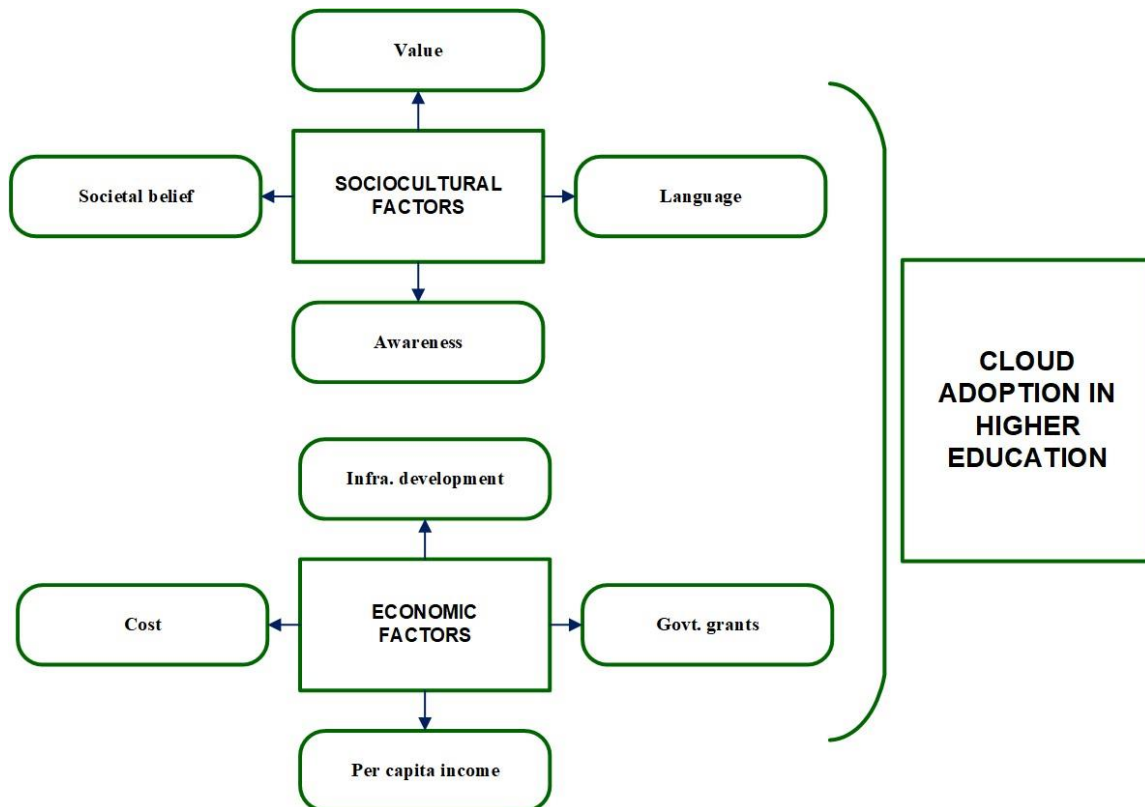
Vygotsky (Lev Vygotsky, 1896) introduced the idea of ZPD (see figure 1) and described it as the remoteness between the actual level of development centered on Independent problem-solving and threshold of potential growth estimated by problems addressed under supervision and in cooperation with adequate peers in society; (Fani & Ghaemi, 2011) 'the growth of better psychological factors.' That is, Vygotsky interpreted the ZPDs as identifying the existing and real learners' level growth as well as the next stage reached by using semiotic and environmental mediating methods and encouraging the use of adults or peers. The theory is that people learn better by working together with other people in shared cooperation and by working with professional people, they learn and internalize new ideas, psychological techniques, and skills. (Chaiklin & Hedegaard, 2013) believes it is necessary to note that the interest of Vygotsky is to establish a theoretical framework for adequate pedagogical procedures, including concepts of the potential educational gathering of students and the identification of interventions of individual learners, as an initial step towards understanding how he developed the field of proximal growth. His theory (Lev Vygotsky, 1896) suggested the below important elements: a. The fundamental significance of heritage and traditions as a mechanism of growth, b. Origin of internally and externally resources that shape the structure of mental function, c. comprehensive ZPD.



**Figure 1:** Zone of Proximal Development

**3. Theoretical framework**

This section describes the conceptual model structure for the analysis. Since cloud adoption is the subject of this study, so the researcher outlined Vygotsky's ideas (Lev Vygotsky, 1896) that articulate the central role of social interaction in the creation of understanding, as he firmly believes that culture plays a key role in making sense. Therefore, the researcher reviewed the societal and economic parameters at the outset then examined research related to this study. Below is the proposed theoretical framework based on the sociocultural and economic factors and cloud adoption in higher education (see Figure 2).



**Figure 2:** Theoretical framework

#### 4. Research Methodology

The persistence of the study is analyzing frequently reported sociocultural and economic factors to widespread adoption of cloud technology. This goal has been followed by examining the selected item that has a profound effect on CCA.

*Sample Size:* To go for an extensive study UoG in Amhara region, Ethiopia was selected. 125 respondents were targeted by the report, but only 95 of them tried all the declaration and thus the research was limited to those defendants. There are two parts of the questionnaire. The first portion consists of 4 (four) questions on the demographic details of respondents (see Table 1). The second portion is made up of 10 (ten) statements based on sociocultural-economic constructs, to study a comprehensive view concerning the adoption of CC. For analyzing each statement, the opinion of the selected actors has been elicited on Likert five theme.

*Collection of Data:* Both primary and secondary data have complied in this study. Main data obtained through a survey form and through interviews with different groups of sample survey respondents. The secondary data collected from the published records of online companies, journals, books, etc.

*Tools of Analysis:* The statistical paraphernalia used for the study included Reliability test, Regression, KMO test, etc.

#### 5. Data Analysis and Interpretation

**Table 1:** Demographic Description

Factor	Classification	Frequency	Percent	Cum Percent
Gender	Male	55	57.90	57.90
	Female	40	42.10	42.10
		95		100
Age	Below 30	48	50.50	50.50
	31-40	29	30.60	80.60
	Above 41	18	18.90	100
		95		
Education	UG	35	36.80	36.80
	P.G	50	52.60	89.40
	Others	10	10.60	100
		95		
Work Exp	< 1 year	25	26.30	26.30
	1-5 years	52	54.80	81.10
	> 5 years	18	18.90	100
		95		

The above table 1 articulates that the sample consisted of 57.90 percent male and 42.10 percent female, predominantly 48 respondents were below the age group of 30 years, 29 respondents were between 31-40 years and only 18 persons were above the age of 41. Further, most of the respondents were post-graduate 50, under-graduate 35, and others were only 10 respondents. 26.30 percent of participants having work experience less than one year whereas most of the participants i.e., 52 were under the category of 1-5 years, and eventually on 18 participants having experience of more than 5 years.

Primarily, to test the reliability of these items, Cronbach's Alpha score was computed that revealed a score of 0.785 that, outlined that the statements were reliable enough for further statistical investigation.

**Table 2:** Multiple Regression Results of Sociocultural Factors

(N=95)

Variables	Codes of items	Ad. R2	B	ANOVA	Sign.
Sociocultural Factors	SoCF_1	0.643	0.821	34.840	.000 <sup>b</sup>
	SoCF_2		0.223		
	SoCF_3		0.217		
	SoCF_4		0.226		

Dep. Variable: CCA

The above table 2 depicted the result of regression tool and the most influencing factors were societal belief (SoCF\_1),  $b=0.821$ , language barrier (SoCF\_2),  $b=0.223$ , awareness towards the cloud (SoCF\_3),  $b=0.217$ , and ideologies or value of individual towards CC (SoCF\_4),  $b=0.226$ . The  $f$ -value= $34.840$  of selected constructs at less than 0.05 level clearly enunciates that all these five factors influence and explain (adjusted  $R^2 = 0.64$ ) the variance of approximate 64 percent users' intention toward cloud adoption.

**Table 3:** Multiple Regression Results of Economic Factors

(N=95)

Variables	Codes of items	Ad. R2	B	ANOVA	Sign.
Economic Factors	EcoF_1	0.863	1.096	119.38	.000 <sup>b</sup>
	EcoF_2		0.033		
	EcoF_3		0.531		
	EcoF_4		0.749		

Dep. Variable: CCA

The above table 3 articulates the outcome of regression and the most inducing factors were high investment cost (EcoF\_1),  $b=1.096$ , Infrastructure development (EcoF\_2),  $b=0.033$ , government grant & subsidies (EcoF\_3),  $b=0.226$  and per capita income (EcoF\_4),  $b=0.749$ . The  $f$ -value= $119.38$  of selected builds at less than 0.05 level clearly express that all these five factors sway and illuminate (adjusted  $R^2 = 0.64$ ) the variance of 86 percent with the users' intention toward cloud adoption. Thus, it can be inferred that cooperative activities among the selected variables are required to foster the CCA.

## 6. Discussion and Conclusion

The rapidly evolving digital revolution provides businesses unparalleled opportunities for increased results through operating productivity, improved customer support, growth of the market, and innovation. It is necessary to get acquainted with new-age technology for the creation of an organizational culture of learning, development, and foster creativity. The creation of technology standards includes the involvement of members from various organizations in the CCA. It is advised that users from all organizational members be actively involved in the strategic or creation process right from the outset, instead of creating "top-down" methods. In order, to increase awareness and the pace of adoption of the cloud, it is important to provide opportunities for early users who are unable to enjoy the full advantages of technological innovation. Since economic and socio-cultural challenges cannot be resolved by policymakers alone, it is important to provide a detailed overview of the main factors that affect the adoption of the HEI cloud, and the same has been examined. Thus, the study examines the role of adopted socio-culture and economic aspects as an antecedent of cloud technology adoption. The results of the complete assessment can contribute to developing a knowledge model that

could be used to examine. It will also contribute to scholarly literature through empirical evidence from study results and include future economic and sociocultural adoption. The result of sociocultural regression depicts that beta value is 0.821 for societal belief, language barrier 0.223, awareness towards cloud 0.217, ideologies or value of individual towards cloud is 0.226. Similarly, the most inducing economic factors were high regression weight via. 1.096 for investment cost, infrastructure development 0.033, government grant and subsidies 0.226 followed by per capita income 0.749. The f-value of selected constructs were significant and answered the research objective (p-value less than 0.05) that clearly enunciate that all these factors not only influence CCA but also explain users' intention toward cloud adoption.

The findings of the proposed study would also include useful knowledge backed by empirical evidence that can be used in academics designing and promoting CC projects. Finally, the analysis will contribute to future research on best technology implementation models applicable to emerging-country contexts. Further, to address the social and economic obstacles associated with configuration of cloud; therefore, the university should also use key members that actively foster change and encourage the transfer of information and the dissemination of knowledge across the cloud.

## References

- [1] Ali, O., & Osmanaj, V. (2020). The role of government regulations in the adoption of cloud computing: A case study of local government. *Computer Law and Security Review*, 36. <https://doi.org/10.1016/j.clsr.2020.105396>
- [2] Barrios, M., Guilera, G., Nuño, L., & Gómez-Benito, J. (2020). Consensus in the delphi method: What makes a decision change? *Technological Forecasting and Social Change*, (November 2019), 120484. <https://doi.org/10.1016/j.techfore.2020.120484>
- [3] Chaiklin, S., & Hedegaard, M. (2013). Cultural-Historical Theory and Educational Practice : Some Radical-Local Considerations *Teoria Histórico-Cultural E Práticas Educacionais : Algumas Considerações Radicais*. 30–44.
- [4] Kant Hiran, K., Henten, A., Shrivvas, M. K., & Doshi, R. (2018). Hybrid EduCloud Model in Higher Education: The case of Sub-Saharan Africa, Ethiopia. In *7th International Conference on Adaptive Science & Technology (ICAST) [8507113]* IEEE.
- [5] Fani, T., & Ghaemi, F. (2011). Implications of Vygotsky's zone of proximal development (ZPD) in teacher education: ZPTD and self-scaffolding. *Procedia - Social and Behavioral Sciences*, 29(Iceepsy), 1549–1554. <https://doi.org/10.1016/j.sbspro.2011.11.396>
- [6] Gajdamaschko, N. (2015). Vygotsky's Sociocultural Theory. *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, 25, 329–334. <https://doi.org/10.1016/B978-0-08-097086-8.23203-0>
- [7] Mahrishi M., Hiran K.K., Doshi R. (2020) "Selection of Cloud Service Provider Based on Sampled Non-functional Attribute Set". In: Abraham A., Siarry P., Ma K., Kaklauskas A. (eds) *Intelligent Systems Design and Applications. ISDA 2019. Advances in Intelligent Systems and Computing*, vol 1181. Springer, Cham.
- [8] Hiran, K. K., & Henten, A. (2020). An integrated TOE–DoI framework for cloud computing adoption in the higher education sector: case study of Sub-Saharan Africa, Ethiopia. *International Journal of Systems Assurance Engineering and Management*, 11(2), 441–449. <https://doi.org/10.1007/s13198-019-00872-z>
- [9] Lev Vygotsky. (1896). Lev Vygotsky (1896–1934) - Cultural-Historical Theory, Education and Cognitive Development - Thinking, Psychology, Functions, and Self - StateUniversity.com. Retrieved November 24, 2020, from <https://education.stateuniversity.com/pages/2539/Vygotsky-Lev-1896-1934.html>
- [10] Sawyer, J. E., & Stetsenko, A. (2018). Revisiting Marx and problematizing Vygotsky: a transformative approach to language and speech internalization. *Language Sciences*, 70, 143–154. <https://doi.org/10.1016/j.langsci.2018.05.003>
- [11] Senyo, P. K., Effah, J., & Addae, E. (2016). Preliminary insight into cloud computing adoption



- in a developing country. *Journal of Enterprise Information Management*, 29(4), 505–524.  
<https://doi.org/10.1108/JEIM-09-2014-0094>
- [12] Shi, L. (2017). The application of cloud computing technology in network data security. *Agro Food Industry Hi-Tech*, 28(1), 912–916. [https://doi.org/10.1007/978-3-319-01766-2\\_99](https://doi.org/10.1007/978-3-319-01766-2_99)
- [13] Yani Supriani, Giyanti, & Tb. Sofwan Hadi. (2020). Conjecturing Ability Dalam Pembelajaran Daring Masa Pandemi Covid-19. *Inomatika*, 2(2), 69–77.  
<https://doi.org/10.35438/inomatika.v2i2.201>

### List of Acronyms Used

- CC – Cloud Computing
- CCA – Cloud Computing Adoption
- HEI – Higher Education Institution
- SoCF – Sociocultural Factor
- EcoF – Economic Factor
- ZPD – Zone of Proximal Development
- KMO – Kaiser-Meyer-Olkin