LLT Journal, e-ISSN 2579-9533, p-ISSN 1410-7201, Vol. 24, No. 2, October 2021



LLT Journal: A Journal on Language and Language Teaching http://e-journal.usd.ac.id/index.php/LLT Sanata Dharma University, Yogyakarta, Indonesia

# LINGUISTIC LANDSCAPE IN A MULTILINGUAL CONTEXT: A CASE OF KENYAN UNIVERSITIES

Stella Wangari Muriungi<sup>1</sup> and Benard Angatia Mudogo<sup>2</sup>

<sup>1</sup>Mount Kenya University, Kenya <sup>2</sup>Masinde Muliro University of Science and Technology, Kenya wangaristl@gmail.com; dmudogo@mmust.ac.ke correspondence: dmudogo@mmust.ac.ke **DOI:** 10.24071/llt.v24i2.3673 received 11 September 2021; accepted 29 October 2021

#### Abstract

The linguistic landscape of a place constitutes a clear representation of its language ideology, culture, users' identity and language practice. These are depicted in verbal language used in public signs including business names, street signs, advertisements and graffiti. The aim of this paper is to examine the language distribution, purpose and authorship of public signage in the multilingual context in Kenyan universities. The paper also examines the students' attitudes towards the public signs in the sampled institutions. A sample of 185 photos taken from notices, advertisements, building names and posters are analyzed. The analysis reveals that English is the most dominant language used in Universities for both top-down and bottom-up signs, with 77% prevalence. This is attributed to the acceptance of English as a global language and presence of international students and lecturers. A high incidence of informative signs is also noted at 42% of all signage linked with the academic nature of the paper context. The findings also reveal that Kiswahili as an African language with Bantu and Arabic roots is barely utilized in public signs despite its official status. This has implications on language policy and its implementation as it indicates a mismatch between policy and practice.

Keywords: Linguistic Landscape, Multilingualism, Language Policy, Public Signs.

### Introduction

Multilingualism is a common phenomenon, which can be manifested in the diverse use of languages in different sociolinguistic context. The paper analyzes languages in context by focusing on the written information that is available on language signs in Kenyan Universities. As observed by Landry & Bourhis, (1997: 25), 'linguistic landscape of a territory can serve two basic functions: an informational function and a symbolic function'. This implies that, the linguistic landscape can reflect the relative power and status of the different languages in a specific sociolinguistic context. In this sense it is the product of a specific situation and it can be considered as an additional source of information about the

sociolinguistic context along with censuses, surveys or interviews. In this respect, the study of the linguistic landscape in a multilingual setting is necessary because it can provide information on the implications of language policy and practices that can be reflected in top down signs such as street names or names of official buildings and the impact of that policy on individuals as reflected in bottom-up signs such as shop names or street posters.

This paper focuses on a comparison of the use of different languages in the linguistic landscape of Kenyan Universities. This is because, from the perspective of language contact and use as well as attitude, these institutions accommodate people with dynamic ethnolinguistic backgrounds. In addition, the presence of international students in the Universities further enriches the institutions as a source of sociolinguistic information. As observed by Gorter (2013), descriptive approach to Linguistic Landscape (LL) provides insights to language diversity in a specific region or territory as it provides information about users' perception about language (s). Therefore, LL adds onto sociolinguistics as it reveals more information on society's perception about language and impacts on linguistic behavior. This is in addition to being instrumental in language instruction and raising awareness on social issues. In the same light, Blommaert (2013) emphasized that a sign is not only a linguistic item but also a representation of the social, political and cultural contexts of its origin.

It is our contention that the study of these linguistic elements, in a given social context presents a field that may justify a systematic study as it may constitute an empirical way of uncovering social realities. In this era of modernity, globalization and multiculturalism (Ben-Rafael, 1996), new institutions, branches of commercial activity, professional identities and demographic developments are legion. They can transform the character, composition and status of quarters, while relations between groups as well as between the institutions and the individuals receive new dimensions. It is against this complex background that our paper wants to read, in the multilingual context of Kenyan, the drives and forces that stand behind the (re)shaping of their LL

#### The notion of Linguistic Landscape

This paper presents an empirical study of the LL of Kenyan Universities. By this notion we refer to linguistic objects that mark the public space and it is studied here in a variety of heterogeneous Universities. The groups involved are University students from different Linguistic backgrounds. The study focuses on the degree of visibility on private and public signs of different languages. This LL study draws its conceptual framework from a few works about LL that preceded it, and its research questions from sociological theory.

LL has been described by Cenoz & Gorter, (2006) as language items that can be seen in particular public spaces. This refers to signs on billboards, public road signs, place and street names, commercial signs and government building signage. According to Landry & Bourhis (1997), LL encompasses the language of place and street names, advertising billboards, shop signs and public signs on public roads and buildings. The nature of LL has been used as a basis for analysis of social structures and perspectives where important agendas are established, negotiated and endorsed. Studies have categorized linguistic landscapes into two; Top-down and Bottom-up landscapes. The top-down approach focuses on language elements propagated by the national government and public institutions, signage on public sites, names of streets and public announcements. On the other hand, the bottom-up linguistic landscape referrers to signs produced by individuals such as shop owners and company or shop names as well as personal announcements as stated by Ben-Rafael, Shohamy, Amara & Trumper-Hecht, (2006). This means that top-down signs are related by governments or other official institutions whereas bottom-up signs are established by private entities such as individual business peoples, companies and private organizations. This categorization was also done by Backhaus 2006 who identified them as official and non-official signs. Official signs constitute signage associated with government and its agencies besides public transport facilities. Apart from the two groups, all other signs are classified as non-official such as business names, private billboards and private enterprises signs.

LL as an approach was first utilized to examine the bilingual situation in Canada where it laid out the ethnolinguistic vitality in the country. The educational context in a multilingual situation has been regarded as a rich resource for sociolinguistics and applied linguistics. School signage reveals more information about the identities, ideologies and language instruction. Waksman & Shohamy, (2008) observe that linguistic landscape in educational contexts provide a platform for further research into language learning and activism. The aim of this paper is to examine the dominant language (s) in the public signage and identify the authorship of the signs in terms of top-down or bottom-up signs. This paper also seeks to bring out the views of the students in regard to the languages used in the campus environment. LL study is significant as it expands the scope of analysis by allowing for the examination of all categories of signs (Gorter, Marten, & Mensel, 2012). A study of LL is also crucial as it encompasses the authors, creators, places and audiences of the signs to give a better picture of the linguistic situation. This is in addition to its ability to provide more information on the demographics, uses and policies affecting language.

Empirical studies related to LL have focused on onomastics in terms of place names (Kibet, 2017), political party names (Malande, 2018), Personal names (Malande 2011), (Miruka, 2018) and (Onchoke, 2018). Other Studies that have contributed to further understanding of local linguistic landscapes include an examination of business names (Atieno & Kinegeni, 2019) and churches (Njoki, 2013). The concentration of these studies has been on Business names and place names with less focus on educational environments; especially tertiary education settings. Muaka (2018) examined the linguistic landscape of Kenya and Tanzania from a youth language perspective. We sampled city signage and established that it was a reflection of the prevailing youth language which informed economy as well as policy.

The focus on linguistic landscape has been intensified by the fact that signs are intentional aspects of society. The signs are put forth by various actors with diverse social and political or cultural motivations or objectives. The linguistic landscape in learning institutions has been examined under theme of shoolscape in previous studies. A comparative study by Wang, (2015) featuring two universities in two different states came up with phenomenal conclusions and implications for language policy. The national languages were the most dominant in signs where language policy was reflected in top-down signs as opposed to

bottom-up signage. Chimirala, (2018) noted that schoolsapes are an indication of ideologies and language policy. He posited that sociolinguistic examination of schoolscapes may be limited by its inability to exhaustively reveal the underlying multilingualism in such contexts.

In the educational contexts the linguistic landscape as it provides insights into language awareness, public participation and intercultural competence, (Mahemuti, 2018) established that international students on campus realized the need and impact for the multilingual linguistic landscape in terms of enhanced language awareness, interaction and identity construction.

#### Language Situation in Kenyan Universities

According to Njoroge, (2018), the average Kenyan student is proficient in a minimum of three languages: Kiswahili, English and one local language. In 1964, the Ominde commission recommended for the use of English as a medium of instruction in upper classes. The commission stated that indigenous languages were ill adapted to cater to the teaching needs in the learning environment. This was however revised by subsequent commissions such as the Gacathi (1976), Mackay (1981) and Koech (1999) in (Njoroge & Gathigia, 2017) which established the use of indigenous languages during the initial three years of learning. Mother tongue is therefore preferred language of teaching for pupils in lower primary as noted by (Oduor, 2010). Njoroge, (2018) explains that the government clearly spells out its intention to promote linguistic diversity in the Kenyan constitution. This includes indigenous and Kenyan sign language besides other communication systems for people with disabilities. The Elevation of the English language is at the expense of majority of Kenvans seeing that a mere 9 percent of the 33 million are proficient in English. While Kiswahili is the unifying language intended to enhance patriotism and solidarity, English acts as a link to the global economy for Kenya. The current constitution CAP 7 on Languages recognizes Kiswahili as an official language (Kenya Law Reform Commission, 2019).

According to Machuki, (2018) to the Kenyan language policy on Kiswahili has been inconsistent. This is a factor that has further enhanced the negative attitude towards the teaching and learning o Kiswahili language. The language policy stipulates that Kiswahili and English are official languages for use in various contexts including the school. However, the school situation is different due to the differences in geographical locations which change the languages of the catchment areas. In their investigation, Mwangi & Michira (2014) predicted that the establishment of Kiswahili as an official language would likely face a number of challenges including its lack of visibility and use in educational contexts. For instance, Ghai, (2017) noted that the constitution does not emphasize the need for legislation to be in both English and Kiswahili. Some universities have also reinstated Kiswahili departments where they had been dissolved as in University of Nairobi (2013) and Maseno University (2004).

The admission criterion at university level has also accepted the substitution of English with Kiswahili in the cluster subject combination. These gains are however curtailed by the absence of Kiswahili Linguistics for language students who are forced to undertake the subject with another subject such as religious studies or history. The students of English however have the advantages of pursuing English at the linguistic and literature levels as a combination readily accepted by the largest employer for education students- the Teachers' Service Commission (TSC). However, the universities need to embrace Kiswahili in their documentation that includes mission statements and core values to efficiently promote Kiswahili as an official language.

Generally, English is the dominant language of use in the schoolscape with indigenous languages coming third in the ranking after Kiswahili. Universities in Kenya are expected to adhere to the language policy which sets English and Kiswahili as official languages with English being the medium of instruction in school. The Bantu-based Kiswahili acts as a lingua franca for transactional purposes for speakers using any of the 68 other languages spoken in Kenya. Kiswahili is also preferred due to its African roots that bear no colonial sentiments. This is in addition to its structural relation to other Kenyan Bantu languages despite borrowing heavily from Arabic.

# Theoretical Framework

The present investigation was based on the Trump-Hehcht (2010) analysis of the symbolic and informative functions of LL. Trump-Hecht (2010) pointed out three facets of space as a concept. These were explained as spatial practice, conceived space and lived space. The spatial practice refers to the physical aspect that indicates language distribution based on the physical signs. The conceived space on the other hand, brings out the political aspects of language as it represents the ideological perspectives and opinions backed by policy makers as well as the impact of policy on linguistic landscape. The third dimension under this view is the lived space which focuses on the experiential perspective by examining the attitudes of language users or inhabitants. The theory will help in the analysis of how social groups cope with the game of symbols within a multilingual setting.

### Method

Based on the Trump-Hecht (2010) definition, the present paper takes a three pronged descriptive analysis of the landscape under investigation. The LL approach is best suited for the paper as it takes into account all categories of signs in the area of study in addition to examining details of authors and target readers. LL used photography to capture the signs and gather data on the spatial practice or physical element of the campus. The photographing exercise focused on road signs, street names within the institution, business names around the campus and signboards designating different sections. The exercise aims at capturing one sign per photograph.

The signage data was categorized in terms of its functions as guided by Spolsky and Cooper (1991) who identified different sign types. The eight categories were applied as follows: building names, warning signs, informative signs, graffiti, objects, street signs and plaques. The sign categories were adjusted to fit into the educational context. These were therefore renamed and condensed into warning signs, advertisements, building/place names, informative signs, plaques and graffiti. The signs were then grouped along the lines of bottom-up or top-down.

The second dimension of political or conceived space was understood through the regulatory frameworks put in place by the institution with regard to language use. The relevant departments were visited to shed light on the communication policies and any other rules governing the placement of signs in the campus. On the third dimension of the lived space, the paper applied questionnaires and interviews to establish the attitudes of students towards the languages used in the institution. The two instruments were structured in order to capture perceptions of users as well as their assessment of the importance and rank of languages used. The paper applied convenience and purposeful sampling to form a sample of international students.

## **Findings and Discussion**

#### **Political Space**

This space is also referred to as the conceived space as it consists of policies and regulations. These are clearly stipulated by government agencies in collaboration with politicians, technocrats and policy makers. Shohamy (2006) explains that language policy is apparent in languages applied in public signs, government business and the medium of instruction in schools, (Spolsky & Shohamy, 2000) state that language policy is an effort by someone with or claiming authority to changes the language practice of someone else". In this context, the university's language policies were also evident in their admission requirements for local and foreign students. University B provided for applicants to indicate their level of proficiency in the English language which is the language of instruction. These were not clear in universities' A and C requirements. For the various Undergraduate programmes, English was the major requirement especially in health science-related and engineering courses. However, Social Sciences, Arts, Hospitality, Engineering and Tourism were found to be flexible as they provided for either official language as a qualification.

The institutions also offer Kiswahili at Undergraduate and Graduate levels. All three had running Master's programmes in Kiswahili while Universities C and B additionally offered them as Bachelor of Arts degrees. The medical programmes in the three universities also recognized the role of Kiswahili. University expected applicants to have good command of the two languages to peruse Veterinary medicine. University B and A maintained that either Kiswahili or English was required to enroll for Bachelor of Medicine and surgery. A look into Legal programmes in the institutions under study revealed that universities stipulated that English language was a mandatory requirement in universities A and B for admission in the Bachelors of Laws programme. University C on the other hand stated on their website that applicants needed to have a good grade in either English or Kiswahili language.

### Physical space

The physical space forms the basis for data collection in LL through photography. The analysis of signs, posters and other documents in the three campuses indicted that a greater percentage were monolingual. Moreover, the paper found majority of the signs to have been authored by the institution's' management, so that the top-down signs were a majority. The high incidence of monolingual top—down signs is attributed to the university's authority over operations at the campuses. Bottom-up signs, on the other hand, included those which were issued by individual social actors such as signs on businesses and personal announcements. The signs were considered in their entirety as some photographs contained more than one signboard. The results are shown on Figures 1, 2 and 3 as shown below;



Figure 1: Top-down signs all Monolingual (English)



Figure 2: Bottom-Up Sign



Figure 3: Bottom-Up Sign-Multilingual Grafffiti

#### Analysis of Physical Signage

The first concern about languages displayed concerns the number of languages used in each unit of analysis (sign). Table 1 gives the results.

Groups	Authorship	Language preference	Number	Percentage
Unilingual	Top-Down	English	98	53 %
-	-	Kiswahili	6	3 %
Bilingual		French and	2	1 %
		English		
Monolingual	Bottom-Up	English Only	45	24 %
-	-	Kiswahili Only	10	6 %
		Sheng Only	4	2 %
Bilingual		English and	16	9 %
		Kiswahili		
Multilingual		English,	4	2%
-		Kiswahili and		
		Local		
		languages		
Total			185	100

There is the predominant use of English in top-down communication. The figures also show that bottom-up signs utilize Kiswahili and local languages. The use of English is linked to its status as an official language as well as an international lingua franca. The table also points out the low incidence of Kiswahili in public signage. This is despite its recent elevation to an official language in Kenya.

Category	Number	Percentage %	
Building Names	35	19	
Warning Signs	13	7	
Informative Signs	78	42	
Graffiti	3	2	
Advertising Signs	43	23	
Street Signs	9	5	
Plaques	4	2	
Total	<u>185</u>	<u>100</u>	

The communicative fuctions of the signs based o the Spolsky and Cooper (1991) classification, idetified informative signs as the most predominat purpose of signage In the landscapes. From table 2 above, informative signs accounted for 42% of the signage followed by advertising at 23.2% and labellig In form of building names at 18.9%. Cautionary signage was also identified at 7.02% while grafitti, street signs and plaques had a less than 5% prevalece. This indicates that the landscape under investigation focuses on passig information, communication of

products and services and labelling. This is attributable to the academic nature of the uiversity context.

### Lived Space.

The lived space is the third dimension in the Lefebvre (1991) concept of the inhabitants' space. This dimension examines the user's interpretations and perceptions towards their linguistic landscape. The interviews sought to examine participants' attitudes towards signs in the campus. From the sample, interviewees appreciated the linguistic landscape of the campus but were aware of the need for inclusivity and cultural sensitivity. The interviewees emphasized on the need for acceptance and empathy towards one another in a multilingual context of the University. Students from previously francophone countries expressed the need to include French in signage. They additionally cited frustrations with Kiswahili for both academic and interactional purposes. However, students from Somalia and Somaliland emphasized the importance of basic English training as content in class is delivered through the language.

# Conclusion

When we try to summarize the order of dominance of the three languages, we see that English is by far the most prominent language in the linguistic landscape in all the three Universities followed by Kiswahili as the second language and in the third place comes Sheng with a marginal presence. The local languages were the least utilized. In all the Universities the majority language (English) is also more prominent in the signs regarding the size of the fonts, the position of the text as compared to other languages and the information given in the text.

This study shows that the linguistic landscape has both informative and symbolic functions (Landry & Bourhis, 1997). The informative function shown in the signs in the different languages indicates the language to be used in communication at shops and other businesses and also reflects the relative power of the different languages. The use of the different language is a salient dimension of a linguistic group. For example, the use of Kiswahili in bilingual signs in the Universities is not only informative, because not everybody can get the information in Kiswahili, but it has an important symbolic function which is related to affective factors and the feeling that Kiswahili is a symbol of national identity.

On the other hand, the use of English in commercial signs could be interpreted as informational mainly for international students but it is obvious that its increasing presence has a strong symbolic function for the local students as well in all the three Universities. Using English can be perceived as more prestigious and modern than using the local languages (Piller, 2003) but it can have important consequences for the future of the other languages present (Phillipson, 2003).

This investigation is limited to the analysis of linguistic signs in only three Universities but shows the important role of the linguistic landscape and its relationship to linguistic policy in multilingual contexts. It also emerges that linguistic landscape does not necessarily reflect the use of the languages in oral communication but it also provides information about written communication between language users.

#### References

- Atieno, C., & Kinegeni, L. K. (2019). Denotative meanings of names given to businesses in chogoria town: A pragmatic analysis. *International Journal of Economics, Business and Management Research*, 3(7).
- Backhaus, P.(2006) "Multilingualism in Tokyo: A look into the linguistic landscape". In: Gorter, D. (Ed.). *Linguistic landscape: a new approach to multilingualism*. Clevedon: Multilingual Matters, 52–66
- Bagna, C., & Barni, m. (2009). A mapping technique and the Linguistic Landscape. In D. Gorter, & E. Shohamy, *Linguistic Landscape: Expanding the Scenery* (p. 126). London: Routledge.
- Ben-Rafael, E., Shohamy, E., Amara, M.H., & Trumper-Hecht, N. (2006). "Linguistic landscape as symbolic construction of the public space: The case of Israel". In: Gorter, D. (Ed.). Linguistic landscape: new approach to multilingualism. Clevedon: Multilingual Matters. 7–30
- Blommaert (2013) *Ethnography, superdiversity and linguistic landscapes: Chronicles of complexity.* Bristol: Multilingual Matters
- Cenoz, J., & D. Gorter. (2006). "Linguistic landscape and minority languages". In: Gorter, D. (Ed.). Linguistic landscape: a new approach to multilingualism. Clevedon: Multilingual Matters. 67–80.
- Chimarala. (2018) Appropriating to the schoolscape: A study of reference of linguistic landscape in dyad text construction. *Indian Journal of Applied Linguistics*, 44, 1-2
- E. Ben-Rafael (1996) "Multiculturalism in sociological perspective" in Baubock, R., Heller, A. and Zolberg A. (eds) The Challenge of Diversity - Integration and Pluralism in Societies of Immigration, Aldershot, England: Gower/Avebury and European Centre Vienna: 133-154
- Ghai, J. C. (2017). *Pluralism, language and the constitution*. Retrieved November 2019, from Katiba Institute: katibinstitute.org
- Gorter, D., Marten, H., & Mensel, L. V. (2012). *Studying minority languages in the linguistic landscape*. Basingstoke: Palgrave Macmillan.
- Kenya Law Reform Commission. (2019). *Kenya law reform commission*. Retrieved 2019, from Constitution of Kenya: http://www.klrc.go.ke/index.php/constitution-of-kenya/108-chapter-two-therepublic/173-7-national-official-and-other-languages
- Kibet, R. K. (2017). A morpho-semantic study of kipsigis place names.
- Machuki, D. N. (2018). Role of school language policies in enhancing teaching and learning of kiswahili in wajir east sub-county, wajir county-kenya. Nairobi: Moi University.
- Landry, R., & Bourhis, R. Y. (1997). Linguistic landscape and ethnolinguistic vitality: An empirical study. *Journal of Language and Social Psychology*, 16(1), 23–49.
- Lefebvre, H. (1991). The production of space. Oxford: Blackwell
- Mahemuti, M. (2018). *Linguistic landscape on campus: Asian college students' perceptions of multilingual learning environments.* State University of New York at Fredonia. State University of New York at Fredonia.
- Malande, M. J. (2018). *Kenyatta univnersity institutional repository*. Retrieved 2019, from Kenyatta University Institutional Repository: https://ir-

library.ku.ac.ke/bitstream/handle/123456789/18888/A%20Linguistic%20Stu dy%20of%20Kenyan%20Political%20Party.pdf?sequence=1&isAllowed=y

- Malande, M. J. (2011). What is in a name? An analysis of the semantics of Lulogooli personal names. *International Journal of Humanities and Social Science*, 1(20).
- Miruka, F. A. (2018). A pragmatic analysis of selected personal and place names in John Habwe's novel, Maisha Kitendawili. *American Journal of Linguistics*, 6(1), 15-18.
- Muaka, L. (2018). The impact of youth language on linguistic landscapes in Kenya and Tanzania. *African Youth Language*, 123-145.
- Mwangi, P. I., & Michira, J. N. (2014). Kiswahili as an official language in Kenya: Its past, present and future roles and challenges. *Reyono Journal of Interdisciplinary Studies*, (1), 42-52.
- Njoki, G. (2013). A semiotic analysis of names given to pentecostal churches in Githurai, Kenya. Retrieved 2019, from Kenyatta University Institutional Repository: https://ir-library.ku.ac.ke/handle/123456789/6638?show=full
- Njoroge, M. (2018, December). Language politics in kenyan higher education through the lens of teacher training programmes. Retrieved October 25, 2019, from PAC University Institutional Repository: http://dspace.pacuniversity.ac.ke:8080/xmlui/handle/123456789/1586
- Njoroge, M. C., & Gathigia, M. (2017). The treatment of indigenous languages in Kenya's pre- and post-independent education com-missions and in the constitution of 2010. *Advances in Language and Literary Studies*, 8(6).
- Oduor, J. A. (2010). A Swot analysis of the language policies in education in Kenya and Ethiopia. *The University of Nairobi Journal of Language and Linguistics*, 1, 86-102.
- Oduor, J. A., & Timammy, R. (2016). The treatment of Kiswahili in Kenya's educational system. *The University of Nairobi Journal of Language and Linguistics*, 5, 174-194.
- Onchoke, A. S. (2018). A Cognitive linguistics study of ekegusii onomastics: The case of the metaphor. *Linguistics and Literature Studies*, 6(2).
- Phillipson, R. (2003) *English-only Europe? Challenging language policy*. London: Routledge.
- Piller, I. (2003) Advertising as a site of language contact. Annual Review of Applied Linguistics, 23, 170-183.
- Shohamy, E. (2006). *Language policy: Hidden agendas and new approaches*. London: Routledge.
- Spolsky, B., & Cooper, R. (1991). *The languages of Jerusalem*. Oxford: Oxford University Press.
- Spolsky, B., & Shohamy, E. (2000). Language practice, language ideology, and language policy. In E. Shohamy, & R. D. Lambert, *Language Policyy and pedagogy*. John Benjamins.
- Waksman, S., & Shohamy, E. (2008). Linguistic landscape as an ecological arena: Modalities, meanings, negotiations, education.
- Wang, J.-J. (2015). Linguistic landscape on campus in Japan—A case study of signs in Kyushu University. *Intercultural Communication Studies*, 1(24).
- Yavari, S. (2012). Linguistic landscape and language policies: A comparative study of linköping university and ETH Zürich. Linköping University.