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Smart Cities and Languages: The Language Network

Andrea Gobbi , Stefania Spina

Dipartimento di Scienze Umane e Sociali, APRIL Project (Ambiente Personalizzato di Rete per l'Insegnamento Linguistico), Università per Stranieri di Perugia, Piazza Fortebraccio 4, 06123 Perugia, Italy

Abstract. This paper intends to analyze the potential of smart cities from a linguistic perspective, with particular attention towards aspects such as second language acquisition (SLA), social inclusion and innovation, but also positive influences on sectors such as tourism and commerce. After an introduction of the theoretical foundations, the possible developing scenarios will be taken into consideration and analyzed more in detail.

Keywords: Language, Network, SLA, Interaction, Internet of Things, Augmented Reality, Social Innovation, Immigration, Minorities, Sustainable Development.

1 Introduction

The advent of smart cities across the globe is interconnecting all of us with one another and with the environment in which we live our daily lives. The tightly interwoven information infrastructure which is arising sees every citizen playing the role of an information prosumer [1]: everybody constantly provides data to the community while using data provided by others. This interconnection of data flow constitutes a constantly updated groundwork on which to make decisions and act to improve quality of life on an individual basis. Adopting a bottom-up approach, the life of the community as a whole is improved. Broadband mobile Internet connections and GPS systems represent the technology that allows all of this to happen, and soon novelties such as the Internet of Things (IoT) and Augmented Reality (AR) will broaden and enrich the range of available opportunities.

This scenario is intriguing and fascinating to everyone, but from the point of view of a linguist it is, if possible, even more interesting. The arising information infrastructure, the very existence of which will rely on citizens, active members of the community in which they live, closely resembles a more basic but incredibly important infrastructural resource we are already part of, and to which we have been constantly contributing, maintaining and evolving: language. This resemblance should not be underestimated. On the contrary, as I will point out, it may offer reciprocal opportunities which range from a sustainable push to the economy to new instruments to promote social inclusion and innovation.

In addition to these initial considerations, one more fundamental aspect remains to be taken into account. What is going to be truly smart about the way we will deal with designing community life in our cities for the next decades - and maybe centuries - will be, above all, the approach we choose to adopt. This smartness does not rely entirely on the use of high tech solutions to solve problems, but rather on how these tools are used. Smart means a radical change of perspective that allows us to solve problems that looked insurmountable before; sometimes, from a new point of view, we see how problems looked insuperable because of our previous perspective, and how elements and points we used to consider troublesome can actually become resources. Smart means differentiated solutions, adaptation to the context, flexibility based on the tight-knit mesh that is society; in a few words: a decentralized approach. After all, if smart also means more democratic, we should remember how democracy represents decentralization in public decision-making [2]. Language, as we will see, is already smart, but we are not used to looking at it in that way, especially when it comes to teaching it.

2 Language is Smart

Language is the main instrument at the base of human communication, the very basic infrastructure we use to exchange information. It allows us to represent ourselves, the world around us, to create abstract concepts and to export all of this in time and space, exchanging this information with one another. Education and learning are largely based on this ability characteristic of humans. If human beings are social animals, it is precisely thanks to language and interaction that we gave origin to and continued to shape society.

A language is an ecosystem functional to information exchange. It is alive, dynamic and flexible, evolving according to the needs of its community of speakers. The more it is used the more it develops. A language develops in breadth by acquiring new speakers every time someone starts learning it, and at the same time by lending expressions to other languages in the form of loanwords. Likewise, it develops in depth by becoming more and more specialized as specific fields require a more detailed and complex system of reference, evolving into technical terminology. Language is a dynamic, flexible and adaptive instrument: based on a relatively small number of fundamental rules, it encloses a huge potential, as it allows high customization, adaptation to any context and usage towards any end. Its development as a system follows bottom-up dynamics, as all its speakers build it collectively in a participative manner. The introduction of a new word or expression, for example, is relatively easy in cases of a contextual use, in order to achieve a particular communicative goal in the very moment when the need arises; should that word or expression be particularly fortunate and be considered worthy by a larger group of speakers who would start using it, its adoption would spread. Following this dynamic, that word or expression could possibly be integrated into a future dictionary, having gone all the way from contextual use, passing through jargon, to finally reach the dictionary. Verbs such as “to google”[3], “to facebook” [4] and to “unfriend” [5], for example, recently followed this path [6]. From a centralist point of view, the inclusion

within the dictionary represents the highest acknowledgment. Nevertheless, a language is alive, subject to a never-ending process of evolution and adaptation towards the constantly arising new linguistic needs of the community it serves and represents.

Language may be looked at as made of two complementary aspects, a personal and a social one. This dualistic nature becomes evident whenever we think of words we all know and use in everyday life: they have both an evocative and personal meaning, strictly tied to the individual history of every one of us, and at the same time a more general and shared meaning, which allows us to communicate with others. Semiotics define these two aspects of meaning as denotative, the shared part, and connotative, the personal part [7]. The denotative portions of words constitute the communicative bridges that unite all of us through the common platform of our shared language. To better understand this point of view, the linguistic concept of idiolect and repertoire can be helpful: every person possesses a personal linguistic set, which interconnects with others' and altogether forms the language of a certain language community [8]. The concept of language community, though, does not have a strict definition, as it represents something that in real life is rather liquid. The personal language of an individual may possibly contain several different national languages and dialects, appropriately selected upon the context in which the interaction takes place. At times, elements from different languages happen to mix, in cases where interlocutors share more than one language. If we accept that languages are based on the people who speak them, from this particular point of view concepts such as 'national language' appear as less monolithic and defined than what we used to think. From this perspective, though, the new image that appears adheres more faithfully to empiric reality than the abstract concepts we used before. This approach is based on the acknowledgement of the bottom-up nature of the developmental dynamics of this complex information ecosystem we call language. It goes without saying that this approach also involves grammar, as the shared acceptance of the structural rules stands at the very base of the architecture of a common platform for the exchange of information.

2.1 A Smart Approach to Language

A smart city scenario is based on the centrality of the person considered in all her/his complexity, interconnected with others and with the context of his/her daily life through the mediation of technology. This same approach applied to language allows it to unveil all its potential. As Ong [9] notes, the more a technology becomes pervasive in our daily life, the more it becomes transparent. Language is probably the most transparent among the information technologies available to us, allowing us to shape our thoughts and our ideas, giving them life outside of our minds, and the ability to exchange and elaborate them socially with the rest of the community.

It is precisely through that intrinsic dualistic nature described in the previous paragraph that language becomes that powerful information infrastructure that allows us to communicate. This ties us all together: the portions of meaning we share with other speakers form the language network we all belong to. Every speaker represents a node in this great naturally interwoven and contextually-defined network.

According to the type of relationship that ties two people, the portion of meaning shared between them might broaden or shrink to a minimum; siblings would share a broader common portion of the representation of the word “mother” compared to a couple of strangers. By simply raising our eyes to the world around us it is possible to realize how, thanks to language, we are able to - and in fact we constantly do - “tag” everything around us, from objects to abstract concepts. Learning and speaking a foreign language, depending on the degree of fluency, enriches considerably the set of available tags. It also means to increase one's connections as a node, developing bridges with others' platforms, contributing to the complexity of the general, common one. A speaker of multiple languages, therefore, represents not only a node for every platform he/she belongs to, but also a connection between different platforms. If a language represents a point of view over the world, as a layer of augmented reality that contributes to the shaping of our perception, a speaker of multiple languages is granted access to as many different layers as the languages he/she speaks. Language augments our reality, allowing us to tag the world around us with names, concepts and narration.

This language network, which arises adopting a bottom-up approach, shows us things from a relatively unusual perspective: language is a social construct. It is a communicative platform whose constitutive elements are spread more or less evenly among its users; it is free and inclusive, as everyone can easily become part of the platform through language learning. Generally, we all imagine and expect language learning to be a long and complicated process. This is partially true, because it does indeed require time and effort. What is also true is that we could be doing it in a smarter way. Research on what we know about this process shows us that the system most of us are used to when it comes to language learning (a teacher, a book, a classroom) is not necessarily the most effective anymore [10]. If the formal part of language learning can be effectively delivered through the aforementioned system, there are important aspects regarding the development of full communicative competence that would greatly benefit from completely different context and support. One of the most effective means to develop such fundamental abilities, as second language acquisition (SLA) research shows and confirms with data [11] [12], is actually very accessible, as it doesn't require expensive structures or organization: it is, simply, informal meaningful interaction. Simple conversation, small talk, basic interaction among strangers, part of everybody's daily life, is extremely important for developing full communicative competence, but this aspect of language learning is usually not taken into consideration, mostly because it belongs to the informal sphere of daily life, complicated if not impossible to control and organize, due to the very intrinsic informal nature of its dynamics. This process cannot be directly elicited, controlled or organized, but a smart approach could, considering its importance, offer support, setting the groundwork for it to thrive.

2.2 Second Language Acquisition 2.0

If language by itself is featured by smart dynamics, the scenario of SLA is particularly apt to provide further examples of this perspective, as it considers the position of people who are building their own portion of a common interactive

platform. The building blocks for this platform are everywhere around the learner, who gains access to them through interaction with speakers of the language in question. These blocks are then reused in similar context, or used as examples and mixed with other blocks to build new structures. The analogy that comes to mind is the copying of a file, or even better, a portion of code exchanged among open source software developers, which allows that same portion of code to be reused in a different context, as it is or modified.

This point of view is based on the assumption that the learner operates in a second language scenario (the studied language is also the language of interaction outside of classroom, as in study abroad or in cases of immigration) juxtaposed to a foreign language scenario (the studied language is only spoken in class). The difference is given by the context in which one lives, with consequences on the quantity and quality of the linguistic stimuli on which to base one's learning. Nowadays, however, the Web has deeply modified this aspect of life, as contents and chances of interaction in any language are widely available, allowing anybody to be potentially exposed to any language context in ways that were not imaginable before. The Web and new technologies allow us to intervene and, at least partially, define the context in which we live, with no exception for language.

Nowadays a language learner is potentially surrounded by those language building blocks even when not living physically in a country where that language is spoken. Interaction happens through the Web, which becomes an interactive context defined by common interests: commenting over a chat about the last episode of our favorite TV series that we just watched streaming in its original language is a little different from having that conversation over the dinner table during a study abroad program, but one does not exclude the other, and the first is definitely more affordable, happening more and more commonly among younger generations.

Web 2.0 as an acquisitional scaffolding for the informal dynamics at the foundation of language learning has recently been an object of theoretical research and analysis, in order to provide solid grounds on which to base further developments, as the one suggested in this paper [13]. These developments would allow everyday outside-of-the-classroom experiences to become language material to include and integrate formal practices of institutional language learning, with such advantages as more effective results, better allocations of teaching resources, and other positive spillover effects this paper will analyze in the following paragraphs.

3 What Smart Cities Can Do for Language

Smart Cities are the result of the interconnection of citizens with places and things that are part of their daily lives. The constant flow of data and information that this interconnection generates is the basis on which to improve the quality of life of every citizen in a multitude of ways: sensors in cars or smartphones provide data about traffic [14], mobile connections and gps allow citizens to report problems with infrastructures or services [15]. A city that is smart from the language side should allow the language networks formed by its citizens to emerge, becoming tangible, visible and shareable. Language is already structurally prepared for this: all it needs is

the practical chance to develop in this direction. Smart cities and the technology on which they are based can finally offer this chance. Technology such as broadband mobile Internet connections, gps, and soon the Internet of Things (IoT) and Augmented Reality (AR) offer the possibility to represent our language network visually, projecting it on the world around us. Transporting our linguistic knowledge outside of us, relying also on the physical world to retain that information, opens the doors to a number of incredible applications based on language. The ones tied to language learning, although extremely fascinating, are only a part of them.

Imagine studying Italian, and being in Venice for a study abroad program, thirty years after your father did the same. His very own language "tags" would be spread all over the city. Should you choose to do so, you could integrate them within your own (choosing steps of his very learning path). Walking inside a café, you could be provided with the right expression to order a cappuccino, posted and shared as a learning reminder by your father, who had learned the same expression in the same context, maybe hearing it from another customer who used it. Now broaden the perspective, and imagine not only tags left by your father, but by anybody who had a chance to post them and make them public, filtered according to your individual and contextual needs. Language all around you, tangible and reachable to be acquired, reused, incorporated into your own learning path. Language already naturally follows these paths to expand as a communicative system. New technologies would only enhance and support those processes, overcoming temporal and social limits, focusing on the individual needs and providing this information on-demand. The physical context in which we live, in which interaction and language learning occurs, would be enriched with all the contextual information that could have publicly been shared by others before us. Language is already a public and social construct we learn through interaction: this technology simply makes it easier. As the invention of writing allowed strangers to exchange and pass on knowledge, overcoming oral tradition, we are now allowed a step further. The web is our new alphabet, and smart cities are our new writing support. As we don't need to personally know a scholar of the past to have access to his or her discoveries, now anybody in a language community is offered the opportunity to share a portion of language with everyone else. Smart cities are smart because they incorporate into themselves the value added by those who live in them. That value is often conveyed through language: providing easier access to language increases the value of a smart city as a whole.

4 What Language Can Do for Smart Cities

Smart Cities offer the opportunity to effectively raise awareness on the great resource and heritage represented by complex language networks that grow and thrive thanks to the great ethnic and cultural variety found in urban contexts. Smart cities represent a chance for the physical realization of the language network, which already exists but lacks representation, taken for granted and often only taken into consideration for its instrumental value, but not fully understood and acknowledged as the great common heritage it is. Raising awareness on these aspects of language would mean unveiling an abundant and shared resource, a byproduct of our urban

lifestyle which could also effectively support it in many ways, from sparking social innovation and reinvigorating the economy.

4.1 Open air-language campuses

In 1960 Marshall McLuhan imagined a classroom without walls [16], referring to the impact of mass media on the learning processes. The Web did not exist yet, but thanks to it, as far as language learning is concerned, McLuhan's metaphor could actually come to life very soon. Language is all over, spread among its speakers. For language learners in a second language scenario potentially every experience in everyday life represents a moment of learning and practice. The object of their learning is all around them, and the building blocks of the skills they are developing are used by all the native speakers around them. The form these language building blocks take, though, is often too complicated to grasp, flying too fast all around them. Acknowledging language as a resource would allow those elements to be framed within an accessible and reusable format. This could be obtained in many ways, through technology that is already widely available. These elements could be the by-product of an activity that could either be entertaining or useful, or both, for speakers; after all, language is used constantly. Every word or expression "framed" and "shared" by a user would be available to anybody on-demand, transforming informal everyday interactions in a huge, constantly-updated, contextualized and available-on-demand database of traceable and therefore recognized learning situations. After all, everyday situations enacted within the chapters of language books, such as ordering food in a restaurant or going shopping, are simply the framing of those linguistic elements in a format which is more easily managed by learners, with the instruments that were available and economically sustainable so far. Language classrooms were the "sandboxes" in which to try out linguistic tools and elements before facing real life. Often, though, the price to pay was lack of realism and variety. Real life is much messier to deal with, and part of the skills required to a speaker is being able to deal with that chaotic environment. Technology now allows us to transform our everyday environments in language texts; every speaker could provide useful language elements which would be framed for future reference or reutilization, by us or by others. Elements which are the most used could be selected to represent general points of reference, but at the same time everyone would be allowed to build his or her own reference grammar. In the end, it is exactly what a language learner does while developing what in SLA research is known as interlanguage [17], but with less difficulties whenever trying to share with someone else what had been internalized as competence. Language learning would become more of a peer to peer activity: while supporting our own learning, it would become potential learning material for those after us, and so on.

Moreover, this could be true not only for the language spoken by the main linguistic community, but also for languages spoken by linguistic minorities, such as the ones represented by immigrants.

4.2 Fostering Social Innovation and Inclusion

Linguistic minorities that live in our cities today represent an important linguistic resource that has not been properly acknowledged. These people are required to learn the language spoken by the main community, while their linguistic heritage is pushed to the side, used to maintain relationships within their community, but mostly ignored by other citizens. The language networks of multilingual cities are structured on many levels, and reach a level of complexity which represent an extremely rich resource for the whole community, if properly acknowledged and given an accessible format. A smart city would potentially represent an open-air language campus for every language spoken by its citizens. The same places, the same objects have as many names and retain as many expressions as the languages that are spoken around them. In a smart city, these languages become visual layers available to everybody. Giving language a more tangible form would support the inclusion of immigrants, offering them tools to acquire the linguistic instruments they need to integrate within the main linguistic community simply through interactions, already part of their everyday life. Interaction itself, at the base of this kind of learning, would acquire a more important status, as it would more evidently represent a moment of potential reciprocal growth and advantage. At the same time, these tools would help change the perspective towards the linguistic background of minorities, transforming it from an obstacle to a valuable and shareable resource.

Language is inclusive, as everybody can learn it and become part of a linguistic community, representing a positive aspect on which to base a common identity. Such an identity is based on what is shared by all members through the fuzzy borders of language. These fuzzy borders represent the complex identity of our own and others'. Acknowledging this complexity allows society as a whole to take a step forward towards respect and understanding of others, concentrating on the overlapping aspects that we share rather than on the differences.

Finally, learning a second language is an important process which allows the learner to see the world from someone else's point of view, fostering open-minded attitudes and supporting openness to dialogue. Often, especially in the early stages of language learning, the will to communicate is stronger than the linguistic capabilities, available vocabulary and grammar, leading to the recombining of available structures to express one's mind, supporting the development of creative problem-solving strategies.

4.3 Economic impact

The economic impact of these dynamics could be very vast, even if mostly of an indirect nature. Language is at the base of communication, so potentially anything that could benefit from improvements in communication would be involved. An apparently contradictory but extremely interesting aspect that such an evolution would determine is the revaluation of the physical world in which interaction happens, even if supported and based on an intangible tool such as the Web. The contradiction is only apparent, as the Web, just like language, is indeed and intangible platform we use to communicate, but the object of that communication is for the most

part grounded in the interactions of our daily lives, and therefore in the environment in which those interactions happen. Research has already demonstrated how the development of social networks on the Web follow, at least in the beginning, a physical and geographical pattern of proximity [18]. It is possible to hypothesize that since language is a social network, it might follow the same developmental path. Moreover, being the denotative meaning of words the link between language and the world around us, the connection seems even tighter. Language represents an economic resource that so far has only been partially put to use. It is a renewable resource which can support sustainable development even in locations which otherwise wouldn't have other economical vocations. All it needs is the presence of speakers and the will to interact with learners.

Language learning altogether already represents an important economic resource for many locations. These advantages could now be enhanced where already present and enlarged to new areas and sectors. To start presenting some examples, commerce could benefit from it by providing, together with goods, linguistic support. Shopkeepers willing to interact with their learning customers could see their kindness and open approach rewarded with more business and improved customer retention. Reputation on the Web is a key factor, and services such as Tripadvisor [19] demonstrate how this can be applicable not only on on-line forums but to physical contexts as well. A system like the one just described would also help optimize the efforts, as linguistic elements that demonstrate to be the most useful could easily be reused and shared again, further improving the business opportunities.

Tourism as well could benefit from the emerging of the language network, as interested travelers could be provided with efficient, on-demand and context-based linguistic instruments to use during their stay. At the same time, this service could represent an initial approach to the study of a language, with the positive consequences that this interests carries in the middle and long term from an economic perspective.

4 Conclusion

Smart cities represent an important opportunity of improvement of the quality of life of the vast majority of citizens, heading towards a more sustainable future. A smart approach to life adopts bottom-up dynamics and uses network effects to maximize collective results starting from small individual efforts. This scenario appears particularly meaningful when applied to language, as the basic elements needed to implement it are already intrinsic to this fundamental feature of human life. The right approach and the adoption of technologies that are already widely available (while waiting for their imminent steps forwards) would allow cities to provide their communities with means to improve their own quality of life starting from a resource with which everybody is familiar, is evenly widespread among population, can be easily and effectively obtained simply through interaction and is renewable and sustainable. There are many positive outcomes that could derive from these relatively simple and inexpensive measures: improved social dynamics through acknowledgement of mutual interconnection; better supported inclusion of

immigrants within the local socio-economic tissue through help in acquiring the local language, while acknowledging the active contribution to the common heritage that their cultural and linguistic background represents; finally, widespread support to a sustainable economic growth based on human relationships.

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