

Virtualization of Research in Terminology. Cloud-based Terminology Management Tools

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Abstract: Developing our previous research in the field, the present paper approaches the evolution of IT and terminology software. It explores the concepts of virtualization and cloud-based computing and its influence in the virtualization of terminology and development of cloud-based terminology management tools. The goal of our paper is to provide actualized information about the existing cloud-based terminology tools and about similar ongoing projects for experts, professors and students.

Keywords: cloud-based computing, terminology as a service, cloud-based terminology management tools, CAT tools, terminology training.

1. Introduction

The impact of IT development in terminology work is a well-documented topic since the very beginning of terminological studies. Many scholars such as Cabré (1998), Pavel&Nolet (2001), and Schmitz (1978-2012) have theorized about the link between technology advances and terminology work. The authors emphasize the importance of different IT tools in terminology and eventually underline the interaction between computer science and terminology.

With the continuous development of IT technology, the terminology methods and workflow tend to improve and change constantly. Therefore the terminologist, as an expert in the domain, should be aware of the latest IT developments applied to terminology. The rapid changes in technology world make this task very difficult for

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the expert, who has to keep up to date with the context of his/her activity and acquire the necessary new skills and competences to be applied to terminology work.

Over the last decades terminology had to adapt to rather innovative technologies which impacted its methodology of research and determined changes in its workflow. As computer technology continues to evolve at a fast pace its impact on terminology continues. Innovations such as *Web 2.0*, *Web 3.0*, *cloud-based computing* and *access virtualization* are some of the new trends that will shape new ways to manage terminology in the future.

The present article will discuss some of the major terminology management tools developed under the influence of the *cloud-based computing* concept. Developing previous research in the field (Ciobanu&Varga 2010; Varga 2011) we will present an updated review of effective tools to be employed for educational and professional purpose. In our presentation we will emphasize the last trend in the terminology development: *cloud-based terminology*.

The main objective of the current paper is to call the attention of the students, professors, and researchers in the field on the new terminological tools existing on the web and on the new opportunities they open up.

The article is also intended to raise awareness of good practice in terminology management and to help terminologists, translators, and students to achieve competence and to increase their level of expertise in the field.

2. IT impact on Terminology

Ever since the beginning of terminology research scholars have described it as an interdisciplinary domain and found that information technologies plays an important role in its development (Wüster, 1959 and 1981).

The relationship between information technologies and terminology is analyzed from two main perspectives: a first approach presents IT and terminology in continuous evolution and interaction (Cabr ,1998: 25-56, 160-161) while the second approach reduces the importance of IT to a set of tools the terminologist use in their work (Pavel&Nolet: 2001, 61-84).

Teresa Cabr  states that IT and terminology interact with one another and take advantage of the latest advances in both domains. According to the author, terminologists use the computer and information technologies in their research and IT uses the results of terminological research, such as dictionaries, glossaries, and terminologies in specialized communication between experts. Teresa Cabr  (1998:

160) presents this interactive relationship between IT and terminology from a diachronic perspective and distinguishes four stages of its evolution.

A first stage of the impact of IT technologies in terminology is represented by the use in terminology of very simple computer programs such as word processors, spellers, and hyphenation programs. The second stage of evolution involves more complex desktop applications such as databases, electronic dictionaries, and CAT tools. The next evolution stage described by the author mentions the use in terminology work of NLP applications such as lemmatizers, concordancers and statistical analysis software. In the description of the last evolution stage is stated the use of the expert systems, algorithms, and AI methods in specialized language analysis (Cabré 1998: 161). The terminologists are assisted in their work by “intelligent” tools such as term extraction software, automatic index systems, and automatic text generators.

A different interdisciplinary approach on IT use in terminology (Pavel&Nolet: 2001, 61-84) limits its role to a simple set of tools the terminologist has to use in different moments of terminological workflow. The authors mention only categories and subcategories of software used in terminology such as *documentary search tools*, *term extraction tools*, *terminology research tools*, *data recording tools*, *electronic-publishing tools*, and *database management tools*. The authors also mention 22 subcategories of software to be used in terminological research.

These approaches are not singular; other scholars studied the impact of IT on terminology from different perspectives. We purposely emphasize the importance of both approaches in terminology studies because we think they offer the theoretical framework necessary to analyze the present state of the art of this interdisciplinary aspect of terminology studies.

3. Virtualization of Research in Terminology

Even though the two approaches mentioned in the previous section describe accurately the interdisciplinary relation between IT and terminology they are too general and they refer to outdated technologies. During the last decade different authors pointed out important features of how modern concepts such as *Web 2.0*, *Web 3.0* (Ciobanu&Varga: 2010), cyber-terminology, virtual reality (Schmitz: 2011), *e-learning* (Cabré&Montané: 2010, Schmitz& Dressler&Raupach: 2011; Cabré&Estopá: 2012), *cloud-based terminology* (Varga: 2012) and *serious games* (Ciobanu: 2010) have been applied to terminology work. In our opinion these studies

illustrate a new stage of evolution of terminology namely the *virtualization of terminology*.

During the last years, one of the major trends in computer technologies is the topic of *virtualization*. Nowadays it became a buzzword applied to many different technologies such as storage, services, communications, access, networks, and servers. While it is used on a regular basis in specialized communication, tech forums, and virtual communities, for many users this concept seems to be unclear, especially because of its multiple meanings. For this reason, many scholars regard the disambiguation of this term as an issue of primary importance and discuss it in very many books, articles, blogs, and forums.

Considering this situation, in the present section we will try to identify which of the many meanings of *virtualization* apply to terminology studies and how this concept is understood in this field.

Virtualization, as a term in computing is defined as "... a way to abstract applications and their underlying components away from the hardware supporting them and present a logical or virtual view of these resources" (Kusnetzky 2011: 1). Intended to revolutionize high-performance computing, *virtualization* offers a series of advantages for the users and enterprises such as "higher levels of performance, scalability, reliability/availability, agility, or to create a unified security and management domain" (Kusnetzky 2011: 1).

The term has today spread in very different domains and it is highly polysemous. In his book, *Virtualization, A Manager's Guide*, Dan Kusnetzky describes a model of *virtualization*, distinguishes five major aspects of this concept and outlines them clearly. The aspects of *virtualization* the author takes into account are: *access virtualization*, *application virtualization*, *network virtualization*, and *storage virtualization*. This list of terms is not exhaustive; other such terms circulate in cyberspace including *service virtualization*, *platform virtualization*, *desktop virtualization*, and so on.

For the time being, Google cannot find any occurrence of "virtualization of terminology" but the process of virtualization in terminology research is observable by the experts. In our opinion, the virtualization of terminology is the new stage of development of the terminology under the impact of the computer technologies. The term refers to the process through which this discipline takes advantage of the techniques, methods or approaches of the virtualization in computing and implements them for its specific purposes.

The *virtualization of terminology* appears under the impact of the generalization of this technology and is materialized in the field through the use of

new terminology management tools resulting from their implementation. For terminologists, the most obvious indices of the virtualization come from the area of *service virtualization*, *access virtualization* and *storage virtualization* in terminology tools. These aspects, visible even to the non-expert end-users, transform the way the terminologists interact with their tools and offer many different advantages for the terminology work. Under these circumstances, virtualization is correlated with another buzzword of technologies world namely the *cloud-computing*. The infrastructure relation with the cloud-computing is explained in Campanella et al. as follows:

“The generic term “clouds” is a rapidly developing paradigm shift. It is often associated to “computing” and refers to a set of “services” of type application (e.g. Google apps), platform (e.g. Windows Azure) and infrastructure (e.g. Amazon EC2). These services are offered through Internet with a simple user interface and leverage virtualization technologies.” (Campanella et al. 2010: 71-72).

The use of the new virtual infrastructure and the principles of cloud-computing continue to develop the previous stages of evolution of terminology tools. These advances allow for the improvement of the tools created under the umbrella of Web 2.0. concerning the operational efficiencies in processing big amount of data, the efficiency and performance of IT resources and applications, reduction of expenses, increased mobility, better control and protection of the applications and data, and so on.

In conclusion, the virtualization of terminology describes the new set of integrated solutions using cloud-based terminology tools allowing terminologists to work in an interactive and collaborative environment which facilitates real-time communication and collective classification of data, easy access to the information from anywhere and with almost any electronic device, continuous evaluation, update, and revision of processed data. These tools open new perspective in the further development of the terminology tools to the implementation of *terminology as a service (TaaS)*.

4. Cloud-based Terminology Management Tools

During the last years terminology management tools has evolved from the simple interactive online databases to more complex collaborative tools. Nowadays different terminology management solutions are offered to professionals, researchers, experts, and students in the field. In this section of our paper we propose to present a

set of terminology management tools that illustrate the process of virtualization in terminology research and help terminologists to enhance the quality of their work.

In what follows, we present some of the tools that become the agents of the changes in terminology work. They were chosen following three criteria: cloud-based terminology management, collaborative work, compatibility with other tools. We distinguish between different categories of terminology management tools as follows: *open social networks*, *educational tools*, and *commercial solutions*.

4.1. Open online communities

One of the first important online communities involved in collaborative lexicographic and terminological work is *Wiktionary* (www.wiktionary.org). *Wiktionary* as a tool in terminology management tool is suited for class work with beginner students who can learn the basics of collaborative work, can observe and practice different aspect of terminology workflow such as: design and implementation of terminological records, term validation and revision in a virtual environment. The students can also get access to different types of lexicographic texts such as *standard dictionary*, *thesaurus*, *rhyme guide*, *phrase book*, and *language statistics* and they can work with complex descriptions of a lexical/terminological unit including *definition*, *etymology*, *pronunciation*, *synonymy*, and *equivalents*. The importance of *Wiktionary* is also related with very modern concepts of GNU, free licensing and Creative Commons License, very important aspects for the students that begin their training as future terminologists. Easy to use and access, displaying multilingual information *Wiktionary* is a good tool to start with.

Recently created but more focused on terminology work, *Termwiki* (www.termwiki.com) is another social network offering a complete set of online terminology management tools and solutions for the open communities and for commercial purposes. The goal of *Termwiki* is to create a social network of terminologists and to offer a space to create, share and discuss terminology issues. Each member of the community has access to a public space and can contribute to the public terminology ongoing projects and has an individual space where he/she can develop his/her own projects. A strong aspect of *Termwiki* is represented by the complex term record form including *main term*, *equivalents*, *definition*, *part of speech*, *synonyms*, *domain*, *sub-domain*, *product/producer* which allows terminologist to create complex glossaries. *Termwiki* terminology tools allow the user to create multimedia glossaries too because they support image and sound files. Each

terminological record is completed with information about the date and the user who introduced the record and the date and the user who did the last actualization. The final display of *Termwiki* glossaries is that of a glossary of equivalents in multiple languages.

Termwiki workspace is connected to a social space which allows the collaborative work and the communication between the members of the community through forums and discussion groups. The members of *Termwiki* community can ask for information in terminology and can also answer to other member questions. Each user is rated in function of his/her activity in the social network, the number of terms inserted in *Termwiki* glossaries and the number of translated units. The glossaries the user created in *Termwiki* can be shared publicly or only with a selected group of users. *Termwiki* allows also the users to export their glossaries as csv and xml files. *Termwiki* offers terminology management solutions for professionals and enterprises as a commercial terminology service under the names *TermWikiPro* and *TermWikiEnterprise*.

In our opinion, *Termwiki* is a complex cloud-based terminology management tool, a good solution for professionals and enterprises and an excellent training ground for students. It is also a successful online open community of terminologists outstanding activity consists of glossaries in 102 languages, classified in 1 716 categories, and comprising 5 610 207 terms¹.

The open online communities specialized in terminology are important sources for gathering multilingual information in an existing domain. They are important resources for students, translators and even experts who can learn and share their knowledge.

4.2. Cloud-based educational terminology tools

Since teaching terminology and specialized communication is nowadays an important topic, cloud-based terminology tools are also integrated in e-learning platforms. Such is the case of *Terminus* (<http://terminus.upf.edu>), a terminology training platform created by *Institut de Lingüística Aplicada* (IULA) and used for training students at University Pompeu Fabra in Barcelona.

Created as a support for a distance learning master degree in terminology, the platform has limited access for outside users. Nevertheless a demo version can be accessed and used by terminologists, translators and students. The advantages and innovations offered by the platform are largely described in many different articles

and conference presentations by the members of the research team who created *Terminium* (Cabré&Estopa: 2012; Montané&Nazar&Reus: 2010).

Terminus was designed like a terminology workstation and offers its users a complete set of terminological tools which assist the terminologist during each stage of the terminological workflow: *projects, sources, conceptual trees, documents, corpus, analysis, glossaries, and terms*. These modules of *Terminus* allow the terminologist to import and organize his/her data online, to work with multiple corpora and glossaries, and to save all information in different formats in order to be published online or downloaded by the terminologist.

A strong point of this terminological platform is the interactive tool which allows the user to organize the information of a specialized domain as a conceptual tree directly online. This conceptual tree tool was integrated only in *Terminus* and it individualizes this platform among others cloud-based terminology management tools existing on the market.

It counts also with a complex terminological record allowing terminologists to describe in detail the data they enter in glossaries. Some of the most important term descriptors of its terminological record are: *lemma, part of speech, term source, context, definition, collocations, and comments*. This complex structure makes *Terminus* suitable for terminological research and glossaries creation.

Since it was designed as an e-learning platform for terminology and not as a terminology management tool for professional purposes, *Terminus* presents some limitations too. It is *interactive* and *virtualized* since all data are stored and manipulated online through different electronic devices such as computers, tablets, and smartphones. These features make *Terminus* a modern terminology tool. On the other hand, *Terminus* lacks of some of the most important Web2.0 features: it doesn't support instant communication between users and has no collaborative work tools. Despite these limitations, *Terminus* is an excellent educational tool for online terminology management.

4.3. International projects promoting cloud-based terminology

Cloud-based terminology is also promoted through international projects and research networks with remarkable results such as *EuroTermBank (ETB)* and *Linked Heritage*. These online management tools are the result of the implementation of virtualization in terminology. They offer free access to data and large collections of multilingual glossaries created by online communities of terminologists and

translators. They also represent a reasonable solution for the translators and students who need to organize multilingual knowledge they work with.

EuroTermBank (www.eurotermbank.com) is structured as a terminology portal which offers free online terminology resources. It allows users to search specialized terms in 33 languages in a collection of more than two million terms. The most important feature of ETB is that the portal allows registered users to create, explore and manage private terminology. In the section “My ETB” each user can create his/her glossaries based on complex terminological records and share his/her data with other users. The system is actualized in real-time so all the users involved in the development of a glossary can see the modifications applied to the glossary.

EuroTermBank is very easy to use for collaborative terminology projects because it supports groups of users who can share and edit the same information. All data are stored online and can be accessed from any electronic device connected to Internet. The terms are grouped in *Term Collections* and each term entered in the database is described following the same terminology record consisting of the following descriptors: *term, language, part of speech, gender, context, definition, source, domain, geographical usage, and status*. Built as a professional terminology management tool, ETB allows the user to introduce equivalents for the main term of each entry (see *add new target term*).

Completely interactive and virtualized ETB is a very useful terminology management tool. Nevertheless, one of the limitations of ETB is that the system is not fully compatible with the principles of Web 2.0. There is no communication tool incorporated in the portal and the members of a terminology project have to use other simultaneous communication tools. Also, the project management has to be very accurate because in ETB the user has no double entries control.

A different concept of the use of terminology is proposed by *Linked Heritage* (<http://www.culture-terminology.org>), a UE funded project providing powerful terminology tools under the Creative Commons License. Based on the principles of the Semantic Web, the Web 3.0, *Linked Heritage* provides to its users a terminology management platform which allows the users to map knowledge, establish hierarchical and associative relations between concepts. The basic idea behind the concept is the possibility to create complex mappings of related concepts. *Linked Heritage* allows creating many different linguistic resources such as *thesaurus, glossaries, terminologies, and ontologies*. All these resources can be linked in relation with their semantic proximity.

The main achievement of the project consists of a terminology management tool that allows the registered users to *search*, *create*, and *link* terminologies. The platform allows two types of searching: *search in public terminologies* and *search in user's terminologies*. For now, the platform offers 48 multilingual public terminologies in different stages of development.

The registered users can add content in order to improve and expand the existing resources of the platform in the section *Create new terminologies*. This section allows the user to add new content or to import existing terminologies. The new added content may be described through a series of descriptors in order to enter in complex semantic classifications. A complex record form consisting of descriptors such as : *title*, *alternative title*, *subject*, *languages*, *edition*, *creator*, *publisher*, *rights*, *description*, *creation date*, *date of issue*, *contributor*, *identifier*, *source*, and *amount of concept* has to be filled by the user in order to import/create terminology. Only after describing the terminology, the user can enter the term records.

The internal structure of the term record consists of linguistic and conceptual information. The linguistic information consists of complex descriptors classified into two categories *labels* and *documentary notes*. The record *labels* consist of three elements: *preferred label*, *alternative label* and *hidden label*. The linguistic information is completed by *documentary notes* consisting of the following descriptors: *scope note*, *definition*, *history note*, *editorial note*, and *change note*.

Complex, Web 2.0 and Web 3.0 oriented, *Linked Heritage* is a solution for cultural institutions which want to give online access to their digitized collections. The terminology management platform is designed to be compliant with Web 2.0. and responds to the necessities of museums and cultural institutions.

These two cloud-based systems are only a part of the research projects on the subject of terminology funded by UE. They are the most representative examples of terminology management systems implemented on the bases of the cloud computing concepts and illustrate that these principles of design are generally adopted in terminology development.

4.4. Commercial solutions

On the market of translations, terminology management is considered as a very important aspect. Consequently, multinational companies involved in translation activities were interested in developing cloud computing applications because of the advantages these new technology brings to the business sector. Therefore, some of the

early terminology management tools based on cloud-computing strategy were commercial applications intended to improve the effectiveness of corporative business on translation market.

An illustrative example of commercial cloud-based terminology tool is *Evoterm* (www.evoterm.net), a software designed to meet companies needs in terminology. It was created for the companies dealing on a regular basis with multilingual specialized information, companies that lack of an in-house translation department and can't afford the costs of the development of their in-house terminological databases. Those companies, can access *Evoterm* services and create, modify, and export their glossaries, consult existing terminologies or even ask for terminological materials adapted to their needs.

Therefore, *Evoterm* is a specialized cloud-computing terminology tool that can be accessed initially as a demo version so the eventual customers can evaluate the diversity and the quality of its services. One of the services it offers consists of the possibility to compile a customized terminology on a concrete domain "from scratch" using the existing *Evoterm* terminological databases. The customer can buy complete or partial access to *Evoterm* terminologies and use them for his/her needs or the customer can obtain a customized terminology on demand. These cloud-based services are very effective because the company obtains rapidly a fully functional terminological product they can exploit immediately without any additional costs such as human resources, maintenance, and technical infrastructure. Multiple users can consult the terminologies simultaneously from any location and on any web connected device (smartphone, PDA, tablet, computer, netbook, notebook etc.) which confers a huge advantage to this product. *Evoterm* assures that the customer's data is safe and really protected against disasters.

Another service available on *Evoterm* webpage consists of a cloud-based terminology management system. The customers can access in the cloud different terminology tools allowing them to create and manage their own terminological databases. The tool provided by *Evoterm* allows the customer to select the type of terminological resource he/she wants to create (i.e. list of terms, glossary, terminology, ontology, and thesaurus) by selecting the complexity of term record and the number of languages the linguistic resource will be designed for. The system offers linguistic support for 22 languages, image support for term records, and includes data import and export options.

Evoterm is a complete cloud-computing terminology solution. It exists only online, all services, data, and resources are available online on subscription. The

customers can select a permanent subscription or a temporary one, in function of the linguistic needs of each company.

The system is not designed for terminological research and from this perspective can present some limitations but it is fully adapted to the companies needs on the market. The system could be improved by developing aspects of collaborative work online such as including Web 2.0 communication features in the platform.

Another commercial cloud-based terminology system is *Termweb* (<http://www.interverbumtech.com/>) launched on the market by Interverbum Tech. It consists of two main services: one cloud-based terminology management tool (*Termweb*) and a complex set of marked oriented glossaries (*Termcentral*) in a variety of languages. As commercial tool, *Termweb* can be evaluated in a demo version that allows the eventual customer to observe its features.

Termweb is a reliable cloud-based system working on almost all OS and allows users to create many terminological resources such as lists of terms, vocabularies, glossaries etc. The strong point of *Termweb* consists in its compatibility with other translation platforms which makes it suitable for use as a terminology resource in translation projects. For customers such as multinational corporations *Termweb* may be good solution since it integrates well with translation software such as SDL Trados, MsOffice, AdobeInDesign, QuarkXPress, Acrolinx, and Ontram. The terminology students also may consider this system as one to be included in their list of terminology tools to learn about in order to improve their competences.

Termweb offers a flexible configurable database structure allowing the user to create complex term records creating, in conformity with their needs, unlimited data fields and language presentations. *Termweb* accepts complex term records consisting of text descriptors, audio, graphic files and external documents and hyperlinks, which allows the customer to create elaborated multimedia glossaries. Each entry is verified before uploaded in a glossary in order to avoid double entries and eventual errors.

There are also other commercial cloud-based terminology management tools available on the market, such as *Terminology Management* from *Acrolinx* (<http://www.acrolinx.com>) but since they don't have a demo version we weren't able to evaluate the features of the platform.

The presence of so many commercial cloud-based terminology management platforms illustrates the new trend in terminology management tools and confirms that they are an efficient solution for the companies.

4.5. Further developments of cloud-computing in terminology

Cloud-computing model continue to be considered as an effective design for terminology management tools and it is implemented in many under construction platforms. Some of the ongoing projects developing such tools are *Taas*, a UE funded project and *ABBYY Lingvo pro*, a commercial project.

Terminology as a Service is a UE funded project coordinated by *Tilde* (<http://www.tilde.com/>) in collaboration with European universities and other companies. For now, the terminology platform is under construction and the only information we have on the project consists of the publications and the conference presentations the members of the consortium presented as dissemination of the project.

As the authors state, *TaaS* project is intended to offer instant access to actualized terms, involve the internet users and motivate them to participate in the creation, actualization and sharing of multilingual terminology. The cloud-based platform *TaaS* proposes to implement different online terminology services such as: automatic extraction of monolingual term candidates, automatic recognition of translation equivalents, automatic acquisition of translation equivalents, facilities for cleaning up, and facilities for sharing and reusing terminology. More information can be obtained on the webpage of the project <http://www.taas-project.eu>. Once released, the platform will impact in multiple terminology and translation domains such as CAT tools, MT systems, and QA in translation.

ABBYY Live pro (<http://www.lingvo.pro>) is a project promoted by ABBYY Language Services, an important research center in linguistics and software development. The cloud-based terminology management system they created can be accessed as beta version until the end of 2013 after previous registration as beta user. Easy to access and with an intuitive user interface, *Lingvo pro* is intended to be a commercial cloud-based terminology platform which centralizes and facilitates the sharing of linguistic assets. The platform is designed to manage and store glossaries, dictionaries, and translation memories. Its creators state the platform is secure and reliable since the system keeps customers resources in a separate secure cloud. On demand, the customers can have their data stored in a private cloud.

Some of the most important features of this commercial tool seem to be the capacity to handle rapidly large amount of terms in a large number of languages. *Lingvo pro* presents a very flexible structure, which allows the user to create and

share customizable glossaries. All glossaries can be exported/imported in a large number of formats and can be integrated with existing CAT tools.

Both of the cloud-based terminology tools presented in this section are still work in progress and their features are promising. The future will tell whether they will be able to find their place on translation/terminology market.

5. Conclusions

As a conclusion, we think we demonstrated that terminology is always in contact with new trends in computing and networking and it is influenced by the discoveries in this domain. Now the buzzword is cloud-computing and we also have *cloud-based terminology* and *terminology as a service* as the last trend in terminology research. This new trend influences the way the terminologists, translators, and interpreters work and it is important to raise the awareness of the professors and the students in the field in order to motivate them to learn and use the new features of the terminology management tools and make more efficient their work optimize their work.

As we have seen, the training of a terminologist has to take into account many different categories of terminology management tools: open online communities, e-learning platforms, commercial tools, and free tools. Not all of them will be used in the same context, sometimes an expert in terminology may use a free tool or a commercial tool depending on the final goal of the task he has to accomplish. Therefore the expert, the professor, and the student in the field of terminology may constantly observe the development of electronic tools in order to keep their proficiencies up to date and in order to make always the appropriate choice of methods and tools.

Finally, we also can observe that terminology work and research is not an individual task anymore but it is regularly perceived as a part of a more complex project and terminology management tools include now Web 2.0 features that allow multiple users to explore possibilities for collaborative work.

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