Organizational E-Learning to promote integration of multi source cadastral data based on common ontologies

Ezzatollah Mohammadi (MSc), Walter de Vries (MSc),
Ali Mansourian PhD (SDI & GIS) and Afshin Mahboobi (MSc)

ABSTRACT

The Title Deeds and Properties Registration Organization (ITDPRO) in Iran was established in the early 1940s and Cadastral Organization in Iran was established 2 decades ago. All ownership deeds of the country are issued in a traditional textual form, and in this description, there is no direct mention of the coordinates indicating the corners of the land, nor is there a map attached. The result is that it is difficult to find the location of parcels of land which is causing many claims and disputes related to the real estate. In other words, the management of land and property in Iran is currently costing a lot of time and effort.

In addition to that, there is an insufficient number of staff to deal with the problems arising from this situation. The ITDPRO is managed in a traditional way, whereby experts of the ITDPRO are relying on traditional technologies. In contrast, the Cadastral Organization of the country is utilizing modernized technology and young specialists in the field of surveying, geodesy, GIS, and Computer Engineering, who were assigned to reform and reorganize the present situation of properties of the country. This duality is resulting in disagreement on the concepts used among ITDPRO and the Cadastral Organization. The main factors of disagreement of concepts and semantics are differences between advanced technology and old techniques in measuring the parcels and defining the boundary of parcels. A parcel which is placed near a river is defined in many types; connected, limited, or adjacent to the river. The concepts in the past and present can be linked and compatible using ontology. Ontology language helps to match both old techniques and advanced technology in ITDPRO and Cadastral Organization.

This disagreement and promotion of common ontologies could potentially be solved through appropriate distance learning, based on internet c.q. e-services. This article derives such services, based on a data model that deals with heterogeneous and multi source datasets. This was developed through a series of steps. With this model and software employees and experts of ITDPRO may use current Cadastral digital maps at each Cadastral department in each province. Local organizations may thus learn using Internet network in the center of the provinces and will send copies of their findings to the State Cadastral Center. This method allows getting the experts of ITDPRO as target groups to incorporate the modern technology gradually and to cooperate with the Cadastral Organization. Early pilots with the software package are showing that it encourages the experts of ITDPRO to absorb the advanced technology.

KEY WORDS:

Integration, Cadastral models, Survey technology, organizational E-learning Technology, Ontology Language

INTRODUCTION

In Iran there are two organizations that deal with Cadastral registration. The Title Deeds and Properties Registration Organization (ITDPRO) in Iran was established in the early 1940s and Cadastral Organization in Iran was established in the 80s. The former organization issues ownership deeds. This is done in a traditional textual form, whereby there is no direct mention of the coordinates. As there is no clear land marks indicated geometrically, it makes their information difficult to connect to any other maps or geo-databases. The title deeds are issued in the country based on the method of writing the four dimensions (sides of the property perimeter) and its area without giving the property coordinates of the corners.

There is no title deed having site plan of the property. A general plan would be prepared for many pieces of lands and then in the same plan such pieces are subdivided into smaller pieces. Plans are not drawn in a single and similar scale and on the same coordination system. For this reason in mosaic arrangement of the pieces beside each other we face the parts interference problem. Such interferences and conflicts would result in properties disputes and finally property claims by legal courts. In such cases the judges refer the dispute to Official Experts of the Justice Administration and in many cases the disputes remain unsolvable.

Traditional registration experts have proceeded to prepare plans based on what could be considered old techniques, whereby the precision of the drawings may be considered imprecise. Because of the limited historical use of any digital technology, they are not equipped to use digital maps prepared by external engineering companies. This has created a conflict of technologies, and has made current maps and ownership descriptions useless and nonconforming to the issued title deeds. The result is that the only valid and legal documents are to rely on the old maps, which are used to assess the legitimacy of claims during property disputes. It is however clear that there is incompatibility of old maps prepared by former organizations and the new maps resulting from the modern technology. The practical result is that it is difficult to find the location of parcels of land which is causing many claims and disputes related to the real estate. In other words, the management of land and property in Iran is currently costing a lot of time and effort.

In addition to that, there is internal opposition in the organization to fully adopting modern technology. This could be contributed to traditional beliefs and conservatism with regards to historical and unchanged job descriptions. With the establishment of Cadastral Organization,

the preparation of digital maps has however commenced with the use of all modern and advanced possibilities, including digital photogrammetry, remote sensing, as well as modern survey equipment, such as using GPS and Total Stations. Traditional experts from ITDPRO who have traditionally followed their own procedures and methods, and who had never been faced with any competitors, now see in the new organizations competitors arising for their expertise, who are equipped with state-of-the-art technologies. Still ITDPRO appears reluctant to accept the new technologies and showed no interest in leaving the old and low-precision techniques, and are currently still maintaining the property deeds issued by the same traditional methods.

To overcome this difficulty, in this article we put forward the main steps in the development of electronic learning and distance education to support organizational change and the learning in the cadastral domain. The learning is targeted to the government organizations that deal with land registration whereby we focused on a certain group, namely the staff and experts of ITDPRO. First we'll show how distance and e-learning could support organizational learning, and then we provide how we developed an appropriate cadastral model and related software for this, and how this was tested. We end by a number of conclusions and recommendations.

THE POTENTIAL OF DISTANCE AND E-LEARNING:

One of the biggest problems when integrating cadastral processes in Iran is the wideness of the country and the diversity of organizations. Yet, electronic and distance education ability is found in big, small and remote cities of Iran. The subject of distance education may highly useful in big cities like Tehran, Esfahan, Shiraz, and Mashhad for traffic problems and polluted air and in turn for transportation and treatment expenses and may bring significant expenses and time saving. For example, a student living in Karaj who studies in one of Tehran universities spends 5 hours in average to go to the university and return his home. This multiple fatigue which is something beyond that of studying and research, requires much time to take a rest and energy regain. Through a simple calculation, considering 5 hours per day for transportation (hereinafter referred to as trip) and five trips per week, he/she would lost 100 hours per month and 1200 hours per year, that is 100 days. This is a very much time during which many important jobs may be done. Figure 1 shows obstacles and barriers of traditional learning.

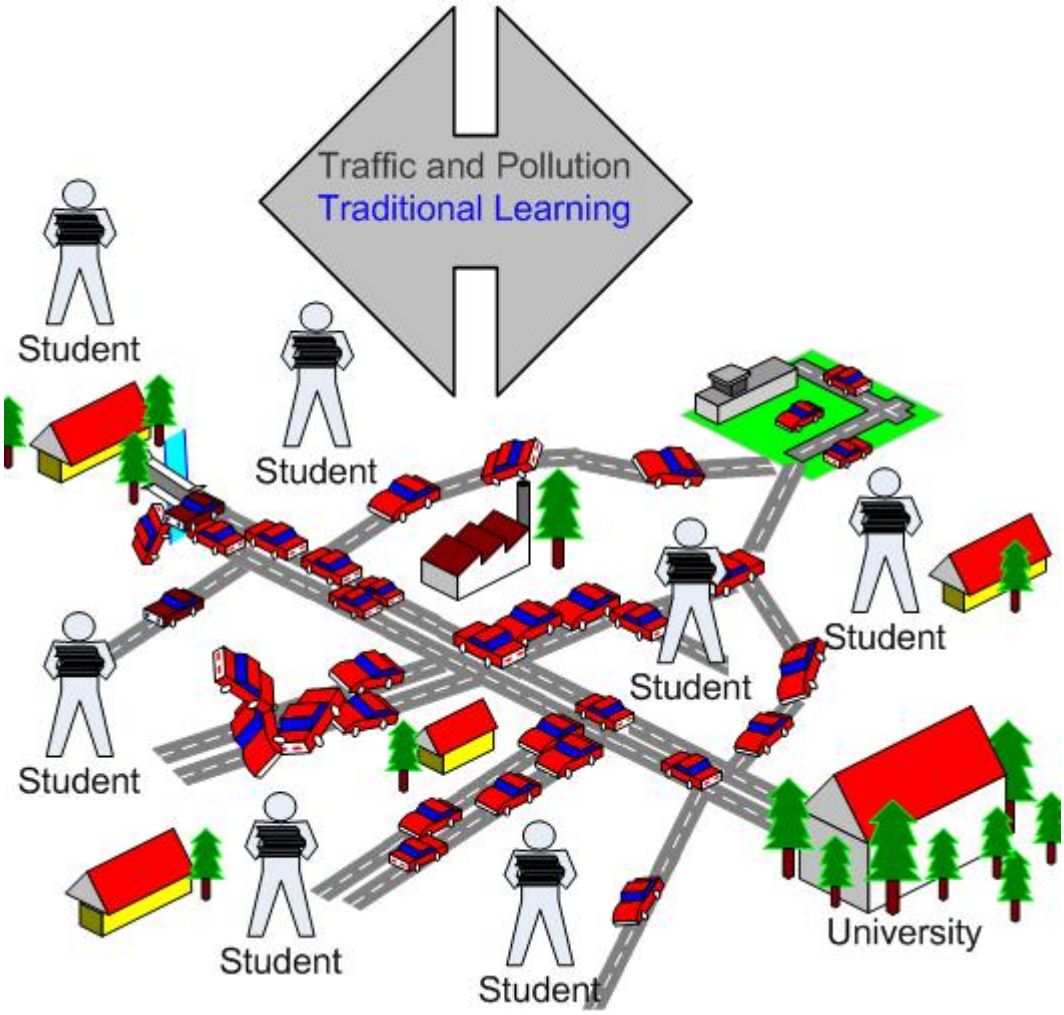

Figure 1, Shows traditional learning problems

Now if such a student has Internet access in his place and can follow his courses and class program through Internet, he would be able to use the time spent for his trips to learn more and take more rest. In case there may be any ambiguity for the student regarding his/her subject matter and research, he can personally refer his/her university and/or professors one or two times per week. For distance education between two country, Internet Video Conference maybe used as an alternative for necessary referral to the University for problem solving. Figure 2, shows benefits of E-Learning, i.e., saving time and costs, reduction of pollution and traffic, as we call it Easy Learning. Furthermore, students share their experience and learn more from each other.

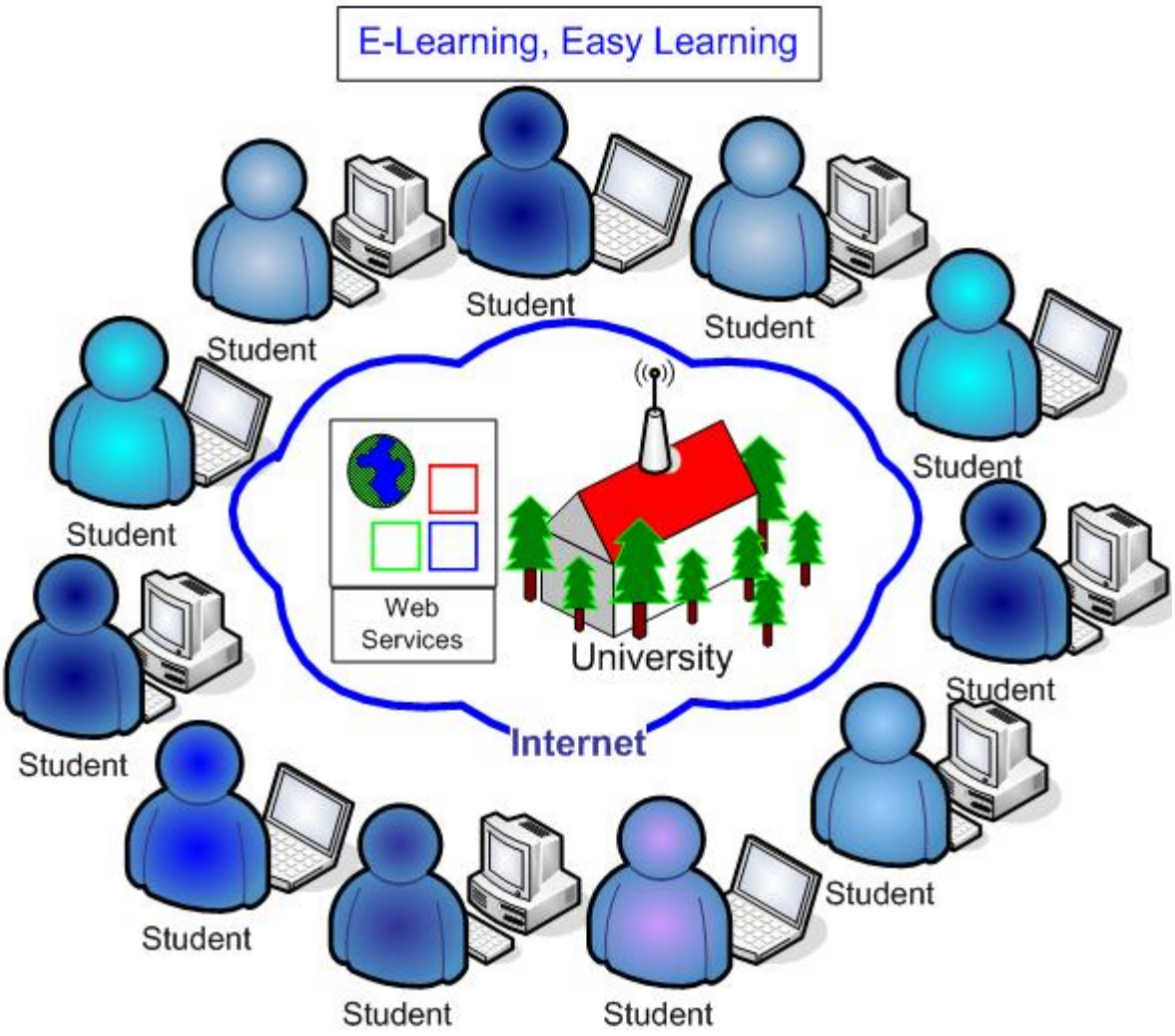

***Figure** 2, Shows through E-Learning, users save time and costs significantly, far from pollution and traffi*c

A complicated issue can be solved through discussion and exchanging knowledge without traveling. Students stay at their home cities or home countries and learn more than people whom travel and get tired of traffic and pollution. The later group are trained more self confident than the earlier group. Nevertheless, because of questioning much, they learn much. It is an interoperable learning that professors and students share their information, knowledge, and experiences in vast groups. The people like MSc and PhD students because of knowing how to research, will be more adapted to E-Learning in comparison with the other people. Monthly video conference is suggested for checking assignments and guidelines for further studies.

The most important advantages of distance and electronic learning in Iran are reported in (Azizian et al., 2007) and (Bahreininejad, 2006). It would lower the trips expenses and country-to-country and continent-to-continent learning charges. In cities and countries lacking skillful professors and teachers, the professors and teachers from those countries haven excess

educational staff may be used via Internet. The authorities excused having no enough budgets to dispatch students to other countries or to employee professors from advanced countries would be resolved.

-E-Learning reduces traffic and pollution.

- E-Learning saves time and costs.

- The speed of propagation and dissemination of knowledge is much more than the traditional study.

The disadvantages of e-learning and distance learning may be that bring disease like backache and fatness because of sitting hours and hours in room working with PC.

-Weakening speaking and conversation.

-Defeatism in communication.

- Avoidance of participating in social meetings.

- Increasing nonsocial behaviors.

According the valuable advantages of E-learning, the admirers/person in charge of E-Learning, should develop and disseminate it with more care and attention. E-learning for long term should be mixed with sport programs, traveling, and meeting for good communication/ice breaking, and exchanging experiences face to face. International seminars and workshops are useful practice in sharing knowledge and information.

PHILOSOPHY BASED ENGINEERING ENVIRONMENT:

Non-development of Internet facilities in deprived areas and unfamiliarity with the potentialities of this advanced technology results to resistance from the old persons who completed their education in traditional methods and are working in traditional methods for years. They are generally unfamiliar with Internet and computer and for their prejudices are not ready to replace their old textbooks and lecture notes with electronic teaching in which everything is limited to PC screen (figure 3).

To make the traditional learning and modern knowledge more close to each other and to combine old techniques and modern technology we need a type of philosophy based engineering environment (figure 4) which can break the resistance of old experts from ITDPRO without making the m to feel humiliation and/or refrain from giving their experiences of available documents. In computer science, this philosophy based engineering environment is called ontology environment. The environment and conditions in which they have been grown and experienced is totally different with the modern one where young

engineers have been educated and are experiencing. Any members from these two groups are afraid to enter the realm of the other group.

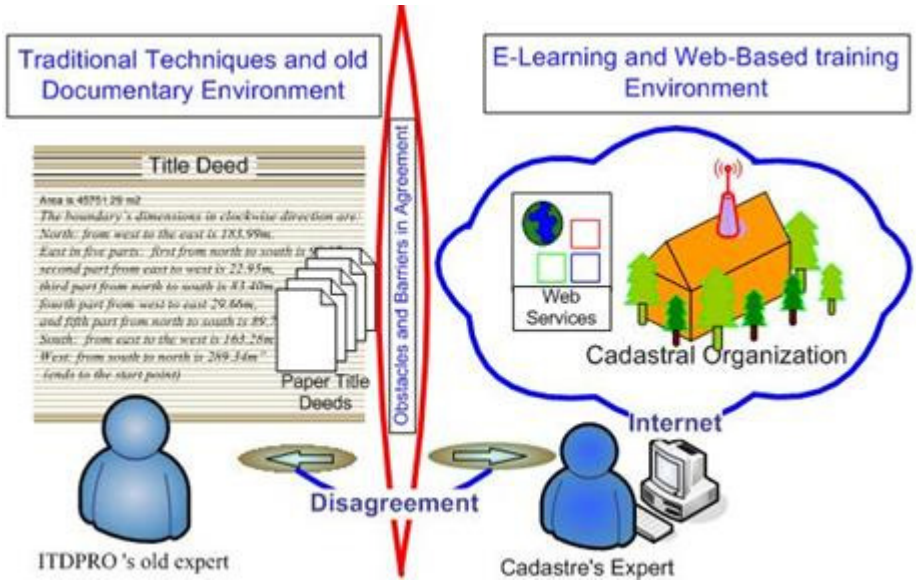

***Figure** 3, Shows two different environments; Traditional Techniques and Advanced Technology in opposition to each other*

We were searching for a mechanism by which to mix and combine these two environments and obtain as the result, a system acceptable by both groups. Neither we could ignore the valuable experiences of traditional experts and their old maps (because they have in them a huge spectrum of valuable and useful properties information), nor we are allowed to neglect modern technology and deprive the country and nation from its benefits and privileges. This designed mechanism is concerning Web Ontology Language (OWL) and Traditional Ontology Language (TOL). Figure 4 shows combining the two environments. We found a solution to encourage the old experts of ITDPRO in E-Learning and Web-based training.

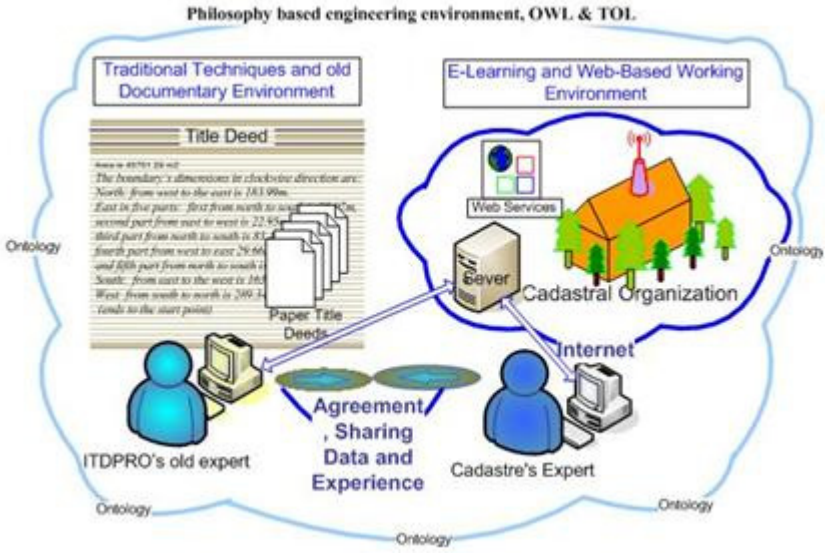

***Figure** 4, Integration of Traditional Techniques and Advanced Technology using E-Learning*

Our solution for such persons, for the development of interoperable environment through the country, is to establish Asymmetric Digital Subscriber Line (ADSL) lines in all areas and to give distance education in 5 to 30 persons classes (depending on the population in any area) by using one PC, one projector and one display screen. In places where there is no school building, mosques may be used, before suitable educational building is build. In this way the potentialities and talents would be flourished in deprived areas and spending very limited amount of money by the government, this talented and deprived class of the community would be given the opportunity to enjoy the benefits of higher education via E-Learning.

SOFTWARE FOR COMBINING TWO DIFFERENT ENVIRONMENTS, VERSION 1:

We have defined a software package capable to enter the written and useful data in properties deeds in a certain format which can then combine them with digital maps obtained by advanced technology in order to locate the properties on cadastre maps for the regions and provinces of the country. This new product would be more complete than digital and exact cadastre maps and premier than old and low-precision maps of ITDPRO while at the same time contain both sets of information. The software would indirectly enter traditional experts of ITDPRO to the realm of Internet and computer. Our objective was to encourage electronic and distance education.

The first version of software is able to draw the geometrical shape of parcels with some limitations in complicated shapes. Figures 5, 6, and 7 show the first version of software in its capability in parcel drawing.

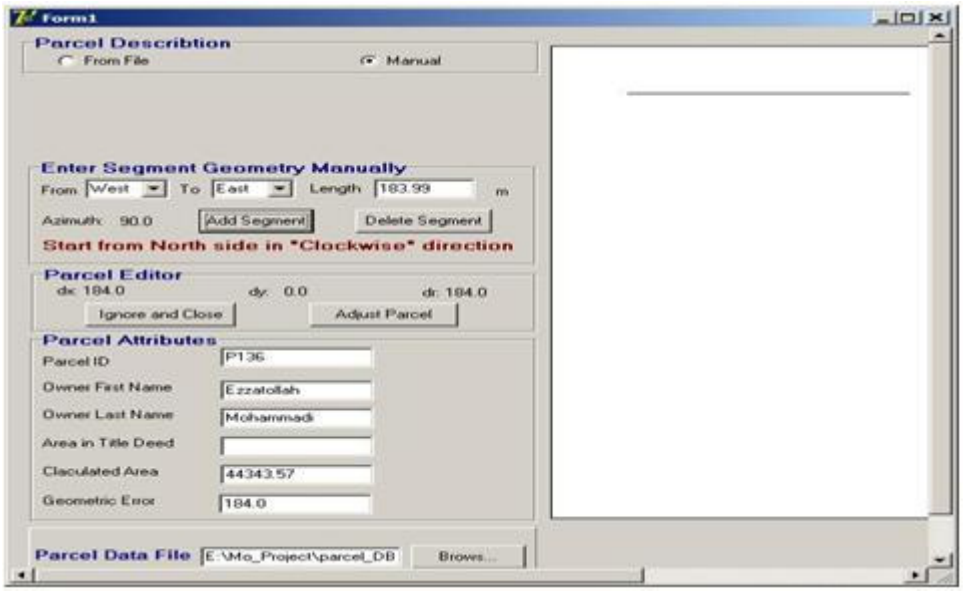

Figure 5, window of software to draw the parcels according the textual data (source Mohammadi,E., 2007)

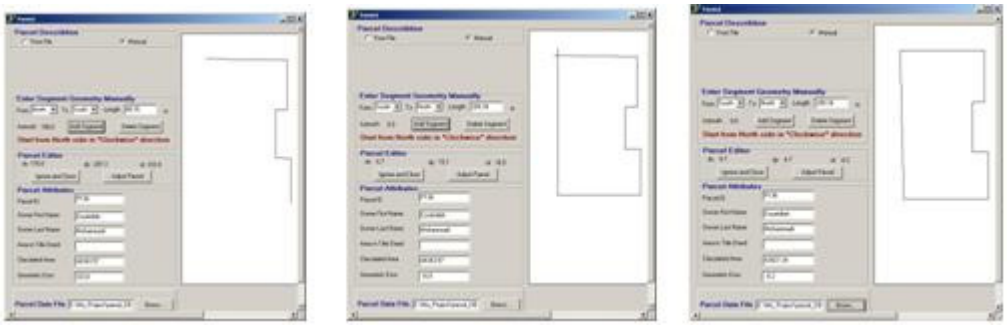

Figure 6, the stages of completing the geometry of the parcel (source Mohammadi,E., 2007)

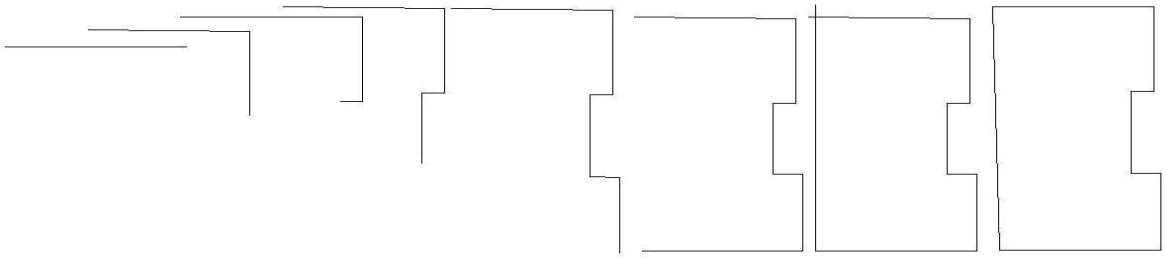

Figure 7, the 8 stages of drawing the geometry of the parcel by the software, version 1 (source Mohammadi,E., 2007)

We developed the software to combine the traditional techniques and advanced technology, using ontology languages; OWL and TOL to encourage the old experts of ITDPRO in *E-Learning.*

The old experts in ITDPRO did not easily accept to participate in normal classes and courses while they accepted our software, worked with it and saw the results (figures 5 to 7) because it was more near to their requirements. They considered the power of Internet to be higher than that of formal teachers. We experienced distance education and electronic learning in an uncommon way. We considered the target group to be the person who accepts no teacher for his/her age and experiences because he/she has long experiences in his/her job. Furthermore, the regulations governing their job and profession have vested much power and authority to them. So they can not simply be said that we want to teach them through Internet and/or electronic media, even if their experiences and knowledge is in contrast with the modern technology and we are daily witness of the losses from going far from advanced technology.

SOFTWARE FOR COMBINING TWO DIFFERENT ENVIRONMENTS, VERSION 2:

Creation of interaction between the group of old experts of ITDPRO with current experts of cadastre and between old techniques and modern technology requires a certain language. The next step is to encourage old experts of ITDPRO to use Internet and making them familiar with E-Learning. To overcome this problem we decided to develop our software in a way to work with Internet. As we believe working with Internet is the first step of E-Learning. Operating the second version software is too easy, and encourages the users to follow the stages. As is shown in figure 8, after browsing our web page according the below address; http://www.ptagis.com/, our home page appears. By clicking the button ***"Enter to View More Details"*** recording window is opened. After filling the empty small boxes, i.e., *Area, Perimeter, Parts of North, Parts of East,* etc. and pushing ***Next*** button, the record is registered, found, and updated. Figures 9 to 11 illustrate the procedure of finding the parcel.

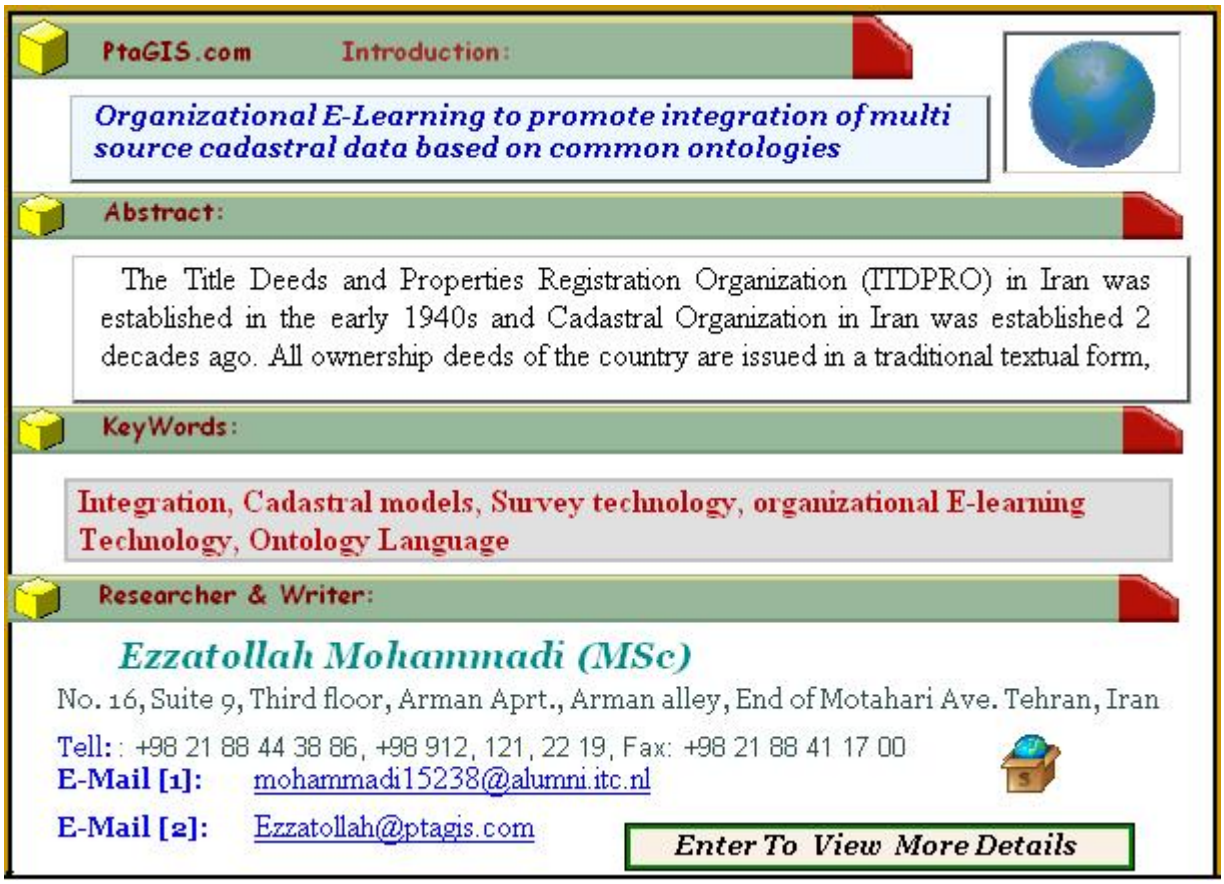

Figure 8, Shows our home page to running the software

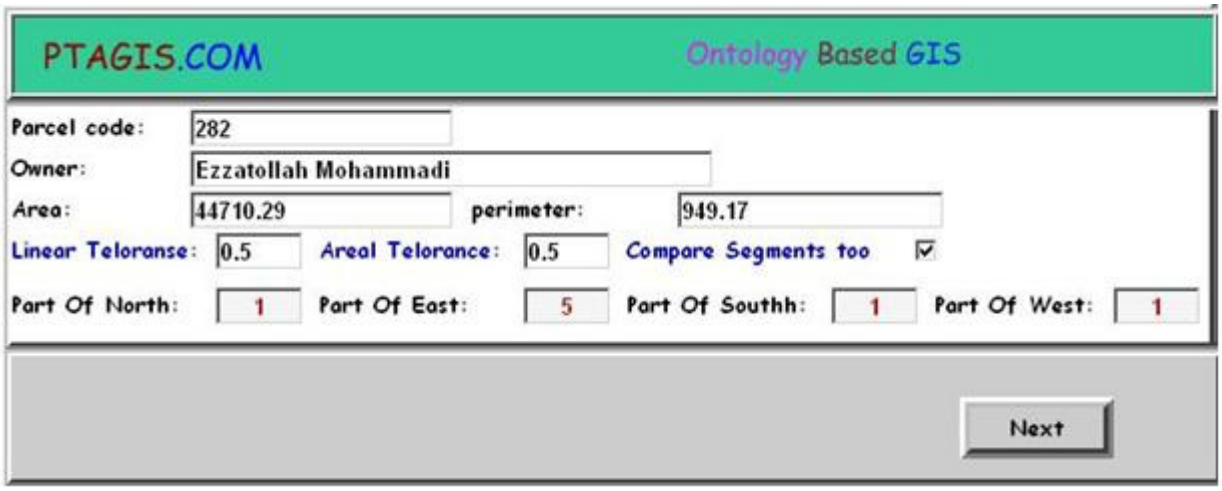

Figure 9, recording the attributes of the parcel

We brought them behind the Pc table through an indirect method and thought them how to use the Internet and how to combine their traditional method with modern method and the result was something accepted by them and approved by current experts working in the same

field and that of their work. Meantime, in our first version software, they used no software on their PCs. They only press a series of keys and observe the result (Figures 9 to 12), since we have produced and installed software package on our server and through a very simple method they could visualize their raw and written data (textual data) in the form of maps and the outcome was connecting bridge between them and advanced technology to show E-Learning is a user friendly system.

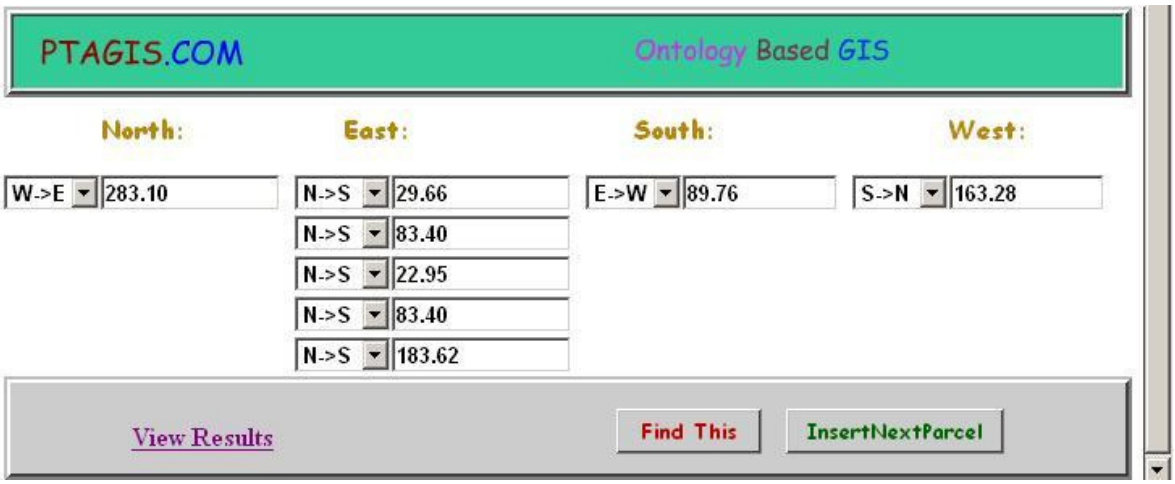

Figure 10, records are saved

Figure 11, the parcel is being found in database

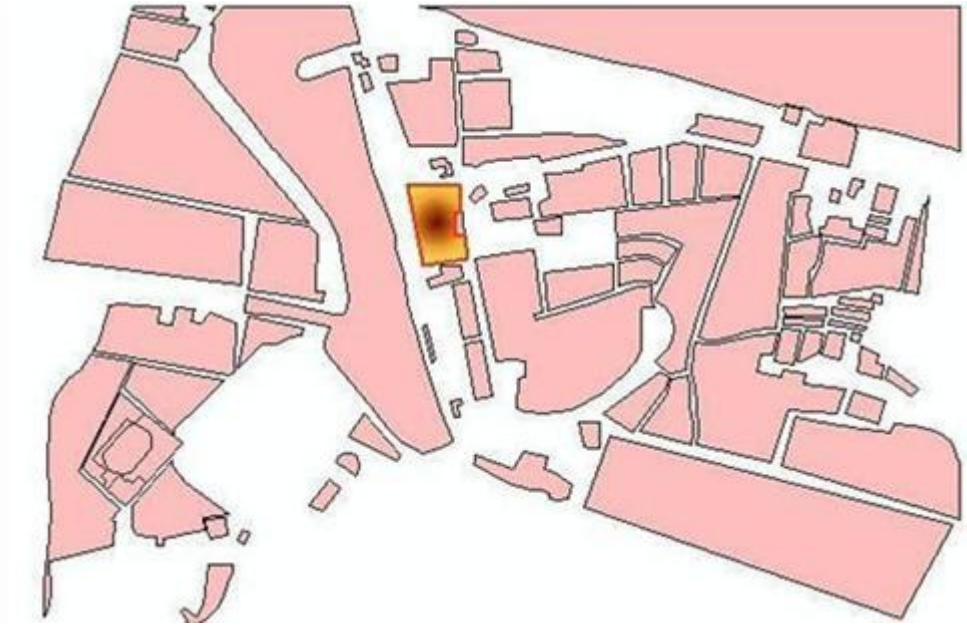

Figure 12, the location of the parcel is shown in the shape file (source Mohammadi,E., 2007)

As it is shown in figures 9 to 12, the software would first record the land attributes and then searches for the land shape in the general map for the area and finding the matched parcel to locate it in the general map. As general map of the area has a coordination system. The land corners would now have their coordination and clicking on any corners, the two dimensional coordination (X, Y) of the point would be given. In this manner the raw and unprocessed information given in property deeds would be changed to valuable and reliable information having coordination system.

The next action of the software is searching the interested parcel in local databases, when it is not found via Internet and Web services. Otherwise, in cases the interested parcels are not found thru Internet in Web servers (figure 13), may be found in local departments' databases. It is extra facility of the software to find the parcels in local databases and warehouses.

Figure 13, the parcel is not found in database, a request is sent to the local departments

In the cases the parcel is not found in the database using Internet, we send our request to the other local departments. As it is shown in figure 13, we push "Click Here" button to benefit from other capability of the software. As it is shown in figure 14 there is the possibility to draw the parcel in PC screen of any local department.

This functionality causes the old experts of ITDPRO challenge with their PC and software in cases they do not have access to the Internet. Essentially, this capability of the software is in side of E-Learning (figure 14).

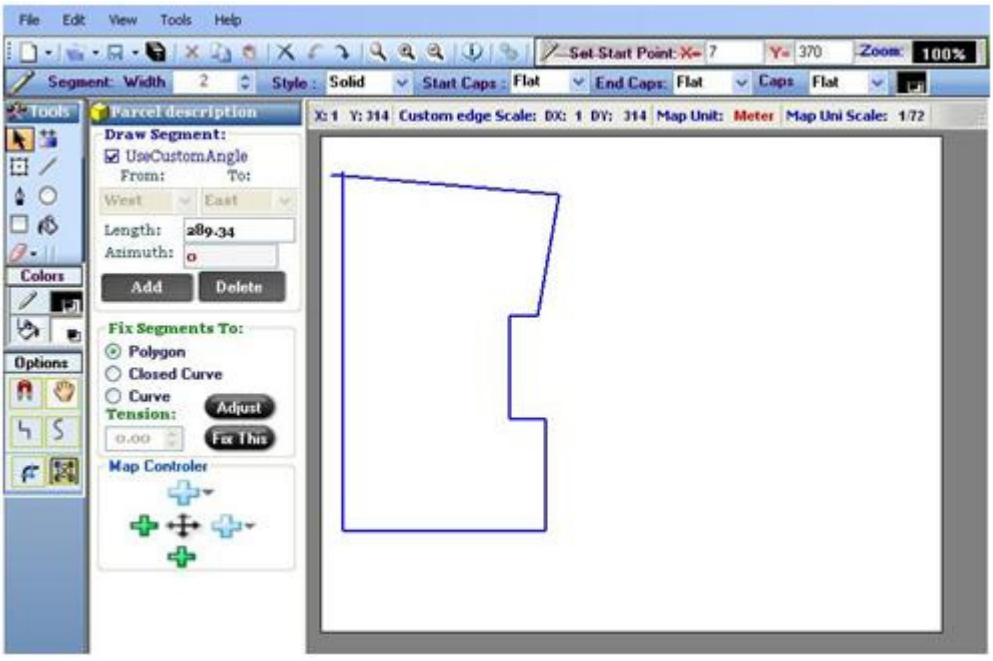

Figure 14, Shows the possibility of software to find the interested parcel in local databases.

TESTING THE METHOD:

We requested some experienced registration expert to select the deeds for one or some piece of land and to perform the localization of pieces. All candidates suggested are satisfying of working with the software and requesting to use the same system in their work (office). We gave the software with some deeds to some young cadastre experts and they were satisfied to be able to locate land pieces via the Internet, on their maps based on the written information of property deeds. Finding that traditional staffs of Registration Departments have accepted this system, they requested for the software to be installed in cadastre organization.

CONCLUSION:

The degree of satisfaction of both groups shows that for distance education and through the Internet in any community we should appropriately relate to the existing organizational culture and beliefs of that community. From that, we could proceed with the education and training upon more attractive methods to them. We could diminish the feeling of unfamiliarity with new technology in old experts to the extent that they may consider new technology as what assists and help them not a system which confront them. Distance education or electronic learning requires cultural works and encouraging tools in developing and under developed communities. We focused our work on a certain group which in through understanding and interaction would be the main user of survey, Photogrammetry, Remote Sensing, and GIS products. As said earlier, the state cadastre was organized 20 years ago while its working environment is totally different with and in some cases contrary to that of traditional registration experts. To create an interacting environment we used scenario No.1, from (Mohammadi, 2007), scrutinized the matter and developed its software in order to minimize a 60 years old problem in ITDPRO and 20 years old problem of this organization with cadastre organization and also present encouraging software for E-Learning.

RECOMMENDATIONS:

While initial pilots are underway, it has become clear that this subject requires more work, research and innovation to be done, consisting of:

1- Attempting to make thinner the gaps between Public and E-Learning; offering encouraging packages.
2- More investigation in society to adapt people with advanced technology, i.e., E-Learning and Web training.
3- Attending the public health while E-Learning and Web training are being developed.

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CONTACTS

Ezzatollah Mohammadi (MSc)
No. 16, Suite 9, Third floor, Arman Aprt., Arman alley, End of Motahari Ave. Tehran, Iran
Tel: +98 21 88 44 38 86, +98 912, 121, 22 19, Fax: +98 21 88 41 17 00
Email: **mohammadi15238@alumni.itc.nl**

Walter de Vries (MSc)
ITC, Hengelostraat 99, P.O. Box 6, 7500 AA, Enschede, The Netherlands
Tel: +31 (0)53 4874475, Fax: +31 (0)53 4874575
Email: **devries@itc.nl**

Ali Mansourian PhD (SDI & GIS)
Department of GIS Faculty of Geodesy & Geomatics Eng. K.N.Toosi University of Technology, Valiasr Ave. Apposite of Eskan, Tehran, Iran
Tel: +98 912 194 05 52
Email: **mansourian@kntu.ac.ir**; **alimansourian@yahoo.com**

Afshin Mahboobi (MSc)
Suite 3, No. 29, 507 St., Phase 4, Mehrshahr, Karaj, Iran
Tel: +98 261 35 26 943
Email: **afshin_campt@yahoo.com**