Chapter 9  Conclusion

9.1  Introduction
This chapter summarises the conclusions of the project. Section 9.2 discusses both the technical and general findings of the project. The technical and logistical difficulties are reviewed. Suggested improvements are outlined and the limitations of the project are reported. Section 9.3 identifies some suggestions for future work, while section 9.4 provides the overall conclusions on the project and section 9.5 gives a summary of the chapter.

9.2  Project Summary
9.2.1  Benefits of this Project
Template Produced
The project produced a template that can be used to create CALL programs for Endangered Languages. It provides the necessary infrastructure for the creation of such a system, enabling the development of lessons, a dictionary and other courseware materials. It uses XML technologies to provide a separation of data from processing (hence presentation), which enables the courseware developer to concentrate on the linguistic aspects of the CALL materials without having to worry about the technical aspects. The format of the lessons produced by the courseware is based on general CALL and User Interface guidelines. The template is designed to be language neutral (although some modification may be required for non-roman alphabet languages).

Nawat Online
The project has helped put Nawat on the Internet. Heretofore, there was no information at all about Nawat available on the Internet. There were no written language samples available, let alone audio resources. This project has put Nawat in the public domain. It demonstrates to the people of El Salvador that Nawat can (and now does) exist on the Internet, that it is not just a language with no place in the modern world. It has helped raise the social profile and esteem of the language. The courseware (especially the Internet and CALL aspects) has provided the opportunity for positive public relations for Nawat (see section 8.5, p154 and Appendix G, p190).

Nawat Language Learning Course
The project has produced a Nawat language learning course. It used the template to create courseware with twelve lessons, along with explanations, a dictionary, audio recordings and other language learning utilities. This course is aimed at (young) adults. Previous Nawat courses (offline) were aimed mainly at children. This course teaches Nawat using modern language teaching techniques and uses current web technology to make the courseware as interesting and beneficial as possible to the learner. A printed version of the course is also available for those without access to a computer.

Nawat Documentation
Several books and texts about the Nawat language exist. Most are out of print. It is, therefore, difficult to access Nawat language resources. This project has documented an aspect of the Nawat language that is often neglected in the more technical language books. The focus is on the spoken word in a
conversational setting. An informal introduction to the structure of the language is provided, along with a dictionary with audio recordings of each word and construction. Furthermore, the project has put an initial Nawat bibliography online for researchers, as part of the language documentation aspect.

9.2.2 Findings

Technical Findings
The use of XML technologies proved very useful during the project development. It allowed the complete separation of data from its processing (hence presentation). This meant that the language data could be worked on independently from the code to format the data. One of the benefits of XML technologies was the ability to reuse data. Thus, different formats could be generated for both online and printed versions of the system. The same information could be presented in different ways (e.g. the dictionary information can be presented in brief or full format) by different processing via the XSL files. The flexibility offered was useful, especially during the early stages of the project, when the XSL learning curve was being traversed.

The decision to automatically generate as much of the system as possible was important. It meant that the courseware developer only had to work with the data files alone and the system administrative load was minimal. It also meant that it was easier from a software development point of view to implement changes to the system – it was simply a matter of regenerating the files and rerunning the scripts to produce the output (HTML) files.

I believe that the audio recordings used in the courseware fill a void that often exists with EL teaching material. It is easier to produce written material rather than audio material and therefore most EL material exists only in printed form. For MCTLs (Most Commonly Taught Languages) and LCTLs (Less Commonly Taught Languages), this lack of access to the spoken word in language learning material can be overcome by alternative means (e.g. access to radio programs or perhaps videos in the target language). However, for ELs, often these alternatives do not exist. Furthermore, the option of meeting up with a native speaker of the target language (as may be the case for MCTLs and LCTLs) is either very restricted or non-existent. Therefore, the audio recordings may be the only opportunity for the student to actually hear the language.

The audio recordings are also important from another point of view. The level of literacy of (potential) EL students may be quite low. They may have difficulty reading the texts and the audio recordings provide a means to hear and learn the language without total reliance on the written word. This is not to imply that the language can be learnt with just use of the audio portion alone, but it can make it more accessible to those who are not comfortable with texts. In addition, the audio recordings would also be helpful to those with an “auditory” learning style.

General Findings
The project showed that it is possible to create a CALL program for ELs and that using the template approach greatly facilitates the process. Planning is important to ensure that things go smoothly when working with the EL community. Certain assumptions about the working environment have to be
overridden and one has to be pragmatic when the unexpected occurs. Allowances for different circumstances have to be made and taken into consideration, particularly during the data collection.

The ability to digitise the audio recordings was very useful. It meant that the audio recordings could be made in a relaxed atmosphere, with the knowledge that gaps, coughs, stumblings and repetitions could be edited later. This eliminated the need for constant retakes until a final perfect recording was made. One of my informants (Genaro Ramírez) was used to the office setting, but my other informant (Paula López) was not. Paula had worked with Nawat researchers before, but she does not work in an office on a regular basis. I was advised by Dr Lemus that careful time management with regard to length of time between breaks and activity management (i.e. not sitting down all the time as they are not used to it) was required during the recordings.

With the knowledge that the material could later be edited, I was able to reassure my informants that all was well as we proceeded with the recordings and put them at their ease. This enabled them to relax and even somewhat enjoy the process. Although the conversations were recorded with both speakers sitting, Paula’s song was recorded from a standing position as she felt more comfortable standing up when singing. Recording the audio portion of the courseware would have been much more difficult without recourse to the technologies used.

Support is available for EL communities that want to preserve or rescue their language. People within and outside the EL community are interested in projects such as this. They realise that it is important not to lose a language. In El Salvador, people helped me in the planning stages of the project and in the provision of materials. They helped me in the checking of the courseware and the production of the CD. People were usually supportive of the project.

I was surprised at the level of interest in the project. When I showed the finished version to people in El Salvador (Universidad de Don Bosco, Universidad de El Salvador), they were all impressed that such software could exist for the Nawat language. They told me (without my asking) that they were motivated to learn the language (although whether this translates into actual study of the language is another matter). People wanted to be able to add more cultural information to the courseware. They have a lot of printed material and wanted to make this available to a wider audience.

The provision of multiple modalities (Internet, CD and print) proved to be very useful. Initial development was on local web pages. Before the second field trip, the courseware was placed on the Internet, put on CD and printed out. This provided valuable backup in case there was no access to the Internet. The printed material was essential for checking the accuracy of the Nawat texts as there was no access to a computer in Santo Domingo de Guzmán. It was also useful for checking the Spanish texts, as the printed version was accessible (and in a known format) for the reviewer. The CD enabled me to demonstrate the courseware in places with computer access but without Internet access.

Once the necessary changes had been made to the printed courseware, the updated version was put on CD and a new version printed. The CD version was distributed to various interested parties in El Salvador.
(e.g. Concultura, Universidad de Don Bosco and Universidad de El Salvador, both in San Salvador and San Vicente) and made available for copying. The CD provided a convenient way of making the courseware available to many people. However, the printed version was pivotal in sharing the courseware with the community in Santo Domingo de Guzmán – it was the only way, given their current lack of computers, to access the content of the courseware.

This provision of multiple modalities is not so important in the usual CALL context, as the intended implementation or deployment of the materials will be in an environment where there is access to computers. However, in the EL situation, it is essential. The ability of the template to generate both an online and printed version indicates its potential for the development of CALL materials for ELs.

There have been several booklets produced to teach Nawat. Not all are in print and those that are available are mainly collections of words and phrases, or geared towards children (see section 5.4, p79). Prior to the production of the Nawat language learning course, no CALL materials were available for Nawat. One of the project aims was to produce a CALL program that would entice people to learn Nawat. The idea was that a CALL program would be more attractive than previous paper-based alternatives. The feedback was very positive. The inclusion of audio recordings and interactivity illustrates the potential power and advantage of CALL over traditional textbook based presentation (at least from the point of view of the motivation to learn).

An interesting finding was the level of interest shown by Salvadorians, one or more generations removed from the Pipil community. Given the difficult history of Nawat (especially since 1932 – see section 5.3, p76), it was felt that people from outside the Pipil community would not be interested in Nawat. Granted, many have no interest in Nawat and would prefer to learn English, but there were people who expressed an interest in the language. Although the EL community has no access to a computer, the project was able to reach out to socially and economically more advanced Salvadorians (although they could not be considered "well-off" by Western European standards) who do have computer access.

It should be pointed out that that this was culturally acceptable in the Pipil context. The Pipils would like to see Nawat spoken by a wider section of Salvadorian society. However, this is not the case with all ELs. Some indigenous groups in North America have strict guidelines about who qualifies as a member of the indigenous group or tribe and thus, who has permission to learn the heritage (usually endangered) language.

9.2.3 Difficulties Encountered

Technical Difficulties
The main technical difficulty encountered during the development of the project was the steep learning curve of the XML technologies for the template developer (as opposed to the template user). Deciding on the XML file structure was not too difficult, but the development of the XSL files to work on the XML files was more challenging. Dealing with the tree-like hierarchy and node structure demanded a conceptual shift from usual programming modes. In addition, working with a relatively new technology
meant that there was not a high level of local expertise, so a lot of the learning had to be undertaken from scratch.

There is a vast amount of literature available about CALL but very little of it addresses the specific needs and characteristics of ELs. While many of the findings of CALL research are, of course, applicable to EL, there are still many unknowns. One such area is that of syllabus design. Syllabi have been produced for many of the world’s languages, but they are usually set in a developed world context. While ELs do (and can) exist in such a context, special consideration needs to be made of the environment in which the EL exists. A syllabus had to be developed for the template with the characteristics of ELs in mind.

Logistical Difficulties
When working with ELs, obviously there are more logistical difficulties to be dealt with than in the case of other languages. Each EL will present its own hurdles. In the case of Nawat, there were several. One was deciding which alphabet to use. As almost every author who has written about Nawat has used a different alphabet, there were several to choose from. The alphabet that was used was chosen on the basis of it being the most consistent. This is a problem that could well exist with other ELs.

One possible problem that did not materialise was finding native speakers willing to help with the project. Fortunately, even though there are so few remaining speakers, Nawat has several willing speakers. The two informants who worked on the project are very aware of the potential importance of a project such as this one for the future of the language. They were very co-operative and helpful at each stage in the project.

One difficulty that did arise, however, was that of recording the conversations during the first field trip. While one of the speakers was able to read the script (albeit with some difficulty as he was used to a different alphabet), the other speaker was not quite as literate and this created some problems. Some of the conversations had to be shortened so as not to overtax the speaker. Sometimes, some of the text could be read, while at others the speaker repeated the text that was spoken to her. However, the process improved with experience.

Another problem that arose was contacting the EL community members. In El Salvador, telephone coverage is not as extensive as in more developed countries (although this is changing). As there was no phone in the cultural centre in the community, the procedure was to ring the local office of the telephone company and leave a message. When the community leader passed by the office, he would be informed that there was a message for him. He would then return the call. However, it was often difficult to get through to the local telephone office. Sometimes the message was not passed on. Perhaps at other times, it was difficult to contact me at my telephone numbers. While such things added to the logistic difficulties, they did not make it impossible to work, only more challenging.

Two issues that might not normally impact on a CALL project are unreliable power supply and the weather. When the corrected version of the system was being written to CD, it was in the middle of the rainy season in El Salvador. This meant that there was often torrential rain, especially in the evenings.
Torrential rain often causes problems with the power supply (which can be erratic even at the best of times). Obviously, to write something to a CD, you need to have (uninterrupted) power, at least for the duration of the copying and writing process. With no power, there is no street lighting, which makes it inadvisable to go on foot (at least in El Salvador where it is not recommended to be out on the street after dark). The rain can also cause roads to become impassable. These were two factors that had to be taken into consideration during the development of the project.

One totally unexpected and tragic event was the earthquake that occurred in El Salvador in January 2001. It measured 6.8 on the Richter scale and caused a lot of structural damage. Up to 1000 people were killed, but many more were made homeless. I was in El Salvador at the time, working on the first field trip of this project. The earthquake was felt in most of the country along with the many aftershocks. As is only natural, it caused great unease amongst the population and it was a while before things returned to something akin to normality. It was difficult to work on the project immediately after the earthquake as the constant aftershocks caused much fear and unrest. Fortunately, the community in Santo Domingo de Guzmán was not badly affected and no one was injured, although it was a while before this could be confirmed due to the collapse of the telephone system.

**Different Roles**

During the development of this project, I had to wear several hats. I had to develop the syllabus for the courseware and also had to learn the language. I studied the language in Ireland and developed the language lessons before I had ever heard the language spoken. Both CALL and Software Engineering skills were required in the development of the project. Being designer, developer and user gave me an interesting perspective on the project. Along the way, social skills were required to interact with the different people in the Nawat world and present the (finished) product to them. While no insurmountable difficulties were encountered, interesting challenges were presented.

**9.2.4 Improvements**

With a project such as this, there is always room for improvement. One area is that of linkage between the various parts of the system. For example, it would be nice if there were links between words in the lessons and the dictionary entry for the word. The dictionary could be expanded and an option to group words based on theme (e.g. family or food) could be provided. Also, the production of the printed version of the project could be made easier. This could be done with the use of Formatted Objects (Pawson, 2001) technology.

There is plenty of room for the addition of cultural information to the system (which will hopefully be addressed by people in El Salvador). Grammar information could also be added to the lessons (if it were deemed to be beneficial to the learners). It would also be desirable to have more items in the activities.

It would be useful to have a better user interface for the XML data files. While they are ordinary text files and do not require any special computer skills to edit them, there is room for user error. A user interface could be designed and developed to overcome this problem. As the XML technologies progress, it may be easier to automatically generate such a user interface. The Universidad de El Salvador is
interested in adding cultural information to the system and the staff members have been shown how to add data to the system. Even though they were not computer experts, they were able to add information and generate a new culture page for the system.

9.2.5 Limitations
Obviously a project such as this could not hope to deliver a system with all possible elements. There are some limitations that must be noted. The system developed makes some basic assumptions about the language that is to be studied. It assumes that it has an alphabet and that there is a code system for that alphabet defined in Unicode.

At the next level up, it assumes that someone in or working with the EL community has access to a computer and possesses some computer skills. To give the courseware a more authentic feel, it is important to use culturally relevant images. A scanner would be required to scan in these images. Sound equipment would be required to record the conversations. (While not essential, it is highly recommended that there be an audio component to the system). Given that not many EL communities would have easy access to such equipment, it is envisaged that perhaps a university in the country could provide some technical assistance to the community.

At another level, the project has to be culturally acceptable to the community. Some aboriginal communities in Australia consider it to be unethical to have images and recordings of people who are dead. Thus, courseware that used the spoken word of someone who subsequently died would have to be handled appropriately by the community.

9.3 Suggestions for Future Work
As the field of CALL is so diverse, there are a number of suggestions for future work. Several in particular stand out. One is the addition of an element of learner speech to the system. Obviously, it would be very difficult to incorporate a generic tool to analyse the learner’s speech and report on (undesirable) differences between it and that of a native speaker. However, there are simpler yet effective ways of adding a speech element to the system. For example, the learner could speak and then hear his/her voice in comparison with a recording of a native speaker.

Animation is another area for future work. This could be used to graphically show the learner how a verb is conjugated or how a sentence is structured. It could also be used to teach prepositions or parts of the body, for example. Obviously, the difficulty would be in deciding how to make this generic and determining exactly what works from a learning point of view.

The template could aim to incorporate more of the proven CALL techniques for teaching specific language items. The template works at a beginner’s level, but at a more advanced level, it would be useful to incorporate longer pieces of text for learner comprehension, for example.

Another area of interest would be to analyse learner errors and to try to deduce the areas of difficulty of a particular language. This information could then be used as a basis for the improvement of the
courseware content. For the world’s major languages (and to a lesser extent the Less Commonly Taught Languages), there is some information available about learner difficulties. This information is generally not known about ELs, but were it available, it could be used to enhance the learning process.

9.4 Conclusions

This project succeeded in creating a template for a CALL program for Endangered Languages. A generic framework was built to enable the creation of an online learning course, with simple data files, sound files and culturally specific images. Using the template, it was possible to generate an online language learning course for the Nawat language, which was something that had never been done before.

The use of modern technology and good CALL practices to teach an EL can help boost the perception of such a language and make it more accessible to potential learners. Although it is more difficult to create CALL courseware for ELs, it is worthwhile to do so. The benefits may not be immediate, but they will emerge over time. In the case of the Nawat language of El Salvador, its profile has been raised with television and newspaper exposure of the courseware. Potential learners are being motivated to study the language and people have been taking copies of the CD.

While carrying out research for this project, it was difficult to find information on CALL in the EL context. Information on CALL was plentiful and information on ELs was available, but there was very little information available on the intersection of the two fields. This project managed to address this largely unreported yet intriguing area. Language learning courseware has been developed for ELs but it tends not to incorporate modern pedagogical techniques. This project demonstrated that it was possible to do so.

Often the only literature available on a specific EL is that provided by linguists. It tends to be technical in nature and is not immediately applicable to language learning. The template provides a forum whereby linguists can work on language documentation while at the same time addressing the often expressed desire of EL communities to develop language learning courseware for their language. The template provides a platform for language documentation that uses 21st century technology and is designed with integration with future linguistic databases in mind. The technology allows the information to be presented in a manner more accessible to non-linguists than might normally be the case with interfaces that focus more on linguistics.

The positive reaction to the template on the Nawat courseware indicates that the project has identified and addressed a real need. It was particularly pleasing that the Universidad de Don Bosco has taken over the ownership of the Nawat courseware. They have added a beautiful graphic to the main page and have presented the courseware at a Congress of Indigenous Peoples in El Salvador. Dr Lemus informed me that the reaction to the Nawat courseware was very positive.

A colleague who works in industry and uses XML technologies reviewed the template software from a Software Engineering point of view. He pointed out the need for enhanced checking of the files edited by
the courseware developer and the User Interface. Overall, he was impressed with the simplicity of the design and the elegance of the solution.

In conclusion, the project was more successful that could have been hoped for at the start. There were several unknown elements at the start of the project which meant that it had a certain element of risk. These included the author’s lack of XML technology and CALL experience, the difficulty of obtaining information about Nawat and the lack of knowledge of the Pipil community’s reaction to the project. However, these potential problems were successfully overcome. One key element was the collaboration with the EL speakers, without whom this project would not have succeeded and the local Universities, especially Dr. Lemus for his introduction to the EL speakers and his Nawat expertise. XML technologies provided a natural base for the template software. Non-expert computer users were able to use the template to produce and modify the courseware contents. Potential language learners were able to use the CALL software without difficulty to start studying the language. The courseware was used to provide positive publicity for Nawat in El Salvador and this was appreciated by the Nawat speakers, the Ministry of Education and Culture, the Universidad de El Salvador and the Universidad de Don Bosco. The template also facilitated the production of Nawat documentation, especially audio documentation, which is crucially important in the EL context.

9.5 Summary
This chapter summarised the benefits of the project, including the production of a template for a CALL program for Endangered Languages, putting Nawat on the Internet and documenting part of the Nawat language. The technical difficulties encountered during the development of the project were reported, as were the logistic problems that were faced. Possible improvements to the system were identified, including more integration and linkage between different elements of the system and an improved courseware developer interface. There are many possible themes for future work based on this project, such as the integration of the learners’ speech production, use of graphics to visually demonstrate some elements of grammar and investigation into the provision of feedback. The chapter concluded with the comment that the project succeeded in developing a template as originally envisaged, which, while not perfect has shown itself to be usable, and that ELs can also enjoy the benefits of modern technology.