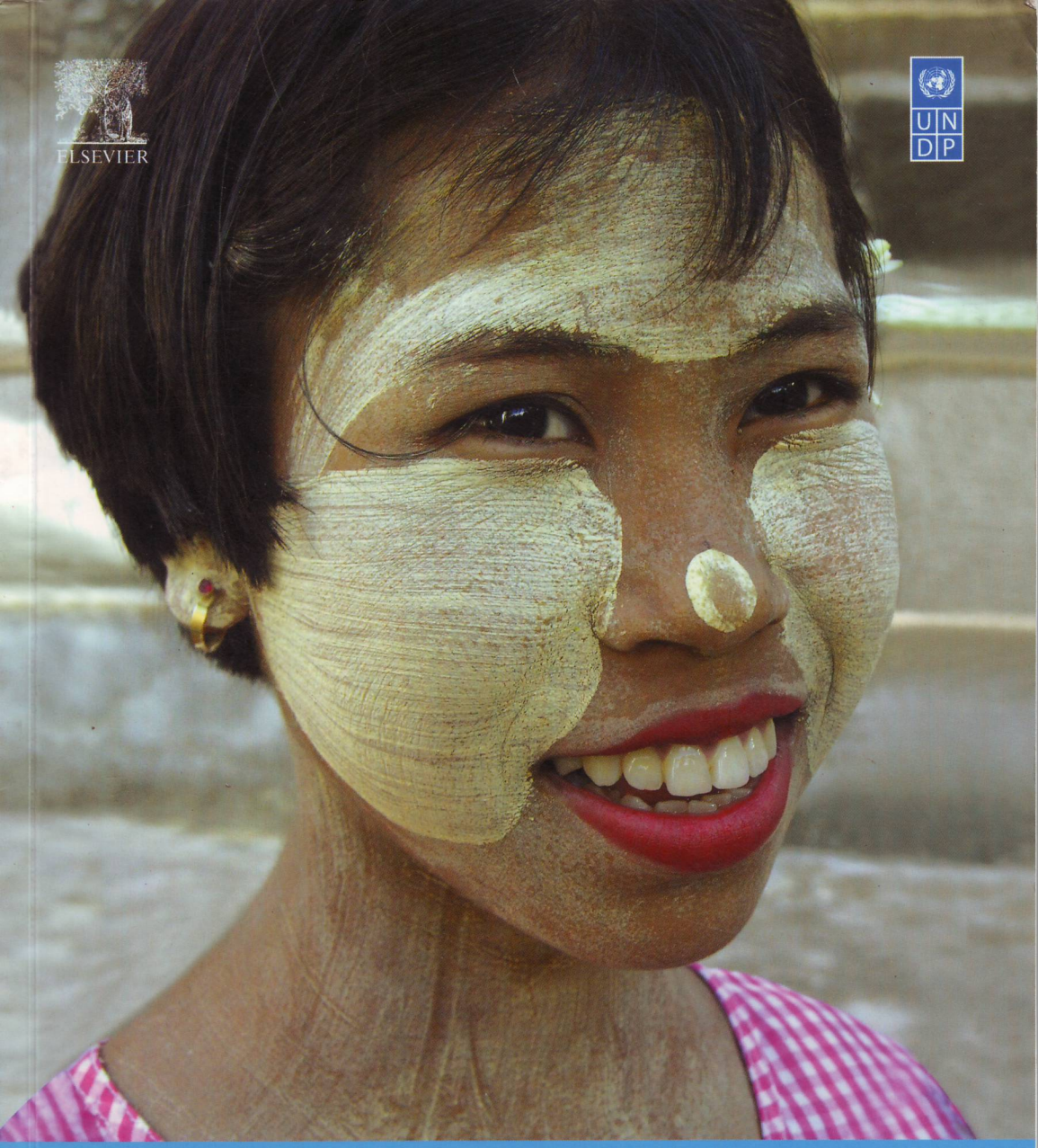

Breaking Barriers

The Potential of Free and Open Source Software for Sustainable Human Development

A Compilation of Case Studies from Across the World

UNDP-APDIP ICT4D Series

Nah Soo Hoe

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Preface

This compilation of Free and Open Source Software (FOSS) case studies is a selection of the submissions received as a result of an invitation by the UNDP Asia-Pacific Development Information Programme (UNDP-APDIP) and its International Open Source Network (IOSN) to capture, document and promote FOSS initiatives from around the world. These initiatives were asked to submit case studies of their projects for consideration as "success stories" and 14 have been selected for inclusion in this book. Each case study highlighted here provides a summary of the project; background of the organization; project's objectives; FOSS applications developed and/or deployed, and their impact; lessons learned; current status of the project; and benefits and challenges in using FOSS; as well as contact information and references.

FOSS has a key role to play in building information and communications technology capacity and bridging the digital divide, especially in poor communities. This has been amply borne out by most of the case studies featured here. The availability of free-of-charge FOSS applications and the ability to localize it by any interested party are important reasons for FOSS being generally preferred in these environments, even though FOSS desktop applications are relatively less mature than their proprietary equivalents. However, this is rapidly changing and as more and more high-quality FOSS applications become available for mainstream desktop usage, the situation will improve further.

With the publication of this compilation, it is hoped that there will be greater awareness of the ability of FOSS to empower and help poorer and less developed communities, especially in developing countries. The experiences gained from these projects should also be useful for new FOSS initiatives in this area.

Nah Soo Hoe

Identifying and Controlling Weeds
OSCAR, India

Summary

The Open Source Simple Computer for Agriculture in Rural Areas (OSCAR) project from the French Institute of Pondicherry (IFP) involves the prototyping of an application software for weed identification and control in rice and wheat crop systems of the IGP. It is targeted at being deployed on low-cost computing devices running GNU/Linux that can be shared among farmers of a local community.

OSCAR has been developed for both desktop computers and Simputers using FOSS tools, and is released as FOSS. FOSS is chosen as it is important to make the software freely available to the farmers and to encourage contributions to OSCAR from various groups and organizations in the IGP. These groups help enhance the system by cataloguing the weed species in their region and their respective control measures. It is also important to be able to perform customizations to suit local languages and cultural practices as the content of the application, particularly the control measures of weeds, may vary with the practices in different regions.

OSCAR is unique in that it is the first of its kind within the domain of ICT applications for agriculture. By being available as FOSS, it promotes the aggregation of information from academic/research institutions as well as from traditional knowledge systems.

The project has tested the application with various target groups in the four countries of the IGP – Bangladesh, India, Nepal and Pakistan –with encouraging results. A key lesson learned from the project is that any implementation of ICT applications for a rural agrarian population has to take into account the prevalent basic issues in agricultural practices and infrastructural constraints. It is essential that methods to integrate participation from local communities are considered.

The current project is concerned with delivering and testing the prototype OSCAR application. While this has been largely successful, the ability to move from this to the actual working environment at the field level remains uncertain, as is the ability to continue to consolidate and sustain the enthusiasm and efforts of different agencies in different countries to participate, contribute, build and enhance on the existing set-up.

The actual deployment of OSCAR will probably not be done on Simputers as several issues with implementing and using it on a Simputer were experienced during the course of the development of OSCAR and its subsequent trial runs. To overcome this and to enable it to reach a wider audience, OSCAR has been successfully converted into a web-based application.

Background of Organization

IFP, a multidisciplinary research centre located in Pondicherry, India, carries out research and training activities in South and South-East Asia in the fields of Indology, Social Sciences and Ecology. IFP is highly regarded for its work in the study of Sanskrit and Tamil languages, literature and grammatical traditions (in collaboration with the Ecole Française d' Extrême Orient) as well as for its vegetation mapping of South Indian Forests and bioclimates in South-East Asia.

The Laboratory of Geomatics and Applied Informatics in the Institute specializes in Geographical Information Systems (GIS) and in ICT. It is responsible for all the ICT infrastructural needs of IFP as well as the development of databases and multimedia products for the departments at the Institute. The Laboratory is also in charge of original applications development, aimed at improving access to new technologies.

Objectives of Project

The OSCAR project aims to address the issue of declining agricultural productivity in South Asia by producing a tool for decision-making in weed identification and control. The specific objective of the project is to demonstrate a prototype of this tool implemented in software and running on desktop computers and low-cost computing devices.

This decision-making tool targets farmers of the IGP at the village level and it will be available in different local languages so as to address the cultural diversity of the project area. An existing software for species identification - Identification Assiste pour Ordinnateur - is ported to a FOSS platform and deployed on low-cost computing devices running GNU/Linux, that can be shared among farmers of a local community. A model database for identification and control of a set of the most important weeds of the IGP is developed for integration with the species identification software. The usage, appropriateness and acceptance of the tool at the farmer community level are also assessed.

The primary target groups are farmers and village communities of selected villages from the four countries of the IGP – Bangladesh, India, Nepal and Pakistan. The indirect target group is the farming community of the region in general. The ultimate end users of OSCAR will be the farmers, village communities and also all the actors involved in the support of agricultural activities, such as development workers, NGOs, training and extension officers of semi-government and government agencies, and students of botany and agronomy at colleges and universities.

For this project, IFP is working with three partners from Asia and Europe:

- The Centre de Coopération Internationale en Recherche Agronomique pour le Développement of France specializing in development- oriented agricultural research for hot regions;
- The Rice and Wheat Consortium of Bangladesh, India, Nepal and Pakistan has weed science experts and a strong background in agriculture in the IGP; and
- The Centre of Innovation Studies, Wageningen University from the Netherlands, is concerned with the way communication can be strategically brought in to reinforce development, pro-social behaviour, organizational efficiency and collective decision-making. Its interests cover the broad and interconnected areas of agriculture, food and health, environment and nature, in western as well as in non-western countries.

FOSS Application

Description

The prototype application, OSCAR, is the primary outcome of the project. With a weed identification system at its core, it has information on 50 of the most common weed species for the rice and wheat crop systems of the IGP. OSCAR helps the farmer to properly identify a weed species and provides information on the botanical aspects and appropriate control measures.

Choice of FOSS

FOSS is chosen as it allows easy customization of the software and data formats used are known and open. These considerations are important so as to encourage contributions to OSCAR from agronomists, researchers, student community and concerned development organizations in the IGP. These organizations can help to enhance the system by cataloguing the weed species in their region and their respective control measures. If the application were based on proprietary formats and software then the whole purpose of OSCAR would be defeated since the agencies currently involved will be required to implement any future enhancements and customization. Also, it will not be practical to have a common application for the whole region considering the cultural diversity of the target region that covers four countries – with different languages and cultural practices. Although efforts are being made to port OSCAR into respective local languages, the content of the application, particularly the control measures of weeds vary with context. By using FOSS, the community can customize the application to suit its own local needs. For example, the number of weed species for lowland rice crop systems in Bangladesh can be increased in the database compared to the numbers of weeds for wheat, so that the application contains more tangible and relevant information.

Development and Implementation

OSCAR is designed to work on GNU/Linux platforms. The Gtk graphics library package is used for developing the Graphical User Interface (GUI) for the application while the libgda library (a library for writing database programs) is used for database access. MySQL is utilized as the database back-end with the gda-mysql package being deployed to interface between libgda and MySQL. OSCAR is developed for both desktop computers and Simputers.

The core component in the OSCAR application is the species identification kit (identikit). The identikit contains a model plant species with different user selectable characters such as root, habit, leaves and flowers. Each character has a number of character states which are, in turn, selected by the user. Based on the user's selection, the identikit displays the most appropriate match compared to the species available on the database. The base code is written in the C programming language, and characters and character states are stored in the database. The database is independent of the base code so as to facilitate future enhancements to the database.

Deployment

The application is targeted at farmers, extension workers and students of the IGP. The project focuses mainly on making it available on FOSS. The application has been widely tested with farmers, extension workers, students and researchers, and has received enthusiastic responses. It is made freely available on the website and interested parties are encouraged to download and use the application. Any agency such as a government or NGO involved in rural development can make use of the application.

The project has tested the application with the various target groups in Bangladesh, India, Nepal and Pakistan. It was found that the local communities were very open and ready to adopt and own the application. From researchers and teaching community at the universities and research institutions to development workers at the grass-roots level, everyone was readily convinced of the advantages of the FOSS model and was eager to actively contribute in one way or another.

The deployment of OSCAR is unique in that it is the first of its kind within the domain of ICT applications for agriculture. The nature of

the application addresses a pressing need of the target groups, namely, to identify the weed species correctly and control them effectively. By virtue of OSCAR being released as a FOSS application, participating parties can freely contribute towards building up its knowledge base. The aggregation of information is provided not only from academic/research institutions but also from traditional knowledge systems, for example, cultural practices in weed control like hand weeding.

Impact

Enthusiastic responses to OSCAR have been received from the research community, in particular, in all the target countries. The fact that researchers can customize the application to fit their own environment has invoked much interest in OSCAR.

OSCAR will encourage and result in the participation of local bodies and organizations including *panchayats* (councils at the village level), cooperatives, farmers' associations and women's self-help groups, etc., to build their capacities with resources accessible within their village. This will also enable these micro-organizations to manage their resources at the village level with the combined knowledge base at local and institutional levels. This effect can contribute enormously towards improving the decision-making capacity of the farmers, not only on issues related to farming, but also on other issues related to development as a spill-over effect.

Another impact is the enablement of partner organizations to garner expertise on various issues including different local needs, the approach and appropriateness of ICT aids in farming, technical presentation of the application, and the integration of technical information in local farming practices and traditional knowledge systems. These factors contribute to the design of better management techniques for the future.

Lessons Learned

The project has contributed much to the understanding of how to design and implement an ICT application for agriculture. One key lesson learned during the implementation of the project was that any ICT application targeted towards a rural agrarian population has to take into consideration the prevalent basic issues in agricultural practices and infrastructural constraints. Acceptance by the target group and methods to integrate participation from local communities is essential for any ICT intervention at the grass-roots level to be successful. Merely dishing out information without considering social issues and differences at the village level and existing channels for information will only make the initiative redundant.

Current Status of Project

The project has completed its final stage and final releases of OSCAR for GNU/Linux and the Simputer. A set of recommendations for ICT initiatives for agriculture has also been published.

During the course of the development of OSCAR and subsequent trial runs, the project found several issues with implementing and using OSCAR on a Simputer. These include the lack of a standard development platform, limited availability of storage space, high local pricing (prices are comparable with a desktop PC) and poor hardware support locally. Given all these restrictions, it is unlikely that further development and deployment of OSCAR on the Simputer will take place. Instead it has been decided to port OSCAR to a web-based FOSS application as this will make it more visible and enable it to reach a much wider population and area. This has been done successfully.

Benefits and Challenges

OSCAR provides farmers in the IGP with the information and ability to identify and control weeds in their paddy and wheat fields. Prior to

this, it was very difficult for non-botanists to identify weeds properly and correctly. The OSCAR application, based on a GUI, using drawings instead of technical jargon, is simple and easy to use.

The use of FOSS tools and applications to develop and build OSCAR as well as a FOSS database to store the data provides an open and adept environment to develop and standardize applications such as OSCAR. The scientific products of academic and research institutions can be deployed on FOSS thereby encouraging wider participation and dissemination.

Positive and spirited responses experienced during the testing of OSCAR show that there is a real need for such applications and FOSS is the only way such initiatives can be sustained and replicated for a wider region. If OSCAR is not a FOSS application it may have been yet another centrally-managed decision-support system that would cease to exist once the project ends. There is now active participation from different agencies to contribute further towards enhancement and deployment.

However, in spite of encouraging signs and activities witnessed on participation in the OSCAR project, the biggest challenge still remains the ability to consolidate and sustain the enthusiasm and efforts of the different agencies in different countries to participate, contribute, build and enhance on the existing setup of the project. As the current project owners and drivers are research organizations, working within the framework of a project with a very specific objective of demonstrating a prototype, it can be difficult to fulfil the expectations raised at the field level.

Conclusion

The OSCAR prototype of an application software for weed identification and control of the rice and wheat crop systems of the IGP has been successfully developed as FOSS and tested in various target groups in Bangladesh, India, Nepal and Pakistan. The use of FOSS to develop and implement OSCAR makes it possible to encourage contributions to it from agronomists, researchers, the student community and concerned development organizations in the region. With the deployment of OSCAR, farmers in the IGP will be able to better identify and control weeds in their paddy and wheat fields. An indirect impact of the project is the encouragement of local bodies and organizations to help themselves by building their capacities with resources from within their village leading to better resource management and contributing towards the decision-making capacity of the farmers on farming and other issues related to development.

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The Potential of Free and Open Source Software for Sustainable Human Development

A Compilation of Case Studies from Across the World

This is a compilation of 14 case studies on the successful deployment of free and open source software (FOSS) in select projects from Africa, Asia-Pacific, Europe and Latin America. In each case study, the reasons for choosing to use FOSS together with the development, implementation and impact of the FOSS applications are discussed. The benefits obtained and challenges encountered as well as any valuable lessons learned are also highlighted. This book aims to provide policy makers and development practitioners with useful insights as to why FOSS may be more suitable than proprietary software for use in information and communications technology (ICT) development, especially in poorer economies. This book comes with a DVD of *The Codebreakers* – a 40-minute version of a programme first shown on BBC World.

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