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SPC Coastal Fisheries Programme data collection systems

BACKGROUND

1. Databases have been developed over the years by the Pacific Community (SPC) Coastal Fisheries Programme to record fishery-dependent and fishery-independent data, as well as socio-economic data. Often developments have been initiated in order to support regional project needs as well as for survey training that is conducted, and associated applications that are distributed to fisheries departments and partners for conducting data entry and analysis.

2. The core of these databases is the SQL Server database management system, which has been chosen for its robustness, scalability, ease to administer, and the availability of an express version for in-country and standalone deployments. For the front-end application – that is used to enter data and query the database – technologies have evolved with time, especially with the increased access to internet and mobile devices.

Client-server databases

3. Client-server databases that were developed in the 2002–2010 period such as Reef Fisheries Integrated Database (RFID), Socio Economics Manual Companion Software (SEMCoS) or Creel and Market Surveys were designed to be run either as a standalone installation or from the local network. They do not rely at all on an internet connection and are well suited for situations were data entry and querying need to be done offline – for example, from a remote island, during a field trip, or from an office network that hosts a central database server. They can also be run by organisations or individuals that want to implement SPC methodology but do not want to share data with third parties.

4. Yet standalone installation of the database can sometimes be tedious on devices that are not up-to-date, lack the prerequisite packages and/or with operating systems that range from Windows XP to Windows 10. The multiplication of offline installations also complicates maintenance, software updates and synchronisation of data issues. Installation and maintenance is made easier in a network environment where the database back-end can be installed on a pre-existing and remotely maintained server (such as the HP microservers that are deployed under SciCoFish).

Web and mobile databases

5. In contrast, online databases are easier to maintain, as the database instance is shared by all users (with appropriate security rules) and application updates are available immediately to all users (yet the web server becomes a potential point of failure and if it fails, all users are affected). The application is run from the web browser and does not require any installation on the client's devices (as long as the browser is recent and compatible with the application). Access to web databases requires good internet connectivity. Recent field survey modules developed for coral, coconut crab, seagrass and mangrove surveys, fisheries exports and fisheries regulations are web-based.

6. Finally, some applications are developed to run mostly offline, with occasional synchronisation and updates when they are back online. This is the case of the tandem TUFMAN 2/Tails, and

World Bank Survey Solutions. These applications are generally limited in terms of computation that can be done offline and are mostly designed for data entry. PacFishID is also an example of a mobile application that is designed to run offline. The table below shows the scope and architecture of SPC regional database applications for coastal fisheries related data.

Table 1. Scope and architecture of SPC regional database applications for coastal fisheries related data

Application	Scope	Type	Available on microservers
RFID/ReefDB	Underwater fish and invertebrate surveys	Client-server application	Yes
SEMCoS	Socio-economic surveys	Client-server application	Yes
Creel and Market Surveys	Creel and Market surveys	Client-server application	Yes
CFP web site – Field surveys	Coral, seagrass mangrove, coconut crab field surveys	ASP.NET MVC web application	No
CFP web site – export permits	Export permits per shipment	ASP.NET MVC web application	Yes
TUFMAN 2	Small scale artisanal catch	Single-page web application	No
Tails	Mobile data entry for TUFMAN 2	Mobile application	Not applicable
PacFishID	Species identification	Mobile application	Not applicable

7. Additional databases have been developed specifically for some countries to record water-quality data, sea cucumber and giant clam production, fishing and exports or fishing licences. Other database modules are planned for Monitoring Control and Surveillance, sea cucumber trade monitoring and aquaculture farm inventories.

ISSUES AND CONCERNS

Long-term maintenance

8. The multitude of systems that are in place corresponds to the various ways of obtaining fishery-independent and fishery-dependent data, in a region where internet connectivity improves with years, but is still an issue in remote areas. Not all systems are used in every country, but all of them are still in use and need to be maintained for the countries that have chosen to use one or more approaches for obtaining coastal fisheries information.

9. Ideally, legacy applications would need to be rewritten – to a large extent – every five to 10 years in order to remain compatible and benefit from ever changing hardware, operating systems and improvement in internet connectivity.

10. With limited human resources, maintenance of legacy regional databases and country-specific databases can only be done at the detriment of new regional application developments and in a best effort mode, with no guarantee. The long-term maintenance of systems that are put in place – whether developed by SPC or third parties – is a concern that has been raised by IT departments of several countries. For applications developed by a software company, the IT department often recommends that an annual maintenance contract is signed and budgeted to ensure long-term support.

11. If SPC Coastal Fisheries Programmes is to act as a software development company, there is a need to formalise the service that is provided to member countries, including software maintenance and adequately funding the required resources – possibly through cost recovery, to provide the long-term support and level of service that is required.

Web application and cloud services

12. Web and mobile applications are more and more preferred than traditional client server applications, mainly because it allows for data entry from remote places without having to install a full database back-end. The web server/web service back-end can be hosted on SPC premises (requiring infrastructure, electricity, internet connection and IT staff) or in a cloud (foreign data centres with potentially more data redundancy, computation power and bandwidth, depending on the purchased monthly plans). In a cloud, one pays for monthly web server hosting, database hosting, file data storage and bandwidth, plus all other services that might be needed (file indexing, sending emails, etc.). Cloud hosting requires additional attention on the effective use of databases that are in place, given that one must pay hosting fees whether the system is used or not. Conversely, bandwidth and storage fees can grow quickly depending on usage; for example, uploading of high-resolution pictures (coral photoquadrats, seagrass surveys, etc.).

POSSIBLE DISCUSSION POINTS

- What are the expectations of fisheries departments and other organisations in terms of long-term maintenance of developed applications, whether developed by SPC or third parties?
- How can we ensure the required recurring funding is secured to meet these expectations, beyond the end of projects and ensure data is not lost after the end of support, server decommissions or the end of cloud service payments?
- What are the challenges faced in countries with client-server, web-based and mobile applications?