

Library automation in developing countries: the last 25 years

Abstract

Library automation has developed in the industrialised world over the last 25 years and progress in developing countries cannot be separated from trends worldwide. However there are different criteria for success in developing countries which are brought out in this review. Open Source has been hailed as a solution to the economic problems but there are still organizational problems to be surmounted. There is also the possibility to develop one's own system. Nigeria, Thailand and India are taken as case studies, illustrating different kinds of solutions that are available and various pitfalls. Predictions into the future are difficult. Internet bandwidth will improve in developing countries and open source may prove useful but economics may not improve and power supply problems are likely to remain.

1 Introduction

When *Information Development* was launched in 1984, library automation was, looked at from today's perspective, very much in its infancy. The largest libraries in the world such as the Library of Congress and the British Library had sizeable databases of catalogue records. University library catalogues were available on-line within their institutional four walls and library circulation was also automated, but data was generally confined to the institution that held it since there was no network resembling the internet. In 1983 the JANET network had begun to connect the universities in the United Kingdom, and some catalogues were beginning to be available online from other institutions. The most common way of accessing remote data if there was a possibility at all was by dial-up modem using ordinary phone lines and a modem or an acoustic coupler in which the phone handset was pushed into a rubber holder to ensure no extraneous noise seeped into the phone line when it was transferring electronic signals between computers. Businesses including libraries were also connected by dedicated phone lines to locations where their computers were located when they were remote. But most automation was firmly confined to the institution where it was based.

Twenty five years ago was also the beginning of the period when computers were being introduced as desk top computers, with IBM PCs and subsequently IBM PC lookalikes. Personal computers were about to make a huge impact on automation in libraries as no longer was it necessary to have a dedicated air-conditioned room to house computers.

In the early days cataloguers had to have terminals on their desks to enable access to the catalogue but eventually all staff had PCs for general administration so no longer was it the responsibility of the library budget to purchase desk-top computers.

Modems were in fact used to access remotely catalogues for bibliographical purposes, to search databases like Medline. It was already possible to dial up databases such as the British Library's BLAISE database or the US National Library of Medicine's Medline. But these facilities required good phone lines and were not available outside Western Europe and the United States. There was no such thing as 'full text' then. Computers did not

have the capacity to store so much data and data stored was often coded to ensure that it did not take up more space than was necessary.

25 years ago, while most libraries in industrialised countries had not only computerised their catalogues but also computerised their circulation, in developing countries there was very little library automation outside that organised by the United Nations agencies such as FAO's AGRIS and IAEA's INIS and these were very much in their infancy or in their planning stages.

To return to the situation in industrialised countries. In the early 1990's catalogues began to be accessible on the internet but were not web-based and required the catalogue software to be run interactively across the internet using various different protocols. By the end of the decade, true web-based catalogues using the power of hypertext were available. Libraries began to include in their catalogues digital resources internally held and externally held (predominantly external). MARC formats thenceforward incorporated a field 856 used to link to an external resource by means of a URL (the internet address). Users of the catalogue could click on a link and go straight to a digital resource that could be anywhere in the world. Subscriptions were possible to electronic journals but they were often not available in developing countries or if they were available the bandwidth of the internet in those countries was not enough to enable the materials to be read. Digital library software became available and UNESCO encouraged its implementation in developing countries by making Greenstone available free-of-charge, a digital library software package developed at Waikato in New Zealand. Links could be made from a library catalogue to material in such a digital library. Material available on the internet which might not be easily accessible in institutions in developing countries with low bandwidth could be downloaded or sent on CD-ROM to the digital libraries and hosted locally. The Soros Foundation set up eIFL (Electronic Information for Libraries) with the aim of creating national purchasing consortia[i]. They have since become involved in supporting other activities such as promoting library automation systems, mindful of the fact that without a catalogue of print and digital materials the library user cannot easily find out what is accessible. eIFL supported the European Union funded project to implement NewGenLib, a system under development in India, in Aleppo and Al Baath university libraries in Syria alongside providing them with licenses at a reasonable price to access electronic resources.[ii] INASP, the International Network for the Availability of Scientific Publications, was set up by the International Council of Scientific Unions (ICSU) in 1992. Aware of the need to establish good catalogues in order to access scientific literature, they have also participated in some library automation projects[iii]. The Andrew W. Mellon Foundation, well known for philanthropic projects in developing countries, is also supporting the development of a new library automation system at Duke University, the Open Library Environment (OLE)[iv]. Although there is no participation from developing countries at this stage it is likely that any open source package developed would be supported with necessary tailoring in line with the needs of developing countries wherever they might be different.

The main feature in the last 25 years then has been in the expansion of computers into every aspect of libraries. Possibly the biggest change has been the development of

digital libraries, acquiring, transforming or accessing data in digital format. In developing countries this methods of digitisation has taken place to a certain extent. However in order to keep this paper manageable we will not be discussing digital libraries in any depth.

2. Trends in the industrialised world

Library systems in developing countries have obviously developed alongside systems in the industrialised world. First we should look at systems for large institutions. The majority of library systems have been developed in the United States. Many commercially available integrated library systems were developed by universities for their own use and later made available to a wider audience. Dynix was one such, developed for a university library and later sold around the world to universities, public libraries and special libraries. Other systems were based from the outset on cooperatives, such as TALIS which originated as BLS, the system of BLCMP (Birmingham Libraries Cooperative Management Project) which was a cooperative set up with government funding in the 1960s. This project was one of two established from the beginning by OSTI, the UK Office of Scientific and Technological Information, to support cooperative cataloguing. They had less incentive to expand outside their country of origin as it was their aim to serve a cooperative all of whose members were equal. In 1967, the Ohio Colleges Library Centre was established to bring library automation to Ohio academic institutions by sharing costs. OCLC as it is now has developed from being a cooperative between libraries in Ohio to being an international cooperative, and at one time promoted a library management system. Then they ceased to support it returning eventually to the market by acquiring OLIB, an Oracle based library system. Its vision is to connect libraries of the world. Originally, as with BLCMP, it was a shared cataloguing system receiving records from participating libraries and adding them to a database which in turn could be used by member libraries to populate their own catalogues. Records were transferred between computers initially by sending large magnetic tapes, a thing of the past, from the Centre to the remote libraries. Later they were transferred by telephone lines and subsequently the transfer was done by a client computer, a PC in a remote institution, accessing the Centre's servers by the internet. Jumping to the present, OCLC have established Worldcat which could act as a large union catalogue for the world if every library in the world added its holdings. This concept is called Cloud Computing, on the basis that the computer is somewhere remote and no one knows or cares where exactly it is! To return to library systems established in individual institutions, VTLS (Virginia Tech Library System), another large library automation system, always had an interest in working with developing countries and have a large number of installations in the Third World after having expanded into Eastern Europe as well. Another popular system, Aleph, is based in Jerusalem surrounded by a number of developing countries some of which have considered installation though by far the largest share of the market is in Europe. As for cooperatives like OCLC, there has existed for many years in former Yugoslavia a miniature version of OCLC, COBISS (Co-operative Online Bibliographic System and Service), which since the break-up of Yugoslavia has expanded to include Albania and Bulgaria on the same basis as other ex-Yugoslav states[v]. They act as a cooperative cataloguing agency but they also keep data on research projects. This

institution would be a good model for other regions to adopt.

Now and again a commercial library system has been licensed to a developing country institution which has subsequently found it difficult to pay the maintenance fees. Maintenance in any case is often more expensive in a developing country because of economies of scale and distance from the supplier. Additionally there may be problems caused by shortages of foreign exchange. Now the internet reaches much of the world, distance is not so important. But there have been many instances of institutions retaining a package but not paying maintenance fees and therefore not updating it.

Marshall Breeding keeps records of as many library automation packages and the sites where they are used as he can find the information. He publishes the results each year in *Library Journal*. The latest was published on the web in January 2009[vi]. He reviews the market as well as providing statistics about library automation suppliers. This is a useful guide to make comparisons with developing countries. Unfortunately in his tables he makes only the distinction between the US and the rest of the world.

However he also includes a general review and this year he reported that the use of Open Source packages is increasing mainly bring provided by third parties. For example, a company called Equinox provides support for the Open Source package Evergreen.

3. Packages which have had an impact in developing countries

Large libraries in developing countries had always had a certain amount of access to library automation systems. For example, the National Library of Venezuela had a system found in many US academic libraries called NOTIS[vii]. However this library's catalogue is still not available on the web.

There is a list of national library catalogues with links hosted by the University of Queensland at <http://www.library.uq.edu.au/natlibs/>[viii]. It is possible to see which systems many of them have; for example Namibia uses WWWISIS and this is in the URL <http://209.88.21.39/wwwisis/OPAC/form.htm>. A number of countries in the former Soviet Union use IRBIS, the CDS/ISIS clone developed by the Russian National Library for Science and Technology.

But ordinary libraries, public and academic, in developing countries have always lacked a wealth of possibilities for library automation. Hardware used to be expensive, and relatively speaking is still expensive for developing countries. Other problems raised by writers on the subject range from the power supply to the problems of training staff. Another issue not often raised is the need for collaboration both within and between institutions to get library automation project off the ground and then maintain it. This is a much more complex activity than a pre-automation situation where there is a library card catalogue maintained by cataloguers and used manually by staff and library patrons.

Smaller systems than the ones developed for universities or networks have been developed which could be regarded as being similar sized to CDS/ISIS, for instance

Inmagic and Tinlib which is discussed below

Some of these were not very easy to use and were not well maintained. Others were adopted by consortia or organizations in the industrialised world with branches in developing countries such as the British Council. The main problem in developing countries has been support because of their remoteness and so those packages offering less support would be more attractive as they would be less expensive overall. This may well change in the future with the increase in the power of the internet and the next 25 years will surely see a difference in the availability of and the charges for support.

3.1 CDS/ISIS

CDS/ISIS has undoubtedly had a huge influence on library automation in developing countries. This author reviewed the package on its twentieth anniversary[ix] Time and again, libraries have begun automation. Below there is even a reference to a library which began with Tinlib and has migrated to CDS/ISIS. Since CDS/ISIS is well mentioned in the literature, concerning library automation in developing countries, it will not be covered here. However the most interesting feature which has become available over the last five years in CDS/ISIS is a Z39.50 import facility which is available as part of IsisMARC, and which enables MARC records from external sources to be downloaded into a CDS/ISIS database compatible with the version of MARC of the records.

CDS/ISIS is not essentially a library management system, rather a database management system aimed at bibliographic records which by their very nature are variable length (with for example book titles being of indeterminate length) rather than fixed length which is the case for most data processing systems. Because it is attractive to small institutions with little funding and because of its parentage (UNESCO), it has attracted a certain kind of institution, for example those in the development community.

UNESCO developed a DOS version in 1985 and a Windows version which was available for many years as a beta test version but was eventually released around 1998.

However libraries were already requiring to place their catalogues on the web and a number of organisations began to develop compatible web-based systems which could be used by institutions which were developing databases for in-house use on Windows or DOS versions of CDS/ISIS. The main developer of the official version was BIREME with WWWISIS but already others were available such as Webisis.

CDS/ISIS is no longer being developed by UNESCO but BIREME in cooperation with UNESCO is leading the development of ABCD on an Open Source basis. [x]

3.2 Tinlib

Tinlib was a package which was used extensively in British Council libraries. In Ilorin Nigeria it was used from 1996 as reported by Adewoye et al. (2001)[xi]. The library had by 2001 almost replaced its card catalogue by the OPAC. The paper was optimistic

about the future and reporting on the use of other electronic resources. However email and the internet were not then available.

However, TINLIB had its problems. It was not an easy system to use and contracts for it dwindled outside developing countries and it ceased to be supported. Adeyoyin describes in 2004 how the Development Policy Centre Library in Ibadan migrated their catalogue from Tinlib to CDS/ISIS.[xii]

4. Developing country scenarios

It is of course a fallacy to make assumptions that all developing countries will have approached and will approach library automation in the same way. The wealth of the country the distribution of that wealth and the culture of the residents will make a difference.

4.1 Nigeria and other African countries

We have already mentioned particular instances of library automation in developing countries. Nigeria has oil money and had automation early, being one of the first users of CDS/ISIS for mainframe computers. Already in 1989 Eytayo[xiii] could write a paper on the attitude of automated library system vendors to investing in Nigeria. Many respondents hoped to open an office and increase their marketing.

Enakrire describes a few instances in Africa where automation has been implemented, indicating that, except for branches of international organizations, it depends on the generosity of donors. In Makerere University in Uganda, the library has benefited from donor funding through the African Virtual University Library Initiative of the World Bank to equip the library with computers and installed Internet connectivity. Other university libraries are developing their information service as they are also benefiting from the Programme for the Enhancement of Research of (PERI) under the sponsorship of the International Network for the Availability of Scientific Publications (INASP). Through PERI, donors have paid subscriptions on behalf of libraries in Africa to access web-based journals[xiv].

The University of Ibadan had a long history of automation, having begun in 1979. Georgina D. Ekpenyong wrote in 1997 about the history so far.[xv] The University of Ibadan Library was already seen as a leader in Nigeria. At that time they used CD-Rom extensively to provide bibliographic data. They took training seriously but did not yet have an OPAC. In 2008, the John D. and Catherine T. MacArthur Foundation in Chicago awarded grants totalling US \$7.1 million to expand academic and research programme and strengthen staff development at two Nigerian universities as part of the Foundation's efforts to improve higher education in Africa.[xvi] The result is that they signed up to VTLS, Virginia Tech Library System, a commercially available package developed originally as Virginia Tech's own system.

4.2 Thailand

In Thailand there were efforts in the 1990s to computerise the libraries with foreign-based systems being purchased. Thammasat University library had Dynix, supported from Ameritech's Australia office, and planned to move to Ameritech's new system Horizon. In 1997 the university library sent three cataloguers to Middlesex University to learn to use Horizon. Since then they have implemented Horizon and exchange of experience took place between Middlesex University and Thammasat University until the Systems librarian at Thammasat moved to a different post around 2006. Many universities in Thailand are able to purchase these systems often through local distributors of international or American packages. Early on though, CDS/ISIS was used and at Thammasat University they used it for databases of journal articles.

4.3 India

India has for many years been known as a reservoir of expertise in computer programming. It would be therefore natural for library systems to be produced inside the country. Moreover, there is a need for multi-script systems, which is equalled nowhere though in Arabic-speaking countries they need, as well as Arabic, Latin and Cyrillic

LibSys[xvii] has been used around India extensively since 1995 and has both web and Windows interfaces. It handles Indian scripts in different proprietary ways including using GIST of C-DAC which is a chip which was important for computers before windows and Unicode. There is today additional 'Unicode' support in LibSys that facilitates handling of both international and Indian languages/scripts. It runs under WINDOWS (NT/2000/XP) and UNIX (various flavours). Besides its own proprietary database handling capabilities, any preferred industry standard relational database management system such as SQL Server, ORACLE, MySQL etc. can be used as well. Adherence of LibSys to standards such as MARC and Z39.50 makes it suitable for cooperative networking and resource sharing.

SOUL is a second system which has made inroads, particularly in the university sector since it has been developed since 1999 by INFLIBNET which is an institution under the University Grants Commission which provides computing and digital services to the higher education sector. This package also implements international standards such as UNESCO's Common Communication Format and MARC21. Staff from INFLIBNET have visited institutions in the United Kingdom to gain experience in how library systems are marketed and supported.

Both of these packages are supported in a similar way to commercially available packages in Europe and the United States. Neither has made any inroads into other countries.

Thirdly there is the NewGenLib system mentioned earlier which is a package which is being released as Open Source and has been developed by a team led by L Haravu who has worked extensively with United Nations agencies.

5. Options for developing countries

Developing countries depend on developments in the industrialised world but they do not necessarily benefit from the same options as the industrialised world can use. Moreover, some of the options may be much more attractive in developing countries or at least may seem to be so.

5.1 Developing a library system

One solution for organisations in developing countries which might have problems with paying organisations in foreign currency but which have good local technical staff is to develop their own software system. One interesting example of this is the University of Colombo in Sri Lanka. They had begun to automate in 1991 by using CDS/ISIS and then later adopted CDS/ISIS for Windows when it became available. In 2002 [xviii], Seneviratne and Amaraweera reported in *Information Development* that in Sri Lanka there was discussion on developing a library automation system to bridge the gap between CDS/ISIS and what commercial software was able to provide, such as Alice for Windows (UK commercial) and LibSys (Indian). In 1997 the National Agency for Research Energy, Science and Agriculture (NARESA) now the National Science Foundation, used the CDS/ISIS DOS version to handle acquisitions, cataloguing, serials management, Current Awareness Services as well as cataloguing and indexing; this package called PURNA was then used in 34 special and academic libraries. AGRIS using CDS/ISIS was widely influencing libraries in the agricultural sector and the Windows version was then used in the National Library of Sri Lanka for its union catalogue. Now they are using Genisis (203.115.24.86/wwwisis/ucat/form.htm), a package to make it easy to implement BIREME's WWWISIS on the web, development of which was undertaken in France by Pierre Chabet but for which a manual was written in Sri Lanka (partially a translation from the documentation in French) by Ms. Deepali Talagala Director/Information of the Sri Lanka Scientific & Technical Information Centre based at the National Science Foundation in Colombo[xix]

Seneviratne and Amaraweera discussed in their paper the features a system would need and the platforms, hardware and operating system, most used and as a result decided to make a prototype using MS Access on Windows. Development took two phases. Firstly a web-based interface to physically dispersed databases with a user-friendly front-end reported by Kumara et al in 1998[xx], and a library automation system described in a BSc dissertation by DMS Dilrukshi, 1999[xxi] *NetLib – a library management system through the internet*. In 2002 a prototype had been developed and the system was due to be maintained by the Computing Service Centre of the University of Colombo.

Unfortunately there is a high overhead in developing and maintaining systems especially for a small client base. In the UK all university libraries have commercial systems. Newcastle, used to have their own system in the 1980s but only Lancaster remained, eventually contracting with Ex Libris to take Aleph in 2001. By 2008 both the University of Colombo and the National Library of Sri Lanka had signed up to Softlink Europe's Alice system, a system used by the British Council worldwide (for example in Oman, Jordan and Sudan: the catalogue of the British Council in Sudan is available on the internet[xxii]) and so has proven maintenance in developing countries. So developing

one's own system is not to be recommended: Eyitayo noted that despite the availability of numerous off-the-shelf systems, most libraries in Nigeria that have attempted automation have chosen to commission expensive and time-consuming in-house projects, most of which have suffered severe set-backs and in most cases are not adequate for library work and often lack the capability for sharing information and interconnection with other systems[xxiii].

5.2 Open Source

In the context of moving towards commercially supported systems, it is interesting to see that CDS/ISIS was attractive to libraries in developing countries. It was available without charge and so there was no danger of not being able to pay for it. Of course it was supported by an organization with as much prestige though not so much turnover as many industrial companies. It also operated on a legal footing. Institutions had to sign a licence agreement to use the software. No doubt many institutions obtained the software illegally but the software was protected in law by the license agreement. UNESCO were more concerned with illegal copies being made and sold for illegal profit than with institutions using the software without being officially licensed since the spirit of the software following the ethos of the developer Giampaolo Delbigio was that it should enable institutions to participate in worldwide record sharing at many different levels. Nevertheless there was established a network of distributors which is still in place[xxiv]. Some acted merely as local distributors sending out the software on diskettes by post and thereby easing the burden of the hard-pressed office in UNESCO dealing with this. Other distributors were able to provide support usually of a limited nature though sometimes of a more extensive nature akin to the commercial support that is found in the large-scale library automation systems. The shareware movement was in place when CDS/ISIS was released in 1985[xxv]. In 1984, Andrew Fluegleman programmed a communications software package, PC-Talk and Jim Knopf a file management application called PC-File a year before the IBM PC was released and called it Freeware. The developers wanted to avoid commercial distribution networks and distribute the software over the now seemingly primitive and slow dial up systems whereby PC users could transfer programs by dialling up a central computer using a modem and phone lines. The idea was that users would download the software, test it and if they liked it make a small contribution to the developer to support further development. Knopf established the term freeware as his own and no one else could use it. There were other microcomputers around at the time, most notably the Apple Macintosh and others which are only part of history such as the BBC Microcomputer, though none ever reached the level of popularity that the IBM PC with the Microsoft Windows operating system has now reached. Incidentally Fluegleman distributed his software with the source code which led to many other developers producing their own versions and PC-Talk was improved and sold on by other developers such that Fluegleman lost control of it. Knopf however established a multi-million dollar company on the basis of PC-File. In 1983 Bob Wallace created PC-Write which became a well used word processor and was used extensively in developing countries. Because the word freeware was reserved he called it shareware. The concept was pretty much the same. Over the years, freeware and shareware became less used as concepts probably because the most used programmes for

business purposes were monopolised by Microsoft with the operating system and Microsoft Office applications. Shareware was in a sense reborn with the open source movement[xxvi]. It is difficult to see any difference between Open Source and shareware but the Open Source Movement has been supported from the outset by large foundations such as the Soros Foundation which founded the Open Society Initiative. In English “Open Source” means freely available source software which developers can use to advance the software in question. In all these cases, software developed is free though usually developers ask for a voluntary contribution. They cannot be sold on. Open Source does not necessarily mean free-of-charge but there is an implication that the availability of the source code will enable organisations to acquire and develop it for free. CDS/ISIS was no shareware or open source but many of the features of open source and shareware were responsible for the popularity of CDS/ISIS. For example, Open Source has the possibility for users with access to programming skills to make their own developments. CDS/ISIS has a feature of being able to write program exits which enable further development. Unlike open source the source code was not made widely available but UNESCO did make it available to BIREME in Brazil where further developments have taken place. Moreover, in the Soviet Union the Russian National Library for Science and Technology developed with permission from UNESCO IRBIS, a functionally equivalent package copied from the DOS version of ISIS.

The Open Source movement gained much greater political credibility than the earlier movements did and UNESCO came under pressure to support the movement. They now have on their website a Free and Open Source software portal[xxvii]. Because of UNESCO’s lead in this concept, CDS/ISIS came under pressure to be declared open source in the early 2000s. But the source code is still not available. This author believes it would lead to many different versions of the software that could generate records in databases that were no longer compatible with each other.

Moreover, Open Source is seen by some as the solution to some of the problems facing the library software industry. Is Open Source all it promises to be? Over the last few years there has been a spate of mergers in the library systems industry led by the equity market resulting in a trend to discontinue the development if not the support of library systems when a company has acquired more than one such package. This severely inconveniences the using institutions which have to migrate from one system to another. Would open source be a protection against this?

Open Source has become so much a fashionable option for library software that the International Federation of Library Associations and Institutions held a meeting in Senegal prior to the annual conference’s meeting in Durban South Africa. The proceedings are illustrative of the views on Open Source. The argument in Savard’s introduction goes that Open Source may help to smooth out the inequalities between industrialised and developing countries[xxviii]. The connection with commerce is weaker than with commercial software but it is not non-existent. In industrialised countries libraries often use third-party services to support Open Source. This means the connection with the commercial world strengthens. There is no way put from paying for support. The question is who pays and there is not much difference between paying a

developer or a third party. In the conclusion of these proceedings, Diop[xxix] feels there are clearly economic advantages to adopting an open source software solution but agrees that mastering open source software can take a lot of time and effort because library and information professionals are often isolated. User communities need to be built up to provide mutual help. However it remains to be seen what will be the impact of open source on library automation, particularly integrated library systems in the industrialised world. A pessimistic outcome might be that the institutions using such software feel no differently being supported by the commercial open source support companies than by the current range of commercial companies who promote systems they themselves own.

6 The current situation and future prospects

Making predictions is a very hazardous occupation in anything to do with computers since the future only tends to bring surprises. Developments in many developing countries are not as advanced as might be expected and in some places there is still a problem with electric supply: Adebibo (2008) reporting on usage of catalogues by students at the University of Ilorin in Nigeria stated[xxx]: "Most respondents [to a survey] claimed to know how to use the card catalogues and OPAC but only a few use them. The possible reason for this low level use of the OPAC is power outages, which have become the rule in Nigeria rather than an exception.

Overall, as the power of the internet increases, particularly its bandwidth and its reliability, library automation in developing countries will have the same capabilities as the industrialised world, but not the finance to support it. In developed countries it is felt by some that the future of library automation lies in open source (outside the control of commercial suppliers) or "Cloud Computing" (very much controlled by commercial suppliers who provide software on their own hardware and the clients access the data via the internet).

However if solutions to library automation are hosted services in the industrialised world, the suppliers of the service would be able to charge developing countries as little as they wish on the basis that every amount, however little, is profit. This has happened with hosted electronic journals where deals have been made by publishers to cover entire countries which are less than the license fee required for a university in the west. We will see if this happens. As with e-journals, it needs a champion like eIFL to promote to the suppliers the benefits of their working with developing institutions in what may be perceived as an altruistic way.

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