



FRAUNHOFER-INSTITUTE FOR MANUFACTURING ENGINEERING AND AUTOMATION

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# **OPEN SOURCE ERP**

**REASONABLE TOOLS FOR MANUFACTURING SMEs?** 

Enterprise system

Workflow management Implementation

Finance/Accounting Data services Project management

Customizable reporting Access control Human resources

# Enterprise resource planning

Process preparation Customer relationship management
Manufacturing Transactional database Configuration Extensions

Management portal Supply chain management

Business intelligence system

Customization

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The Fraunhofer Project Center for Production Management and Informatics (PMI) is a common endeavour of Fraunhofer IPA, Fraunhofer Austria, and MTA SZTAKI. PMI that was established in 2010 offers its applied R&D and consultancy capacities, including services in selecting and implementing ERP, PPC, APS and MES software, furthermore, developing, installing customer-specific, tailor-made solutions in the fields of

- production planning and optimization,
- design and management of co-operative production networks,
- order management in the production and service industries, and
- real-time, responsive production scheduling and control.

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# **OPEN SOURCE ERP SYSTEMS**

#### 1 Introduction

Nowadays, information technology is unavoidable in every part of life and business management is also not an exception. One of the most widespread solutions is the use of enterprise resource planning (ERP) systems that has proved to support the integration and automation of the processes, the improvement of the performance, and the reduction of costs. Yet, several mostly small and medium enterprises (SME) cannot afford the time, the uncertainty and the resources that are required by the implementation of an ERP system.

This paper provides a brief overview of the functions, implementation steps, benefits and difficulties of these planning systems in general, as well as a catalogue of open source ERP systems. The descriptions of the systems are guided by common criteria that help the comparison of the different solutions. This study is intended to inform IT practitioners and managers about the existing open source planning systems and support the software selection.

### 2 General overview: ERP systems

The concept of customer-orientation has gained greater importance in the last few decades of global competition, requiring very quick or instantaneous responses to market changes. The ability to consistently meet customer expectations can be supported by improving the overall organizational efficiency through integration and automation of the value chain. This kind of automation is only possible through standardization and integration. Looking at the different business functions separately and supporting them with completely isolated software systems, however, makes the continuous improvement process difficult or even impossible.

Enterprise Resource Planning systems are standardized, integrated applications to facilitate the information flow between the business functions of an organization and to manage relations with partners in a unified way. A good ERP solution must provide wide functionality that often covers several business areas of an enterprise. For this reason, most systems are designed in a modular way to allow users to combine the required components. Every component uses a common database for increasing data consistency and assuring communication across departments. A further requirement is that ERP systems should support standard best practice processes and, above all, provide flexibility and customizability, since every organization has its own unique conditions to be considered and respected.

#### 2.1 Functions

The traditional functions of enterprise information systems cover the operational tasks. The common characteristics of these are the focus on short- or medium-term, mostly daily decision making and control. These tasks need very detailed and accurate data, and due to its dynamic nature, real-time tracking of changes is required. The advantages of the operational functions are that they can be relatively easily automated, or at least supported and administered by appropriate software modules. The typical functions of this type concern financing, controlling, human resource management, assets management, procurement, inventory management, warehousing, distribution, production planning, marketing, sales, customer service, maintenance,

workflow and document management. Furthermore, several industrial sectors have their own specific processes, therefore some ERP systems provide standard modules for their demand. Such components are frequent for industries like automotive, pharmaceuticals, chemicals, retail, wholesale, banking and insurance, just to name a few.

Besides the automation of the daily operational work, the ERP systems also support strategic and project management. These tasks usually involve long-term planning that are difficult or impossible to automate. Therefore the systems' functionality aim rather at supporting the strategic planning and facilitating decision making by providing high level reports about operations, performance and trends. These tasks are based on aggregate information instead of detailed data that is generated by sophisticated data mining and business intelligence tools. The realization or execution of the strategic plans can also be tracked by measuring performance indicators, and creating specific scorecards and reports.

The most advanced ERP systems cover not only the inter-organizational processes, but also support e-business functions, i.e., functions for connecting the company to customers and suppliers. Two different types are the business-to-customer (b2c) communication—where a human customer is interacting with the ERP system in a controlled way—, and business-to-business (b2b)—which necessitates interfaces between the different IT systems. The main possibilities of e-business are as follows.

- The Customer Relationship Management (CRM) helps the registration of customers, the marketing (e.g., sending newsletters, direct marketing emails), sales process and even customer service.
- The Supplier Relationship Management (SRM) provides functionality for registering the suppliers, evaluating them (e.g., according to the prices, service levels, quality, capabilities, etc.), which can be a basis for supplier selection.
- The Supply Chain Management (SCM) helps coordinating both the material and the financial flows across the supply chains.
- The e-commerce function can automate the sales process including order management and invoicing both for b2b connections and for b2c customers by maintaining a webshop portal. It can also automate the procurement by generating automatic orders, receiving invoices and initiating payments.

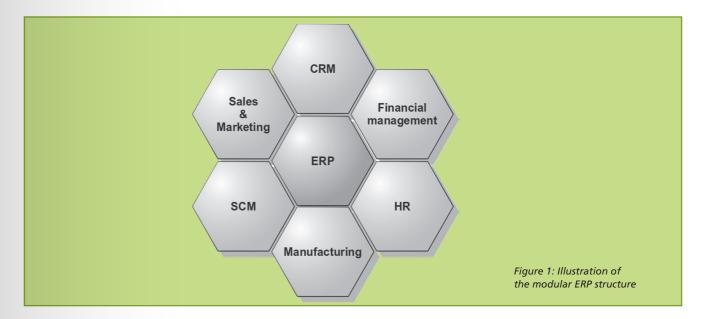
#### 2.2 Main components

Different ERP systems have different capabilities and functionalities, but in general they provide the following modules.

- Financial Management: e.g. accounts payable, accounts receivable, fixed assets, general ledger, cash management, banking, invoicing, budgeting and consolidation.
- Human Resource Management (HR): e.g. recruitment, benefits, compensation, training, payroll, time and attendance, labor rules and people management.
- Customer Relationship Management (CRM): e.g. service, commissions, customer contact, call center support and after sales support.
- Manufacturing: e.g. engineering, resource & capacity planning, material requirements planning (MRP), workflow management, shop floor management, quality control, bills of material, manufacturing process, production orders, scheduling, cost management, manufacturing projects, activity-based costing and product lifecycle management.
- Data Warehouse: e.g. Reporting, business intelligence.

- Supply Chain Management (SCM). Inventory management, supply chain planning, purchasing, product configuration, inspection of goods, commissions, supplier scheduling, claim processing, sales order administration, procurement planning, transportation and distribution.
- Sales & Marketing: e.g. pricinf, contact management, e-marketing, campaign-management

Often, functions like project management or data warehouse management are integrated as well.



#### 2.3 Implementation

Implementing an ERP system is a very complex and difficult task that often takes years—depending on the business size and the degree of required customization. The main steps of implementation are as follows:

- 1. Preparation and project planning. It is very important to set up an appropriate project team and appoint a responsible project manager. Before choosing the ERP system, the goals of the implementation project are to be defined, including both the desired functionality and the data to be collected. Possible ERP systems have to be inspected; feasibility studies and return on investment (ROI) calculations support the preparation phase. At last, a comprehensive project plan is prepared.
- 2. Process design. After implementing the system, completely new business processes are usually required that affect both staff and IT infrastructure. The change in the processes has to be properly prepared by applying business process re-engineering (BPR) methodology. The processes may necessitate special configurations or even customization of the chosen ERP.

- 3. Data integration. Since one of the main advantages of the ERP systems is the common, broad and consistent database, the necessary data are compiled and integrated from the separate sources. If necessary, interfaces to legacy systems are to be developed applying enterprise application integration (EAI).
- 4. Training and testing. In this phase, users are given access to the system and are trained how to use it. The functions of the system are tested.
- 5. **Usage and evaluation**. After the go-live, the implementation project has to be evaluated and the system regularly monitored, maintained and updated.

Since the implementation process is so complex, the implementing company usually cannot do it all alone. In most cases, they resort to the help of some vendor or consulting company expert in ERP implementation. The most common services are as follows:

- Consultancy. Consultants mainly help in preparing the implementation, but they may also assist in BPR and training.
- Customization. In many cases, the ERP system needs some degree of customization in terms of user and data interface or program code.
- Support. This affects the maintaining of the live system, as well as assistance and troubleshooting for the users.
- Application Service Providing. Some providers undertake the hosting of the system and provide the service for a monthly fee.

#### 2.4 Benefits and pitfalls of implementing an ERP system

Implementing an ERP system entails a number of advantages but also difficulties. It is beneficial since most systems were designed on best practices, so that adapting them usually results in improved productivity and performance. The new processes focusing on the value chain improve the customer service. Due to the integrated database, the data consistency is enforced; there is also no need for synchronization between separate applications. The ERP systems increase data visibility and transparency, and facilitate effortless communication across departments.

On the other hand, implementing an ERP system is a long process, and during implementation the performance of daily operations can worsen since necessary resources are withdrawn from them. There are risks involved in the new business processes, and even if they are well designed, they may generate resistance on the part of the staff. Customization is often limited and, in addition, might be too difficult and costly. A system threatens to become rigid and inflexible if a function is not covered by any module and if the system is difficult to extend. The expenses including the cost of the application, regular updates, necessary IT infrastructure, consultancy and customization are definitely high; it is therefore difficult to exactly plan and calculate the ROI. Once an ERP is implemented at a company, it is difficult to switch due to the large investment. Another risk involved in the support is that the vendor may cease to exist or that it could be bought up or change its fields of activity.

#### 2.5 Outsourcing ERP

Outsourcing means that an organization delegates the fulfillment of a business-related service or activity to an external provider. The main reasons for outsourcing are as follows:

- **Economic reason**. The outsourcing decreases the operational costs.
- Strategic reason. The organization can better focus on core competencies.
- Technological reason. The specialized external provider usually owns more advanced technology and expertise.
- Organizational reason. There is no internal resource to fulfill the given function.

In the IT world, the software as a service (SaaS) model is a frequent form of outsourcing, where an application service provider (ASP) provides access to an application, in most cases over the Internet. The payment usually consists of a monthly fee, based on the number of users and the required functionality or software modules. In this model, the provider is responsible for maintaining the hardware infrastructure, updating the software and providing the appropriate service level. This way, clients do not have to maintain dedicated IT infrastructure and departments, and the monthly service fee instead of a large initial investment also simplifies financial planning. SaaS model has become popular for several business applications including EPR systems, e.g. SAP ByDesign.

#### 3 Open source software

Today, open source software is competing on a par with traditional proprietary applications, offering affordable solutions for users with limited budgets. This kind of software is distributed for free, and only the related services and added value features, such as installation, customization, training and technical support are charged for. Open source applications such as web browsers (e.g. Firefox), e-mail clients (e.g. Thunderbird) or multimedia software (e.g. VLC media player, GIMP) have become very popular among home users for their moderate costs and reliability. But also business users apply several open source solutions, such as the market leader Apache web server, the GNU/Linux operating system, the MySQL database or the OpenJDK Java development environment, just to name a few.

The history of open source software started with the free software movement in the 1980s in response to the commercialization of software development. To give an organizational frame to the movement, the Free Software Foundation (FSF) was founded, which used four criteria to define free software (verbatim from [9]):

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works, and change it to make it do what you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Later, the name "free software" has been highly criticized due its ambiguity: as the definition suggests the term "free" refers to the concept "freedom", however it can also express "gratis" or "free of charge" which is not the intended meaning. Therefore the name "open source" was suggested instead, and in the late 1990s the Open Source Initiative (OSI) was founded that gave a new definition to this name (see Section 3.2). With the emergence of the new principle, the emphasis has shifted from

the philosophy of freedom to a public, collaborative development model. Until that time, free software was considered to be the toy of keen amateurs, but the new idea of the development process slowly became popular among professional software companies, too, starting with Netscape (Mozilla), followed by Sun Microsystems (now subsidiary of Oracle) (Java platform, MySQL, OpenOffice, VirtualBox), Novell (openSUSE), Adobe Systems (Flex) and Apple (Darwin), etc.

It is nearly impossible for a simple outsider to distinguish free from open source software because the differences are very slight. However, one should keep in mind that the majority of free software is open source and vice versa, although there are some exceptions. In order to avoid ambiguity and provide a general term, the name Free/Libre/Open-Source Software (FLOSS) has been proposed recently.

# 3.1 Open source software development

Open source software is often developed in a public, collaborative way, i.e. groups of developers and users are cooperating. This idea is similar to the one used in the "Web 2.0" world, where information providers and consumers are not differentiated, as with Wikipedia.

The value creation of open source projects contains two different processes: producing (i.e. to create the content) and filtering (i.e. to compile the product releases). Both processes can be done either openly so that anybody can contribute, or in a limited manner. When talking about software, the filtering process is usually limited to a coordinator. The remaining possibilities are the so-called cathedral and bazaar models. In the former one, the development is done by an exclusive group of developers and the source code is only open for the releases, while in the bazaar model the development is completely open, which enables more extensive experimentation, testing, and quicker finding and fixing of the program bugs.

The bazaar model is the most widespread development form of open source software, which has several advantages over the cathedral approach. Since the users are involved in the development, their requirements are considered more quickly, the testing is more comprehensive and the group of developers is not restricted. The contribution of the developing community instantly appears in the current development version of the software, while in order to avoid the risk of using untested code, stable releases are issued from time to time.

Applying the open development process has several benefits, but some risks as well. If a large developing community works on a software, it is more likely to be well tested, bug-free, i.e. more reliable and secure, and sometimes it even provides better performance and functionality compared to "closed source" proprietary applications. The continuity of the system is also steadier, since a community cannot go bankrupt like a software company, which would cause the termination of the software support. On the other hand, there is the risk of disagreement in the community, which can lead to a project forking, i.e. continuing with two separated projects. This results in the fragmentation of the community, fewer developers and less collaboration.

#### 3.2 Definition and software licenses

The OSI uses 10 criteria to define open source software (verbatim from [10)]:

- 1. Free Redistribution. The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.
- 2. Source Code. The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.
- 3. **Derived Works**. The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.
- 4. Integrity of The Author's Source Code. The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.
- 5. No Discrimination Against Persons or Groups. The license must not discriminate against any person or group of persons.
- 6. No Discrimination Against Fields of Endeavor. The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.
- 7. **Distribution of License**. The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.
- 8. License Must Not Be Specific to a Product. The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.
- 9. License Must Not Restrict Other Software. The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.
- 10. License Must Be Technology-Neutral. No provision of the license may be predicated on any individual technology or style of interface.

A software license can only be called open source if the OSI approves that it conforms to the above criteria. There are several different licenses enumerated on the OSI homepage, but the most popular ones are briefly compared in the following table.

License	Combine with proprietary software?	Combine with other soft- ware and redistribute?	Change the code and redistribute?
GNU General Public License (GPL)	No	Yes (if the whole soft-ware is distributed under GPL)	Yes (if the software is distributed under GPL)
GNU Lesser General Public License (LGPL)	Yes	Yes	Yes (if the software is distributed under LGPL or GPL)
Apache License	Yes	Yes	Yes (but "Apache" cannot be used in the name of the modified code)
BSD License	Yes	Yes	Yes
Mozilla Public License (MPL)	Yes	Yes	Yes (if the software is distributed under MPL)
MIT(X11) License	Yes	Yes	Yes

None of the above licenses exclude the commercial application of the open source software. Apache, BSD and MIT are the most permissive licenses, whereof MIT is the most popular one due to its simplicity: its text only consists of three short paragraphs. The GPL is the most restrictive, so-called "viral" license that means any software containing even a portion of a GPL-licensed software must be GPL-licensed itself. This property of GPL becomes important at the dual sourcing business model (see Section 3.3). LGPL is a transition often used by software libraries that can be freely used in other software, if the LGPL-licensed part remains unchanged.

#### 3.3 Business models

As we have seen, the open source development model has several advantages compared to "closed source" development. But the ultimate question for business companies is how to make money with open source? Several business models have evolved to ensure profitability. Here, we only mention the most widespread ones.

- Dual licensing. The most frequent model for developer-oriented applications, when the same software is offered freely with GPL and a commercial license. Due to the viral property of GPL, any derived work should also be licensed with GPL. If somebody wants to deviate from GPL, he or she must buy the commercially licensed software.
- Open core (or split open source/proprietary). In this model, there is an open source basic version of the software, and a commercial one with additional functionality. The most widespread license for this type of model is MPL, which was explicitly

- designed for this purpose. The difficulty of this approach is that the basic application should be useful in itself, while the commercial one should also be attractive for the users.
- Selling services. In this case, the company offers services such as training, consultancy, selection, customization, integration, and support and charges only the added value. A possible drawback of this model is that competitors can easily provide similar services for lower fees.
- Indirect revenues. The developers expect revenues from other products not directly connected with the open source code.

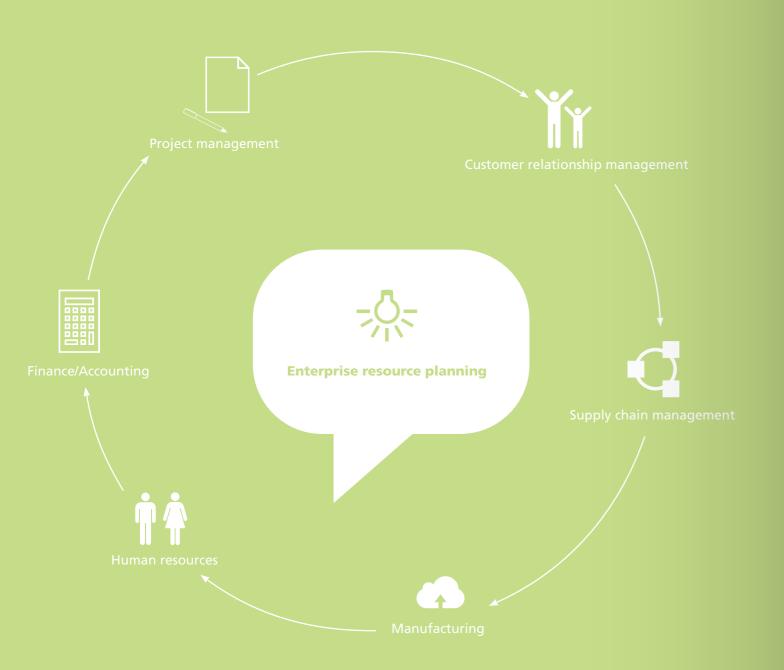
  The most well-known example is providing open source driver software for hardware instruments.
- Partnerships and donations. Some open source projects are funded by business partners or accept donations. An example for such a partnership is the Mozilla Firefox web browser, which contains built-in search engines due to the sponsorship of Google and other companies.

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<sup>&</sup>lt;sup>1</sup> ERP Systems in Hungary in the 21th Century.

<sup>&</sup>lt;sup>2</sup> Openly, too.



# 5 Study on "Open Source ERP software"

# 5.1 Objective

ERP systems for resource planning and process optimization are widely used, especially in large companies. However, among small and medium-sized companies (SMEs) the demand is also growing for software-supported tools to efficiently plan corporate resources and to analyze and improve business processes. Here, an additional range of free software has emerged over the last few years. Due to their flexibility and economies of scale, ERP systems without license fees can be an alternative solution to existing proprietary systems.

The main objective of this study is to research the market and compile a current list of existing open source ERP systems (focusing on systems suitable for manufacturing enterprises). By defining uniform criteria and describing the systems, it is possible to give a general overview. Focusing on the German and Hungarian market, the following systems were identified to be described below:

- ADempiere
- Apache Ofbiz
- AvERP
- CAO-Faktura
- Compiere
- Limbas Lx-Office

- OpenERP

Openbravo

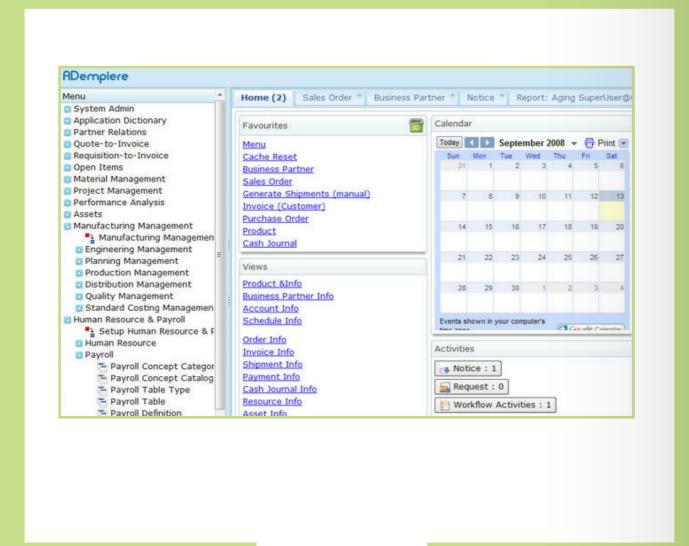
- Opentaps
- SQL-Ledger
- Tryton
- WebERP
- xTuple ERP

# **5.2** Definition of criteria for system description

Since open source systems fundamentally differ from proprietary systems, the criteria to evaluate such systems need to be properly adapted. In addition to general information, there are criteria included that evaluate the

- functionality
- flexibility
- support
- continuity
- maturity

of the systems. A list of systems and the associated criteria can be found in chapter 5.5.



# **5.3** Description of the systems



#### Adempiere

Year of development	2006
Website	www.adempiere.com
Functions	Sale Management, Purchase Management, Materials Management, Accounting, Manufacturing Management, Reporting, Project Management, Promotion & Pricing Management, Order Management, CRM
License	GPL
Programming language	Java

The Compiere derivative has been available since 2006. A registered association functions as main developer and undertakes the marketing of the system. Like Compiere, this system is Java-based and licensed under GPL. Adempiere is listed by SourceForge among the "10 most active ERP projects", which is a sure sign for permanently updated software and active participation. The system also runs on Linux and Windows but unlike Compiere provides browser support even without proprietary license. The system is built on Oracle (XE) and PostgreSQL databases. Adempiere is multi-lingual, but does not support different currencies. It uses EDI or .CSV documents to import data into the system. Output is ensured by .CSV, .HTML, .XML, .PDF formats, as well as DATEV and EDI.

The system provides more or less the same features as Compiere and, on top of it, has an extensive manufacturing solution integrated into the software, which needs not be purchased separately. Functions such as Procurement, Analysis, Reports and Project Management are included. Other functions are: Sales, eCommerce, CRM, HR, Finance, Invoicing and Project Management.

Support can be requested only from an IT service provider, who also provides further training courses, etc. Support ranges from software configuration to maintenance and personalization. Minor problems are covered by a comprehensive wiki, various manuals, FAQs, HowTos, and a several books.



## Apache Ofbiz

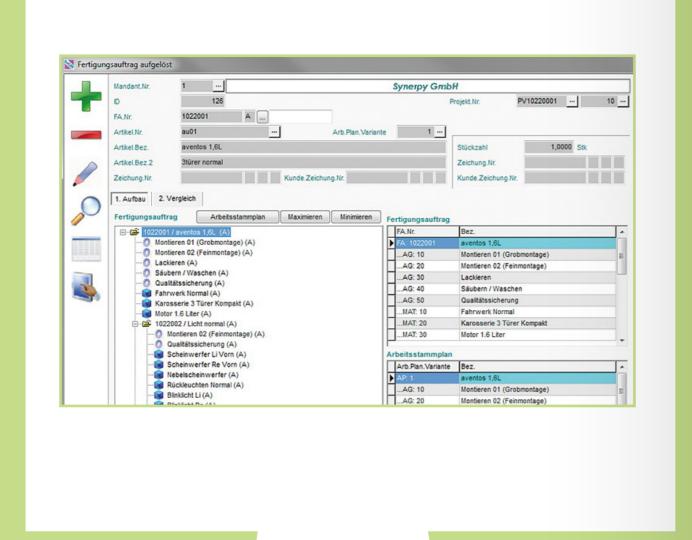


Year of development	2010
Website	ofbiz.apache.org
Functions	E-Commerce, Catalog Management, Promotion & Pricing Management, Order management, CRM, Warehouse Management, Accounting, Manufacturing management, Project Management, Content Management, Point of Sale
License	Apache License 2.0
Programming language	Java

The development of Ofbiz started in 2001 and is a project of the apache software foundation. It is based on Java, released under the Apache license and compatible with Microsoft and Linux, operating systems and also offers a browser UI. The general graphic design of the software is pretty weak and user-unfriendly with poor menu navigation. On the other hand, it offers sophisticated customization and a very flexible architecture allowing the individual programming of program parts. As databases are used Oracle and PostgreSQL, as well as MySQL, MS SQL, Sybase and DB2. The .CSV and .XML formats are available for data imports and exports.

Apache supports Order Management, Manufacturing, Purchasing, and Material Management. Other functions include the integration of eCommerce, Catalog Management, Promotion & Pricing, CRM, Warehouse Management, Accounting, Workload Management and a POS solution, but is mainly used by webshops (according to the reference list).

The developers do not provide support. The support by IT service providers is more comprehensive: Apart from training courses and seminars, they offer mailing lists and even a YouTube channel introducing the software functions. Documentation is also taken care of by means of books, an online documentation and a wiki.



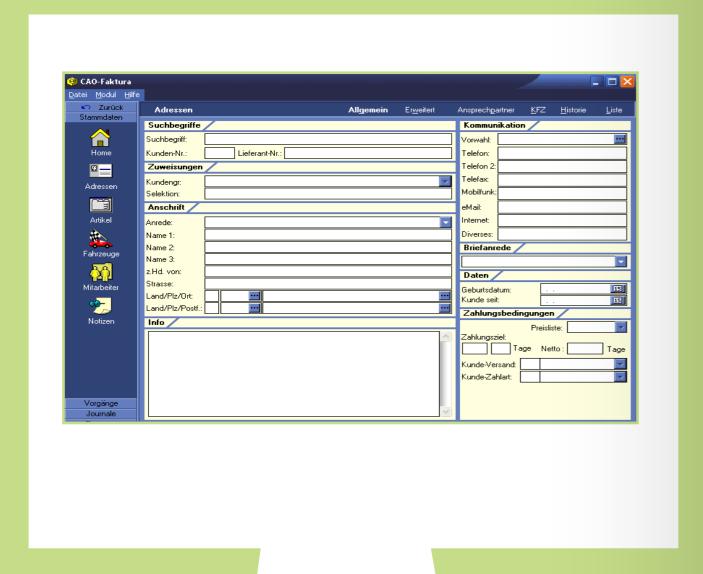
AVERP

Year of development	1998
Website	www.averp.de
Functions	Materials Management, Logistics, Manufacturing Management, CRM, Project Management, Document Management, Human Ressources, Point of Sale, E-Commerce
License	
Programming language	Delphi

Since 1998 the software has been developed by the German company Synerpy. It is based on the Interbase SQL database and written in the Delphi programming language. The program can only be run on Windows, but by using emulators such as Wine, it is also compatible with Linux, etc. The software IBExport is used for data import and export (Excel spreadsheets, etc.). The website gives an overview of the separate functions of AvERP. More than 12,000 forum entries demonstrate an active involvement of community and users. The system was specifically designed for SMEs.

The software offers the essential functions of current ERP software: Order Management, Purchasing, Material Management, and manufacturing functions such as planning, batch management, BOM explosion number management, orders, and production order planning. This is complemented by important features such as Bar Code Management, Sales, Project Management, Information Systems, Complaint Handling, Warehouse Management, CAD, etc.

Synerpy GmbH offers software support services by which they are mainly financed. Support includes installation, free upgrades, training courses and workshops, and customization. The support agreement defines that services are only paid on demand and requires no annual fees, making it particularly attractive for small companies. Besides, the online shop offers various versions of detailed manuals for sale.



#### **CAO-Faktura**

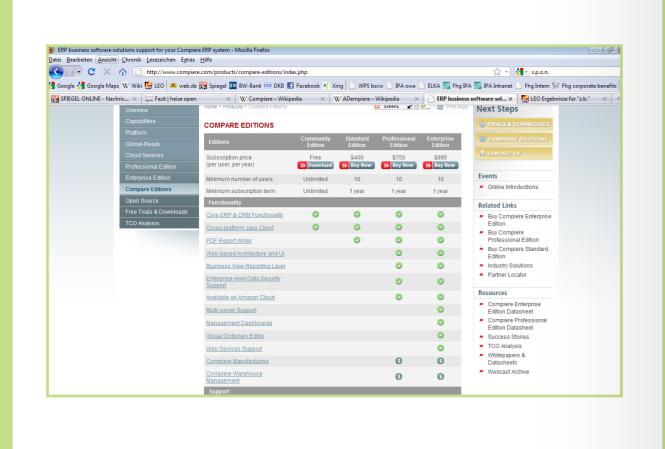


Year of development	2003
Website	www.cao-faktura.de
Functions	Accounting, Invoicing, Finance Management
License	GPL
Programming language	Delphi

The development of the Delphi-based program started in 2003. It is released under the GNU license and only runs on Windows. MySQL is used as database. CAO allows administering multiple currencies and clients. In addition, it offers a cash desk solution and is network compatible. However, it provides no interfaces to other programs, except by importing and exporting data with the .CSV format.

Since the system is specifically designed for small companies, it holds no manufacturing functions but offers Order Management, Purchasing, and Material Management, as well as other essential functions such as Warehouse Management, Accounting, Finance and order-based Invoicing.

Developers as well as IT service providers offer support services such as implementation, installation and maintenance. Seminars and training courses are only held by IT service providers. The software documentation includes an easy-to-understand explanation of the individual functions and how to operate the software.



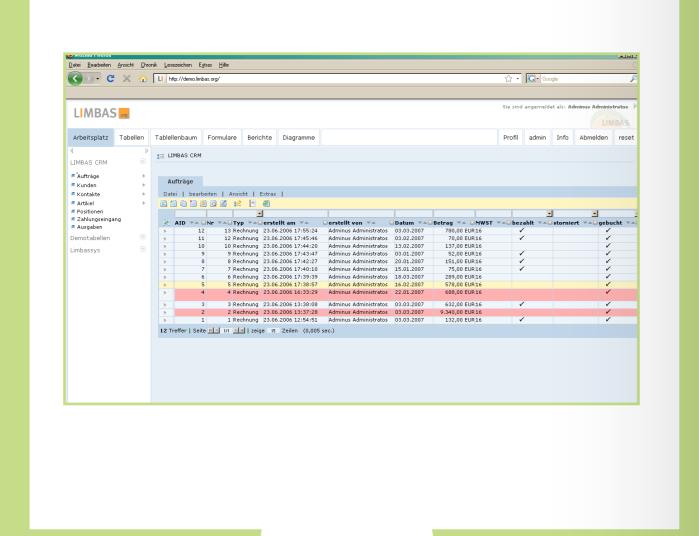
Compiere Compiere

Year of development	1999
Website	www.compiere.com
Functions	Financial Management, Materials Management, Purchasing, Order Management, Manufacturing, Warehouse Management, Projects, Sales, E-Commerce, Point of Sale, Performance Management
License	GPL
Programming language	Java

It has been developed since 1999. Most of the system is released under GPL, but there is also a Professional Edition available which is purely proprietary. The Java-based software runs on Linux and Windows systems; a browser client is only available for the Professional Edition. Oracle is used as database. Its wide range of functions makes Compiere a comprehensive system. It is multi-lingual, multi-currency and multi-client capable.

With a view to security, the system is equipped with data encryption and a data-/role-based security system. To import data the program uses .CSV and .XML formats. Data output uses .CSV, .HTML, .DOC, .PDF, .PS, .TXT as well as .XML formats. Various SQL tools and even cloud services can be used.

Compiere provides the important functions of ERP software: Purchasing, Material Management and Order Management. Some manufacturing functions are available, a wider range (also many other functions) is reserved for the Professional Edition. Both developers and IT service providers offer software support, the community offers a wiki. There are some forums available, but not used frequently (e.g. last forum entry in the German forum in 2005). Also the "news" are updated frequently only until 2009.



Limbas

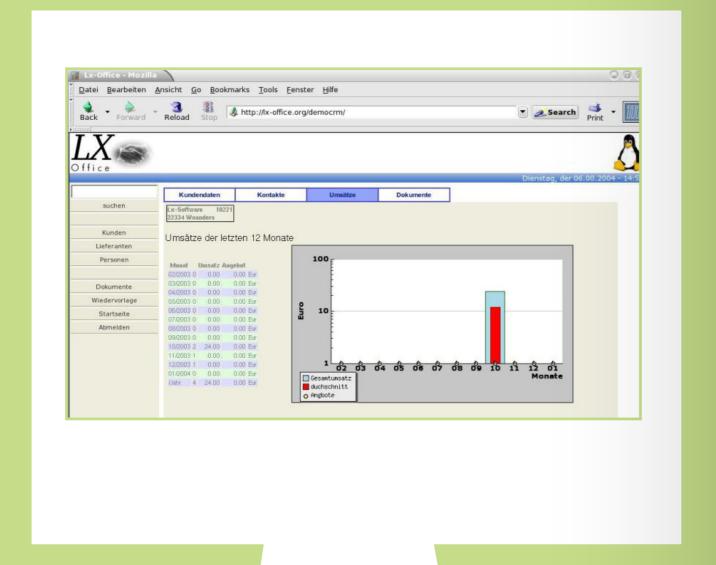
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Year of development	2006	
Website	www.limbas.org	
Functions	Webshop, CRM, Content Management, Project Management, Human Ressources, Callcenter, Workflow	
License	GPL	
Programming language	РНР	

Since 2006, Limbas software has been mainly developed in Germany by Limbas GmbH. The Apache and PHP based software is distributed under the common GNU license and only works on Linux, Unix and Solaris. As databases are used MaxDB, PostgreSQL and SAPDB. The program provides an easy-to-handle UI and operates at high performance, which enables it to run even on underperforming computers in a stable manner. By downloading add-ons, the software can always be expanded. Customizing the UI is very easy, for example to fit corporate identity. With a view to security, Limbas provides an efficient rights management system, encryption and a proxy system able to fend off external attacks.

The software offers no manufacturing functions but the important features of Order Management, Purchasing, and Material Management. Other functions are partly integrated and partly to be implemented via add-on: Webshop, CRM, HR, Call Center, Workflow, and Project Management.

Since the development and distribution of Limbas is undertaken by a GmbH (= company with limited liability), the latter is also responsible for programming the add-ons. Anyhow, there is already a wealth of system extensions available. The development team provides support for hosting, implementation, and remote maintenance. Training courses and seminars can also be booked. A comprehensive manual can be consulted for minor problems.

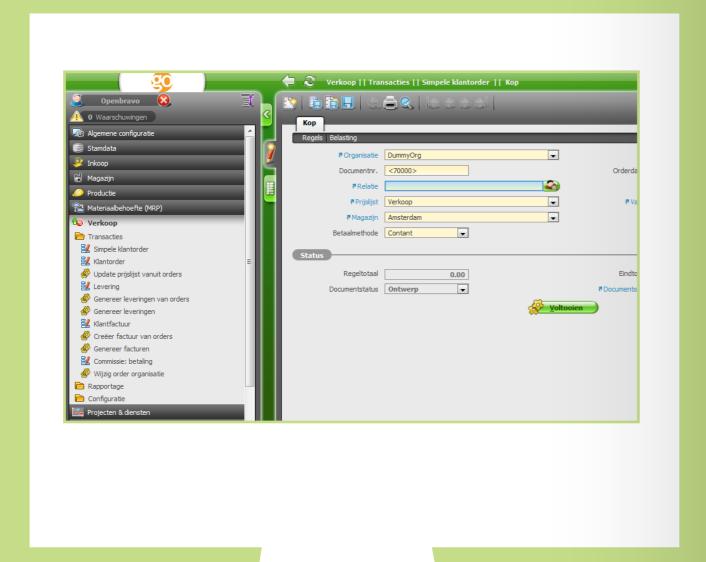


Lx-Office PLx-Office

Year of development	2003
Website	www.lx-office.org
Functions	Invoicing, Accounting, Supplier/Customer Management, Point of Sale
License	GPL
Programming language	Perl, PHP

Lx-Office is based on SQL-Ledger and concentrates on the German market. The system is divided into two big units: the ERP system written in Perl and the CRM system based on PHP. As a result, the two functions cannot be directly connected, leading to compatibility problems. The OS server is exclusively designed for Linux and the browser of the computer suffices as client. PostgreSQL and SAPDB are used as databases. The system provides an interface to DATEV software. For exporting data, Lx-Office uses .CSV files and the DATEV file format. The system is very open to community suggestions and contributions and interested in business partners.

Lx does not provide any manufacturing functions There is a POS solution, Invoicing, Accounting, and CRM. The developers provide support only via mailing lists and forum. For further support you need to turn to IT service providers, which offer complete packages including consulting, installation, implementation, hosting, seminars, and customization. For instant support, a detailed e-book is available.



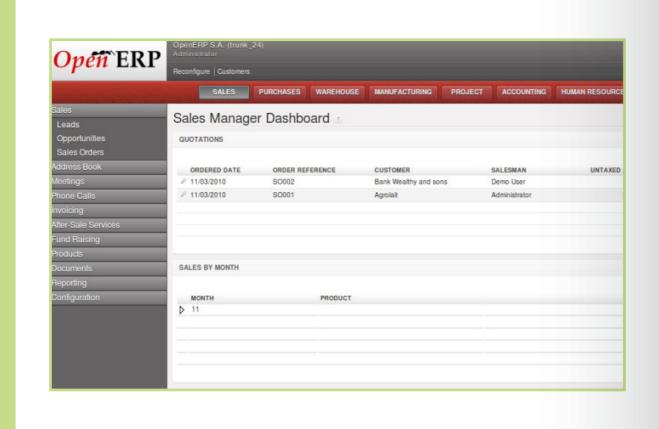
Openbravo openbravo

Year of development	2001	
Website	www.openbravo.com	
Functions	Master Data Management, Procurement Management, Warehouse Management, Project and Service Mgmt, Production Management, Sales and CRM, Financials and Accounting, Business Intelligence, Point of Sale	
License	Openbravo Public License	
Programming language	Java	

The system has been developed since 2001 and is based on Java.. The server works on Linux, Windows and MacOS. The client software is independent of the operating system and exclusively started by browser, which makes it very user-friendly and, in general, allows offering a very advanced UI. The software is released under a specially developed license based on the Mozilla Public License. Openbravo supports Oracle and PostgreSQL databases and uses .CSV files to import and export records. Apart from a high security level (https, role-based access level), it offers multi-lingual, multi-currency and multi-client compatibility. The advantage of the software is that it distinguishes versions depending on company size and number of employees.

Openbravo offers a wide range of functions. It provides standards such as Order Management, Purchasing, and Material Management, but also useful manufacturing functions: production planning, stock levels, cost centers, calculation of manufacturing cost, tool management, project and service management, procurement, product categories, and bills of material. Other functions such as Accounting, Sales and Warehouse Management are an integral part of the program.

Developers and IT service providers offer 365-day support. There is also the option to establish a maintenance contract to resort to professional help at any time. In addition, seminars for users and system administrators are offered to quickly get accustomed to the program. The documentation of Openbravo is freely available and comprehensive.



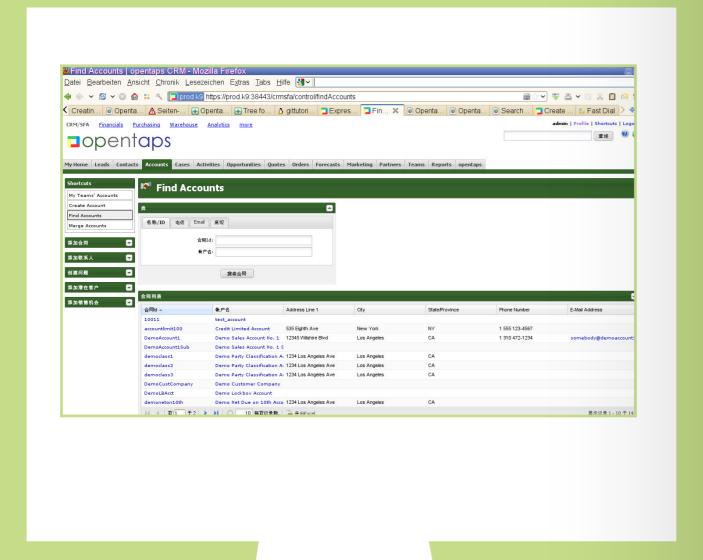
OpenERP OpenERP

Year of development	2005
Website	www.openerp.com
Functions	CRM, Purchase, Manufacturing, Warehouse Management, Project Management, Accounting, Human Resources, Marketing
License	AGPL
Programming language	Python

The development of the software started in 2005, and it is distributed under the *AGPL* license. The headquarters of the main developers is in Belgium, but German IT service providers are also listed on the website. The exact number of developers is not indicated on the website, but the more than 70,000 contributions and current entries and a community with 1.000 individuals make it clear that quite a lot of people take an interest. The Python-based system can be run on both Linux and Windows servers. The system also offers a browser client and accordingly a Web GUI. It is based on a *PostgreSQL* database. For import and export the. CSV format is used.

The system includes the important functions of ERP software: Purchasing, Material Management, Order Management, and Manufacturing. The manufacturing functions comprise, for example, resources (both human & material) and the creation of a master file which informs about the amount of raw material consumed and the individual semi-finished products. In addition, the production process can be planned (order prioritization, schedules) and controlled (procurement). Other functions include HR, CRM, Warehouse Management, Project Management and Accounting.

Regarding support, OpenERP offers a bunch of options: The development team provides technical support and also offers a five-day technical training or user training. Maintenance agreements can be arranged with IT service providers. The documentation is of high quality: e-book, manual, knowledge center and the forum.



#### **Opentaps**

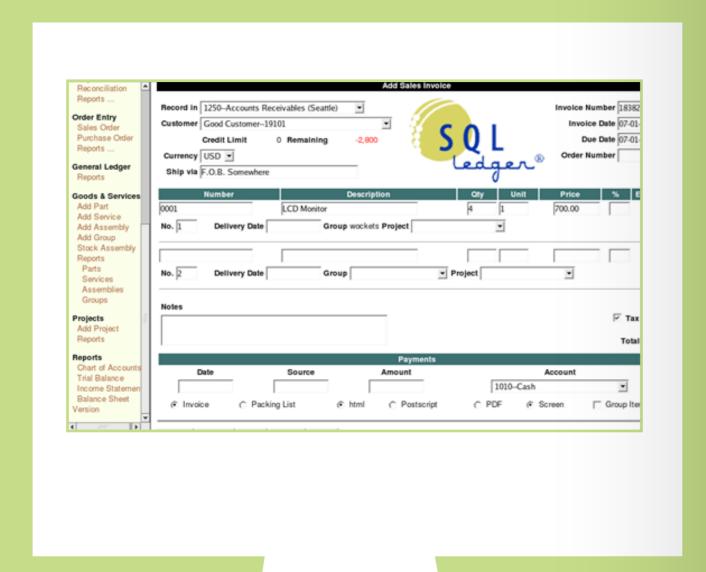


Year of development	2006
Website	www.opentaps.org
Functions	Inventory Management, Financial Management, Reporting, CRM, Sales, Warehouse and Manufacturing Management (BoM, MRP)
License	AGPL
Programming language	Java

Opentaps is a relatively new system. It is distributed under the terms of the AGPL license and can be run on Linux, Windows and Mac OS. MySQL and PostgreSQL are the standard databases. The program provides a very user-friendly UI. A handheld version and data cloud services are also available so that the program can be used in a flexible manner. A drawback is that the system is currently only available in English. Data import and export relies on compatible .CSV files. The system is used by big companies such as Honeywell and Toyota and presents on its website case studies to visualize the usability and flexibility of the program to the future user. In general, the website gives a very good overview of the functions.

Opentaps offers standard functions of Inventory Management, Finance, Reports, CRM, Warehouse and Manufacturing Management and Sales.

The system is backed by a large community. Support services include the evaluation of companies and requirements, seminars, mentoring, customization, development and technical support. Also, various detailed books, a wiki and videos are available to help understand the functions of the programs.



# SQL Ledger

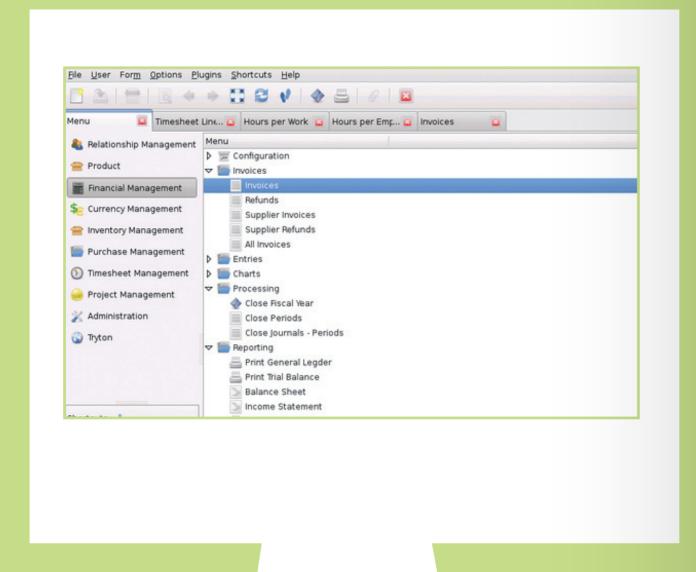


Year of development	1998
Website	www.sql-ledger.com
Functions	Inventory Management, Financial Management, Reporting, CRM, Sales, Warehouse and Manufacturing Management (BoM, MRP)
License	AGPL
Programming language	Java

The Perl system is released under the GNU license. Server and clients can be run on Unix, Windows and Mac systems and even be used on handheld devices. The program also offers a wide range of menu languages. The SME ERP system allows, for example, customizing and designing reports to meet personal requirements.

The system provides the standard features of Order Management, Purchasing, and Material management, but goes without manufacturing functions. Other functions include Accounting, Inventory, Invoicing, and a POS solution.

Customers will only get comprehensive support from IT service providers: implementation, development and technical/user support. A wiki is available as online resource.



# Tryton



Year of development	2008
Website	www.tryton.org
Functions	Accounting, Invoicing, Sale Management, Purchase Management, Analytic Accounting, Inventory Management
License	GPL
Programming language	Python

Tryton is a ERP system, which is based on Tiny ERP (now OpenERP). Like most systems, it runs on Linux and Windows. At present, only a beta version is available for Mac. It is released under the terms of the GPL and written in Python. PostgreSQL is used as database. Data cannot be imported, but data export is possible in the Pro-Edition, using the .csv format. The website provides detailed information on program and developers and an online demo of the software.

The functions offered by the system include Accounting, Invoicing, Sale, Purchase and Inventory. Manufacturing functions are not integrated.

Support is provided by the developers and by IT service providers in different countries in Europe and India. Apart from seminars and training courses, the IT service providers offer software customization, implementation, maintenance and also further development of existing software parts. The documentation is of a high standard.



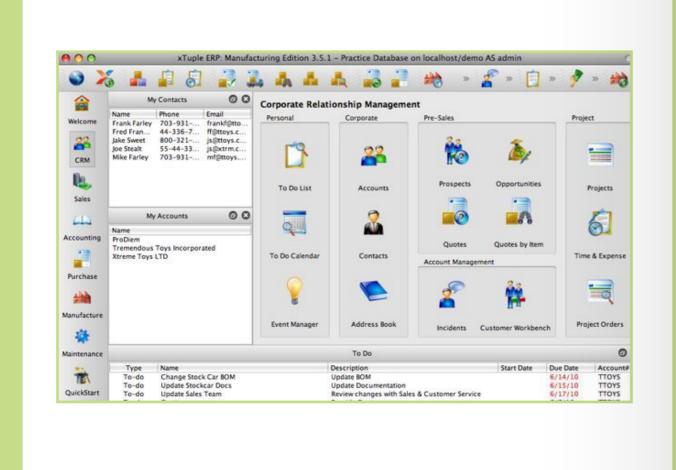
WebERP



Year of development	2003
Website	www.weberp.org
Functions	Accounting, Invoicing, Purchase Management, Sale Management
License	GPL
Programming language	РНР

The system is based on PHP and can be customized and extended with the programming language. The server operating system is built on Linux, whereas the client software, as the name suggests, is accessed via web browser. The SME ERP system is multi-lingual and offers role-based security settings, passwords, encryption, and https security.

WebERP is a system with focus on inventory management. Functions are Accounting, Invoicing, Purchase and Sale Management. Support is provided either by the community (online manual, FAQ, wiki) or by IT service providers.



# xTuple



Year of development	2001
Website	www.xtuple.com
Functions	Inventory, CRM, Accounting, Product Management, Sale Management, Production Scheduling
License	Common Public Attribution License
Programming language	PHP

The Unix ERP system has been mainly developed in the US. Written in PHP, the client runs on Mac OS, Linux or Windows; PostgreSQL is used as database. The UI of xTuple is very user-friendly, easy-to-understand and can be customized. This is all displayed on the website. English is the only menu language, but several currencies are supported. The software offers special versions for SMEs but also for retail and manufacturing companies. The program can always be expanded by apps. Access restrictions, role assignment, and SSL encryption ensure a high security level. xTuple uses .CSV-files for data import and export. The main developers are very open to the community and bank on excellent cooperation.

The functions include Order Management, Purchasing, and Material Management. Special manufacturing functions are: inventory, procurement, resources, and reports. Also offered are CRM, Accounting, Sales, and Product Management.

Support is provided by the American main developers. They offer setting up the database, auditing, integration, update service, backups and hosting, consulting, and training courses. Videos, webinars and a very detailed online guide are available for documentation purposes.

#### 5.4 Conclusion

The study analyzes 14 different and independent open source ERP systems. The websites of the developers and distributors of the individual programs served as a basis for investigation. To enable a comparative analysis, the focus was particularly placed on the customizability of the programs, as well as on individual functions.

With regard to the user-friendless of the systems, it is remarkable that they all can be run on the well-known and widespread Windows and/or Linux operating systems, some of them on Mac OS. To ensure a high level of compatibility, many systems offer browser support, which means that the ERP software need not be installed on every single computer workstation but can be controlled from a central server by means of the computer's web browser.

Regarding the presentation of the websites, striking differences can be found: Ranging from a comprehensive wiki via FAQs and detailed functional descriptions to a merely rudimentary presentation of the software or a simple reference to a service provider. This often echoes the strength of the community behind the system, and, in turn, is an indication of the system's being up-to-date, its development and support. The bigger and more attractive systems were usually promoted, supported and programmed by a large community and accordingly had an extensive update history. Many of the investigated ERP systems not only offered support by their own community and developers but also indicated external help from professional service companies, providing installation, customization, and software maintenance services.

Open source ERP systems are not very widely used today. Yet, there are a number of systems that also provide support for manufacturing-related areas. These systems vary greatly in functionality or, for instance, customization - just as proprietary software does. For open source software, however, there are a number of additional criteria that are relevant to decision-making. The frequency of updates, for example, can be an indicator of an active community (which might help with questions and problems). Even the type of support can be decisive. For some systems, there are companies that act as developers and contacts providing professional support from customized programming to help desk services.

A 'plug-and-play' ERP system does neither exist with proprietary systems nor with open source systems. Integrating professional support providers is therefore a suitable way to create an alternative to proprietary systems. The use of open source software can also provide a good opportunity especially for providers of business software to expand their portfolio by including the functionality of ERP software.

In summary, it may be said that many of the long-standing systems are very sophisticated. With "newcomers", it remains to be seen whether they will be pushed by a large and active community for a longer period of time. Since open source systems are quite frequently used as business software in other fields (e.g. Firefox, OpenOffice), it can be expected that even in the field of ERP the rare use of open source systems will change for the better.

# 5.5 Detailed description of the systems

		ADempiere	Apache Ofbiz
	Webseite	www.adempiere.com / www.adempiere.de	ofbiz.apache.org
General Information	Licence	GPL v.2	Apache Licence 2.0
	Programming language	Java	Java
	Server-OS	Linux, Windows, Unix	Linux, Windows, Unix, Mac OS X
	Client-OS	Linux, Windows, Browser	Linux, Windows, Browser
	database	Oracle, Oracle XE, PostgreSQL	MySQL, PostgreSQL, Oracle, Sybase, MS SQL Server, DB2
Gen	Web-GUI	yes	yes
	Format for imports	EDI, .csv	.csv, .xml
	Format for exports	DATEV, EDI, .csv, .html, .xml, .pdf	.csv, .xml
Functionality	Functions	Sale Management Purchase Management Materials Management Accounting Manufacturing Management Reporting Project Management Promotion & Pricing Management Order Management CRM	E-Commerce Catalog Management Promotion & Pricing Management Order management CRM Warehouse Management Accounting Manufacturing management Project Management Content Management Point of Sale
lity	Year of development	2006	2001
Continuity	Update frequency	14.06.2010 (Version 3.6.0-LTS)	2009 (Version 9.04)
S	Transparency		
	User friendliness		weak GUI and menu navigation
Flexibility	Customization	multi-lingual	very flexible system-architecture thanks to individual programming
Flex	Security		
	Scalability	1,500 employees	SME
	Supoport (Developer)	no	no
ť	Support and maintenance agreement	yes (IT-Service-Provider)	yes (IT-Service-Provider)
Support	Support infrastructure	customizing, integration, consulting, maintenance, surveillance	YouTube channel, mailing lists, online documentation, wiki
S	Training	yes (IT-Service-Provider)	yes (IT-Service-Provider)
	Documentation	comprehensive wiki, manuals, FAQ, HOWTO, book	books, wiki, mailing

		4 500	CAO E LA
		AvERP	CAO-Faktura
ıtion	Webseite	www.averp.de	www.cao-faktura.de
	Licence	Own	GPL
	Programming language	Delphi	Delphi (Pascal)
rma	Server-OS	Linux, Windows	Windows
nfo	Client-OS	Windows	Windows
General Information	database	Interbase SQL	My SQL
Gen	Web-GUI	yes	yes
	Format for imports	IBExpert	.CSV
	Format for exports	IBExpert	.CSV
Functionality	Functions	Materials Management Logistics Manufacturing Management CRM Project Management Document Management Human Ressources Point of Sale E-Commerce	Accounting Invoicing Finance Management
uity	Year of development	1998	2003
Continuity	Update frequency	22.1.2011 (version 2011-A.02)	25.10.2010 (Version 1.4.3.4)
Ö	Transparency		
	User friendliness		
Flexibility	Customization	Every option customizable, specialized in German market	multi-currencies/-clients, cash-desk solution, net- work-capable
He	Security		
	Scalability	SME	SME
	Supoport (Developer)	yes	yes (Forum)
ب	Support and maintenance agreement	yes but no annual fee, only on demand	yes (IT-Service-Provider)
Support	Support infrastructure	Free Updates, Training, Workshop, Installation, Customization	implementation, installation, maintenance
S	Training	yes	yes (IT-Service-Provider)
	Documentation	very comprehensive Manual	easy understandable documentation

		Compiere	Limbas
	Webseite	www.compiere.com	www.limbas.org
_	Licence	GPL v.2/Professional Edition	GPL
tior	Programming language	Java	Apache, PHP
ma	Server-OS	Linux, Windows	Linux, Unix, Solaris
General Information	Client-OS	Linux, Windows, Browser (only for professional edition)	Linux, Unix, Solaris, Browser
era	database	Oracle	Max DB, PostgreSQL, SAPDB
Gen	Web-GUI	only for professional edition	yes
	Format for imports	.csv, .xml	
	Format for exports	.csv, .html, .xml, .txt, .pdf, .ps, .doc	
Functionality	Functions	Financial Management Materials Management Purchasing Order Management Manufacturing Warehouse Management Projects Sales E-Commerce	Webshop CRM Content Management Project Management Human Ressources Callcenter Workflow
		Point of Sale Performance Management	
nity	Year of development	Point of Sale	2006
ntinuity	Year of development Update frequency	Point of Sale Performance Management	2006 6.9.2010
Continuity		Point of Sale Performance Management 1999	
	Update frequency	Point of Sale Performance Management 1999 29.9.2010 (Version 3.6.2)	6.9.2010
	Update frequency Transparency	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender	6.9.2010 extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource-
Flexibility	Update frequency Transparency User friendliness	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/	6.9.2010 extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable
	Update frequency Transparency User friendliness Customization	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/ -currencies/-client	6.9.2010 extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable addons potent right-management, proxysystem to
	Update frequency Transparency User friendliness Customization Security	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/ -currencies/ -client  data encryption, data/role-based security	extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable addons potent right-management, proxysystem to prevent, external attacks, encryption
Flexibility	Update frequency Transparency User friendliness Customization Security Scalability	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/ -currencies/ -client  data encryption, data/role-based security  SME	extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable addons potent right-management, proxysystem to prevent, external attacks, encryption SME
Flexibility	Update frequency Transparency User friendliness Customization Security Scalability Supoport (Developer) Support and maintenance	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2)  upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/-currencies/-client  data encryption, data/role-based security  SME  yes	extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable addons potent right-management, proxysystem to prevent, external attacks, encryption SME yes
	Update frequency Transparency User friendliness Customization Security Scalability Support (Developer) Support and maintenance agreement	Point of Sale Performance Management  1999  29.9.2010 (Version 3.6.2) upcoming events calender  complex configuration, cloud service  wide range of functions, multi-lingual/-currencies/-client data encryption, data/role-based security  SME  yes yes	extension Programming LIMBAS GmbH only intuitive UI, high performance, not ressource- demanding UI tweakable (corporate identity), downloadable addons potent right-management, proxysystem to prevent, external attacks, encryption SME  yes yes hosting, implementation, realization, remote

		Lx-Office	Openbravo
	Webseite	www.lx-office.org	www.openbravo.com
lon	Licence	GPL, LGPL, Artistic License	Openbravo Public, License (based on Mozilla Public Licence)
General Information	Programming language	Perl (ERP), PHP (CRM)	Jave
forn	Server-OS	Linux	Linux, Windows, Solaris
<u>-</u>	Client-OS	Browser	Browser
era	database	PostgreSQL	Oracle, PostgreSQL
Gen	Web-GUI	yes	yes
	Format for imports		.CSV
	Format for exports	.csv, DATEV	.csv
Functionality	Functions	Invoicing Accounting Supplier/Customer Management Point of Sale	Master Data Management Procurement Management Warehouse Management Project and Service Mgmt Production Management Sales and CRM Financials and Accounting Business Intelligence Point of Sale
ity	Year of development	2003	2001 (as Tecnicia)
inu	Update frequency	24.3.2010 (Version 2.6.1)	16.4.2009 (Version 2.5)
Continuity	Transparency	open for community and partner, trade fair participation	release of update scripts, open source database
ξ	User friendliness	no client needed, browser only	mordern system architecture, distinct separation between data and logistics
i E E	Customization	specialized in German market	multi-ligual/ -currencies/ -client
Flexibility	Security		https support, auditing for each transaction, access levels per user based on roles
	Scalability	SME	distinctive software versions per firm size
	Supoport (Developer)	yes (free via forum and Mailinglists)	yes
۲	Support and maintenance agreement	yes (with coasts for IT-service-provider)	yes
Support	Support infrastructure	consulting, installation, implementation, hosting, customization	daily operational support, recovery processes
S	Training	yes (IT-Service-Provider)	yes
	Documentation	comphrehensive (e)book	open and free documentation

		OpenERP	opentaps
	Webseite	www.openerp.com	www.opentaps.org
on	Licence	AGPL v3.0	AGPL
General Information	Programming language	Python	Java
forn	Server-OS	Linux, Windows	Linux, Windows, Mac
프	Client-OS	Linux, Windows, Browser	Linux, Windows, Mac
era	database	PostgreSQL	MySQL, PostgreSQL
gen	Web-GUI	yes	yes
	Format for imports	.CSV	.CSV
	Format for exports	.CSV	.CSV
Functionality	Functions	CRM Purchase Manufacturing Warehouse Management Project Management Accounting Human Resources Marketing	Inventory Management Financial Management Reporting CRM Sales Warehouse and Manufacturing Management (BoM MRP)
lity.	Year of development	2005	2006
Continuity	Update frequency	20.1.2011 (Version 6.0)	19.11.2010 (Version 1.5)
S	Transparency	push into German market	case studies available on homepage
<u>ج</u>	User friendliness	right management not very userfriendly, easy installation process	user friendly UI, use on handheld, cloud service, English and french only
biii Hiid	Customization	wide range of functions, flexible tools	
Flexibility	Security	role-based rights management, specifiable for each user	
	Scalability	5 - 200 employees	SME
	Supoport (Developer)	yes	yes (Forum)
+	Support and maintenance agreement	yes (IT-Service-Provider)	yes (IT-Service-Provider)
Support	Support infrastructure	forum, book, knowledge center, online documentaion	evaluation, training, mentoring, customizations, development, technical support
S	Training	5 day user/technicak training	yes (IT-Service-Provider)
	Documentation	e-book, book, online documentation	wiki, serveral books, videos

		SQL-Ledger	Tryton
	Webseite	www.sql-ledger.com	www.tryton.org
_	Licence	GPL	GPL v.3
tior	Programming language	Perl	Python
ma	Server-OS	Windows, Unix, Mac	Linux, Windows, Mac (beta)
Jor	Client-OS	Windows, Unix, Mac	Linux, Windows, Mac (beta)
General Information	database	PostgreSQL	PostgreSQL
Gen	Web-GUI	yes	no
	Format for imports		-
	Format for exports		.csv (for professional edition)
Functionality	Functions	Invoicing Accounting Supplier/Customer Management Point of Sale	Accounting Invoicing Sale Management Purchase Management Analytic Accounting Inventory Management
ity	Year of development	1998	2008
inui	Update frequency	15.1.2011 (Version 2.8.33)	7.11.2010 (Version 1.8)
Continuity	Transparency		comprehensive news page on website, online demo, calendar with upcoming events
>	User friendliness	use on handheld, wide choice of languages	
iii l	Customization	customizable reports	
Flexibility	Security		
Щ	Scalability	SME	SME
	Supoport (Developer)	yes	yes
t	Support and maintenance agreement	yes (IT-Service-Provider)	yes (IT-Service-Provider)
Support	Support infrastructure	implementation, development, technical/user- Support	IT-Service-Provider (customizing, implementation, maintenance, developments)
S	Training	yes (IT-Service-Provider)	yes (IT-Service-Provider)
	Documentation	wiki	development documentation, wiki, FAQ, online documentation

		WebERP	xTuple
	Webseite	www.weberp.org	www.xtuple.com
<u>_</u>	Licence	GPL	Common Public Attribution License
General Information	Programming language	PHP	PHP
r.	Server-OS	Linux	Unix
Infe	Client-OS	Browser	Linux, Windows, Mac, Unix
<u>la</u>	database	MySQL	PostgreSQL
ene	Web-GUI	yes	yes
G	Format for imports		.CSV
	Format for exports		.CSV
Functionality	Functions	Accounting Invoicing Purchase Management Sale Management	Inventory CRM Accounting Product Management Sale Management Production Scheduling
rity	Year of development	2003	2001
Continuity	Update frequency	21.1.2011 (Version 4.0)	16.12.2010 (Version 3.6.0)
Ō	Transparency	vastly community-based	open to community, collaborative work
	User friendliness	multi-lingual, multi-currency	user friendly UI (customisable), multi-currency, English only
Flexibility	Customization	via PHP	special versions for small and medium Enterprises, retail or manufacture extentable via apps
₽	Security	role-based security, password safety, encrytion, HTTP security	access restrictions, role-based security SSL
	Scalability	SME	SME
	Supoport (Developer)	yes (community)	yes
	Support and maintenance agreement	yes (IT-Service-Provider)	yes
Support	Support infrastructure		database setup, dauditing, integration, update service, nightly backups, hosting, implementation, consulting
	Training	yes (IT-Service-Provider)	yes
	Documentation	online FAQ, manual, wiki	videos, webinars, comprehensive online documentation

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