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PREFACE

The activities of the International Conference is in line and very appropriate with the vision and mission of the UBL to promote training and education as well as research in these areas.

On behalf of the First International Conference of Engineering and Technology Development (ICETD 2012) organizing committee; we are very pleased with the very good responses especially from the keynote speakers and from the participants. It is noteworthy to point out that about 45 technical papers were received for this conference

The participants of conference come from many well known universities, among others: Universitas Bandar Lampung, International Islamic University Malaysia, University Malaysia Trengganu, Nanyang Technological University, Curtin University of Technology Australia, University Putra Malaysia, Jamal Mohamed College India, ITB, Mercu Buana University, National University Malaysia, Surya Institute Jakarta, Diponegoro University, Unila, Universitas Malahayati, University Pelita Harapan, STIMIK Kristen Newmann, BPPT Lampung, Nurtanio University Bandung, STIMIK Tarakanita, University Sultan Ageng Tirtayasa, and Pelita Bangsa.

I would like to express my deepest gratitude to the International Advisory Board members, sponsors and also welcome to all keynote speakers and all participants. I am also grateful to all organizing committee and all of the reviewers which contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector which give us endless support to these activities, such that the conference can be administrated on time.

Bandar Lampung, 20 Juni 2012

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The First International Conference in
Engineering and Technology Development
(ICETD 2012)

UNIVERSITAS BANDAR LAMPUNG
Bandar Lampung, Indonesia
June, 20-21 2012

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Open Source ERP for SME

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Abstract, There are huge barriers for small medium enterprises (SME) to adopt enterprises resource planning (ERP) into their systems. Open source ERP is one of the solutions to overcome it. This paper describes the reason of SME to apply open source ERP, examines seven open source ERPs, and highlight critical success factors for implementing open source ERP in SME.

Keywords: Open Source, ERP, SME, Critical Success factors

I. INTRODUCTION

There is a long process before goods are received by customers. The process begin from raw materials are procured; goods are produced by manufacture, shipped it to distribution channel, store in warehouse and then sent to customer. Many parties are involved in this chain: supplier of raw material, manufacturer, distributor, wholesaler and retailer. Each of them has their own business process. As general, it consists of three processes: purchasing from supplier, selling to customer and internal business controlling. These processes are complex and cost a lot. It needs e-commerce application to support this business process.

E-commerce is 'the conduct of business communication and transaction over networks and through computers or as buying and selling of goods and services, and the transfer of funds through digital communications'[1]. It contains all inter-company process such as supply chain management and customer relationship management and intra-company functions such as marketing, finance, manufacturing, and human resource. Integrated application for manage intra-company function as unified system rather than separated system is called enterprise resource planning or ERP [2].

There are three aspect of supply chain that will be affected by e-commerce, physical flows, Information flows and financial flows [1]. Companies will avoid physical flow of information. Thus, Order, transaction and any other process will be build online for efficiency and reduce error. Furthermore, information flow can be accessed 24x7x365 hour per year to non-stop service for customer and electronic

payment services provide automatic financial flow between parties.

The first adopter of supply chain management (SCM) and ERP system are big companies. They need it to make efficient process of transaction among many parties, simplify procurement process to gain lower prices, opening new market, stock efficiency and feedback for customer for product design. Small medium enterprises (SMEs) also want to gain benefit from SCM and ERP but different with big companies goals, SMEs motivation are observing new market, strategic for competition, faster operation, long term partnership, faster successful entry, benchmark competitive position, procurement cost saving [3].

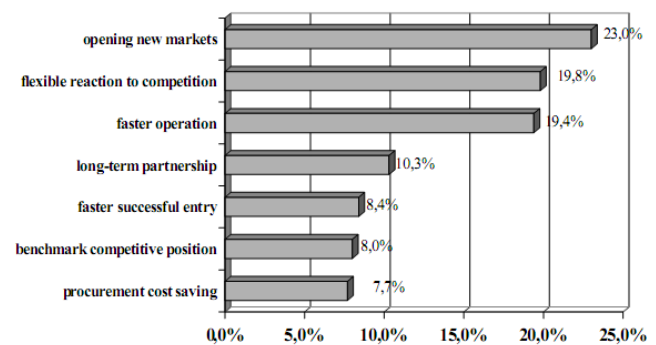


Fig. 1 SME Main Motivations For Electronic Commerce [3]

However, many barriers inhibit SMEs to adopt SCM. List below explain some obstacle for SMEs to entry SCM base on research in Czech [3]:

1. SMEs have higher susceptibility so they more careful to use new and unproven concepts. They cannot afford the experiment too much.
2. SMEs have a unique business style, commonly based on individual connection and community links
3. SMEs have considerably higher cost awareness and ROI priority

4. SMEs have much higher risk awareness – one failure might be the last one (which is not as true for large corporations, at least in the area discussed)
5. SMEs have more difficult access to verified success-story information and also have a attitude cannot trust anyone
6. SMEs have different characteristics of competitive pressure (large enterprises are expected to be at the forefront)
7. SMEs lack confidence and trust in new technologies
8. SMEs usually using low bandwidth Internet dial-up connections, as their understanding of the connectivity value does not justify more expensive fixed line or broadband technologies
9. SMEs face little pressure to drive down their operational costs (typically reasonably low), but show a more careful approach to investments
10. SMEs lack experience/education/understanding of the e-Commerce opportunity

In order to overcome the barriers, some solutions had been identified by [3]. Table below summarize the solutions.

TABLE I
APPROPRIATE SERVICES RESPONSE TO SPECIFIC SME E-COMMERCE REQUIREMENTS[3]

SME Requirements/Needs	Service Response
SMEs have an insufficient technology base and IT management capability	Outsourced application services
SMEs strive to expand and to gain a lasting source of new business opportunities	eCommerce services providing new business contacts
SMEs try to have long-term, stable business relationships	eCommerce services supporting repetitive trading
SMEs have unstructured business, sales and purchasing processes	Business process management services
SMEs lack confidence in the new technologies	Targeted effort to ensure security of both - data and business transactions
SMEs have concerns about doing business with someone unknown and far away	Supportive elaborate system for credit rating business partners
SMEs lack experience and education	Increased focus on support services and product Friendliness
SMEs show investment cost sensitivity and limited access to the Internet	Packaged services provided with ISPs and mobile service providers
SMEs' effort to stay in business under pressure to be connected to manifold proprietary (vertical) environments is no longer manageable as proprietary solutions are too complex and operational cost is too high	Services which are going to allow SMEs to connect to multiple electronic marketplaces through a single web gateway

SMEs do not use ERP yet since its implementation needs huge resource and entails high risk [4]. SMEs need ERP because they want to manage their resources efficiently and in supply chain, they want to connect with big companies that already have their own ERP.

Open source software (OSS) can be used for SMEs to implement ERP in their business process [4] because commercial off the shelf (COTS) ERP are expensive and their evolution tied to the vendor. Customer cannot customize the code, as they needed. This paper will explain about the reason of using open source, some factors that have to be considered when implementing ERP, and selecting open source ERP.

II. OPEN SOURCE SOFTWARE

Open Source software is software which source code is openly published and freely distributed [5]. Usually it is developed by voluntary effort from academics and non-profit research institute. OSS usually is available free under a license describe by the Open Source Initiative or GNU licensing. These rules allow the redistribution of Open Source software under some particular circumstance. Table below explain the definition of open source software [6].

TABLE II
OUTLINE OF KEY CONDITIONS OF OPEN SOURCE DEFINITION[6]

Condition	Commentary
The source code must be available to user.	The software distribution must include the source code (i.e., the original programming language), or else the code must be made available by free, public Internet download.
The software must be redistributable.	The user of an OSS release is given full rights to reproduce and redistribute the software, on any medium, to any party, either gratis or for a fee.
The software must be modifiable, and the creation of derivative works must be Permitted	All users are given the right to modify the software or produce derivative works. There is considerable variation among licenses regarding whether or not modifications must also be released publicly under an OSD compliant license.
The license must not discriminate against any user, group of users, or field of endeavor	In an attempt to counter overtly ideological content in software licenses, the OSD precludes any limitations on the possible uses of an OSS distribution.
The license must apply to all parties to whom the software is distributed.	While some licenses might allow modifications to be released under a non-compliant license, an OSS

	distribution cannot be “relicensed” by the user.
The license cannot restrict aggregations of software.	OSD compliant licenses cannot be limited to a particular distribution, nor can they seek to contaminate separately licensed software with which it is aggregated.

OSS has been grown up significant in many categories software, operating system, databases, web server, development tool, offices and business application. Now, Companies select OSS not only because of low total cost of ownership but also believe in their high quality [4]. Bugs have been fixed quickly by using collaborative technology.

Base on research of Mehmetgencer et al, OSS has been spread and used in almost all government organization over the world. They clustered the country into five cluster using Internet usage and human development indicator as follow [7]:

1. Cluster 1: Low relative Internet usage, mid-range hdi; mid-range open source count reflecting the mid-range size (i.e., population) of the country. This cluster contains 24 countries, among them Bulgaria, Latvia, Croatia, Vietnam, Armenia, and Iran.
2. Cluster 2: Low relative Internet usage, mid-range hdi; low open-source count reflecting the smaller size of the country as compared to Cluster 1. This cluster contains 33 countries, among them Belize, Samoa, Tonga, the Bahamas, Panama, and Puerto Rico.
3. Cluster 3: Low relative Internet usage, mid-range hdi; higher open source count reflecting the larger size of the country as compared to Cluster 1. This cluster contains 18 countries, among them the Russian Federation, Poland, Brazil, China, Thailand, and Romania.
4. Cluster 4: Highest relative Internet usage, highest hdi; very high open source count, almost irrespective of the population size. This cluster contains 35 countries, among them the United States, Germany, France, the United Kingdom, Canada, and Italy.
5. Cluster 5: Very low relative Internet usage, very low hdi. This cluster contains 30 countries, among them Sierra Leone, Sudan, Pakistan, Myanmar, Laos and Kenya

TABLE III
CLUSTER MEMBERSHIP AND SERVER SOFTWARE VARIETY OF ORGANIZATIONS[7]

Cluster	Central bank		Bureau of statistic		Finance regulator		Foreign ministry		Postal service	
	P	F	P	F	P	F	P	F	P	F
1,2,3	21	39	6	17	12	16	11	7	9	11
4	9	12	6	18	13	11	16	6	14	10
5	7	9	4	1	3	2	3	3	3	2

P = proprietary, f = free

It is no doubt to used open source software anymore, high quality, used everywhere and low total cost ownership are some basic reasons. Build by community in collaboration environment make OSS have proven quality. Table above shows how OSS in government organization had reduced the using of proprietary software. It also described the spread of OSS in the world. No license cost and various supports by community lead low total cost of ownership that appeal numerous government, company and individual to use it.

III. IMPLEMENTATION SUCCESS FACTOR

However, software is only one of success factor to implement ERP in the company. Nah, Zuckweiler and Lau have already run through eleven success factors to implement ERP. List below show that eleven factors and reference list for the support [9]

TABLE IV
REVIEW OF CRITICAL SUCCESS FACTORS FOR ERP IMPLEMENTATION [9]

	ERP Success Composite	Change Management Program	Top Management Support	ERP with Minimum Quantization	Business Process Management	Project Management	Project Champion	Communication	Monitoring and Evaluation/Reference	Software Development/ Troubleshooting	Appropriate Business and IT Legacy Systems
Bingi, Sharma, and Godla (1999)	x	x	x	x						x	
Baskhou, Fery, and Nemer (1999)	x		x		x						
Falkowski, Pedigo, Smith, and Swanson (1998)	x	x			x	x	x	x	x		
Holland, Light, and Gibson (1999)	x	x	x	x	x	x		x	x	x	x
Murray and Giffin (2001)		x	x	x		x	x		x	x	
Richards and Barner (1993)		x	x	x		x			x		x
Rostrik (2003)	x	x	x	x	x	x	x	x	x	x	
Schae and Habermann (2001)											x
Sharks et al. (2003)	x	x	x	x	x	x	x	x			
Stefino (1995)	x							x			
Sunmar (1999)	x	x	x	x	x	x	x	x	x		
Woo (2000)	x	x	x	x	x	x	x	x		x	
Number of citations	9	9	8	8	7	7	6	6	6	6	2

Note: BPR = Business Process Reengineering; IT = Information Technology.

Most of experts believe that ERP teamwork and composition and change management culture and program are the most important factor. Companies need to prepare their human resource or outsourcing it to implement ERP. ERP teamwork shall be selected from cross-functional best people who has empowered decision maker and work full time. They must have business and technical knowledge on ERP. Operational changing should work smoothly and govern thoroughly, socializing and training needed in change

management program. Support from top management is the next success factor that will give energy for implementation process success. Top management should approve, publicly and explicitly point out the project as top priority, and allocate their limited resource to implement ERP system.

Less customization in business process reengineering makes the user adopt easily. Employee will give their full potential when they know business plan and vision of the companies. It will give them goal in work. Project champion is someone who has the power to set goals, legitimize change, and leadership skill in organization. Project champion will resolve conflict and resistance because of excess of implementation of the new system. Every goal and expectation in each level should be well communicated as milestone. It will leverage the success and learning environment. Every milestone and target then needs to be monitor and evaluate. Evaluation will show the progress of implementation performance. Software development and testing should be well managed to avoid reconfiguration in every stage and discrete system. Business and IT legacy system determine the BPR or change management level [9].

IV. SELECTING OPEN SOURCE ERP

Thomas Herzog had made a research about comparing open source ERP system [8]. He compared 7 OS ERP systems: SQL Ledger, LX Office, GNU Enterprise, TinyERP, ERP5, Opentaps and Compiere. He pointed out that SQL Ledger has accounting focus and is proved internationally. It is best-used out-of-the-box or as accounting module in an integrated solution. The SQL Ledger fork LX Office should only be evaluated for the German speaking market. GNU Enterprise is not production ready and missing any reference customers. TinyERP is evolving fast, provides more ERP functionality than SQL Ledger and can be customized with add-on modules. ERP5 and Opentaps (OfBiz) have very flexible architectures. ERP5 is following a purely object oriented approach, whereas Opentaps/Ofbiz is more relational database centric. Compiere, the current market leader, is a mature system, providing many customization possibilities [8].

However, Because of the most important success factor is ERP teamwork and composition, OS ERP should be selected comprehensively to match with business process and staff skills. Forcing teamwork member to learn new technical things leads to increasing cost, effort, time, and hard shifting process. This factor reflected in 10 most popular OS ERP downloaded from www.sourceforge.net [10]

TABLE V
10 MOST POPULAR OS ERP FROM WWW.SOURCEFORGE.NET

No	OS ERP	Downloaded (weekly)	Programming Language	Categories
1	Vtiger CRM	6,203	JavaScript, PHP, and Visual Basic	Calendar, CRM, ERP
2	Openbravo ERP	3,762	JavaScript, Java, PL/SQL	Accounting, CRM, ERP, Project Management
3	OrangeHRM	3,093	JavaScript, PHP	Enterprise, ERP, Human Resource
4	Adempiere ERP Business Suite	2,112	Java	Accounting, ERP, Object Oriented
5	Dolibarr ERP-CRM	1,942	PHP	CRM, Enterprise, ERP
6	Postbooks ERP, accounting, CRM by xTuple	1,924	C++, JavaScript, PL/SQL	ERP, accounting, CRM
7	WebERP	1,109	PHP	Accounting, Enterprise, ERP
8]project-open[- Project Management	1,224	PL/SQL, Tcl	Accounting, CRM, Enterprise, ERP, Project Management, Time Tracking
9	opentaps open source ERP+CRM	725	Java	Accounting, CRM, Dynamic Content, Enterprise, ERP, Point of Sale
10	FrontAccounting	501	JavaScript, PHP	Accounting, Enterprise, ERP

From top ten OS ERP, five applications are using PHP and three coded by Java. These are the most common programming languages. Thus, ERP teamwork member should be familiar with one of the languages; otherwise company should train, hire, or outsource the services. The team also should consider OS ERP features, sophisticated systems sometimes too complicated for user while simple system is difficult to serve increasing business requirements. Modular system like Dollibar is one of the systems that provide the flexibility.

Moreover, assessing the application on controlled environment before deploying it in real world business process is a wisdom step. It will lead identification of change management requirements and training. Employee also can prepare their self in new business process.

V. CONCLUSION

As a part of supply chain, SMEs also want to have efficient organization and have transaction to big companies. Big companies usually enforce SMEs to use e-commerce in transaction. In order to exchange information electronically, SMEs need to manage their internal business process efficiently. ERP can be chosen to make an integrated system among business processes. However, implementing ERP is expensive and needs huge resources.

Open Source ERP is an ideal solution to provide low total cost ownership and high quality system. Many OS ERP can be selected depends on resources of SMEs and needs. Actually, selecting software is only one factor from eleven factors presented in this paper. Considering business process and organization resources are the key point to success in implementing ERP.

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