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Comparison of open source maturity models

Umm-e-Laila, Adnan Zahoor, Khalid Mehboob , Sarfaraz Natha*

Sir Syed University of Engineering and Technology, CED , Gulshan –e- Iqbal, Karachi, Pakistan

Abstract

Component based development was formerly dependent on propriety/closed source software's (CSS) components. Open Source software components has attracted noteworthy attention and become an operational alternative of proprietary software because of OSS security, cost effectiveness, quality, flexibility and freedom. Due to the increased attention on component-based development in the past decades, companies have widely adopted open source software (OSS), with the view that using the right software is critical to project success. The availability of Internet as a marketplace for components and wide adoption of OSS has introduced new challenges for selection of software components. Source Forge, other general and domain specific software repositories, different software foundations and individual OSS providers offer an abundance of OSS components. Identification, evaluation and selection of best possible OSS Components for the required need is a quite challenging job. As a reaction to these challenges different methods have been proposed for OSS maturity measurements. E.g. Capgemini-Open Source Maturity Model(C-OSSM), Navicasoft-Open Source Maturity Model (N-OSSM), Qualification and Selection of Open Source (QSOS), Open Business Readiness Rating (Open BRR) and Easiest Open Source (E-OSS).In this paper we compare different Open Source software maturity models available in the market that will help user in OSS component selection.

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Keywords: Open source software, free and open source software, general public license, free software foundation, COSMM, NOSMM, QSOS, Open BRR, EOSS;

* Corresponding author. Tel.: +92-21-111-994-994;
E-mail address: ulaila2002@gmail.com

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1. Introduction

Now a days Open Source Software (OSS) Components are increasingly being incorporated into commercial products. The basic reasons behind the usage of OSS components is cost savings, fast time-to-market and high-quality software[1,2].

OSS components are utilized as an alternate to Commercial Off-The-Shelf (COTS) components. Evaluation and selection of OSS components is as challenging as COTS components because of this the research community and industry have proposed evaluation and selection approaches to help practitioners to select appropriate OSS products. However, research has shown that practitioners rarely use formal selection procedures[3]. Instead, OSS products are frequently selected on the basis of component familiarity or colleagues recommendations[4.]

OSS components selection is entirely different than selection of Commercial Off-The-Shelf (COTS) components selection. OSS is available free of charge, whereas COTS are third party companies products or components, OSS components are freely available in public repositories like Source forge etc. which make selection process more complicated and troublesome. Whereas COTS repositories are not as large as compare to OSS as in COTS companies are involved i.e. third party is involved, Source code of OSS components is available i.e. user know full functionality of components which is not possible in COTS as code is not known, OSS components are owned by community who has permissions to modify and extend the code whereas COTS is controlled by the COTS owner, training and communication with vendors, literature reviews and conferences.

There are many OSS selection models available out of which five models focuses on components maturity which are COSMM, NOSMM, QSOS, Open BRR and EOSS. To better understand the selection and evaluation of OSS components a comparison of different OSS components maturity model is done in this research.

2. Description of Available Models

The selection and evaluation of OSS components is normally based on recommendation and past experiences. The evaluation is very important for component selection. There are few available methods for Open source software maturity assessment whose primary objective is to select the appropriate components which is trustworthy and suitable for organizational needs.

2.1. C-OSMM

C-OSMM (Capgemini Open source Maturity Model) is developed by Capgemini in 2003. This model consist product and application Indicators. Product indicator is the objective and measurable facts about the product whereas application indicator are the customer requirements and future needs. The product Indicator are grouped into 4 groups[6]. Application indicator includes usability, interfacing, performance, reliability etc.

Table 1. C-OSMM product indicator

Product Indicator Groups	Description
Product Group	Basic Information of product e.g. age license selling point etc
Integration Group	Check whether the product is able to integrate with the other products and follows standard
Use Group	Information about product support
Acceptance Group	Product ability of growing

2.2. N-OSMM

N-OSMM (Navica Open Source Maturity Model) is developed by Navica software in 2004. This model consist of three phases.

Phase1: Assessing key product element maturity which assess key elements shown in table 2 which are divided into 4 steps includes: organization requirements, identifying the available resources, assess its maturity and then assign maturity score.

Table 2. N-OSMM key product elements

Key Product Elements
Product Software
Support Documentation
Training
Professional Service
Product Integration

Phase 2: Assign weight to each of the key elements according to key element importance.

Phase 3: Calculate product total maturity by multiply to each key element score with the weights and add them all to get the final result[7].

2.3. QSOS

QSOS (Methodology of Qualification and Selection of Open Source Software) developed by Atos Origin in 2005. This model focuses on qualification and selection of free and open source software with respect to support and technological survey services. This model consist of four phases/steps.

Phase1: Definition: used to define the components characteristics with respect to software families, type of license and types of communities.

Phase2: Evaluation: used to evaluate the components by collecting information from the open source communities. As a result an identity card of the software and evaluation sheet is created based on three major axis. i.e. Functional coverage, risks from the user's perspective, risks from the service provider's perspective.

Phase3: Qualification: used to define filter and constraints for selection of OSS components. Example of filter are filter id, filter for functionality, filter on user risks, filter on service provider risks.

Phase4: Selection: used to select the components based on user requirement. Selection is done based on two models .i.e strict and loose selection[8].

2.4. Open BRR

Open BRR (Open Business Readiness Rating) is developed by Carnegie Mellon West University, Spike Source, Intel and O'Reilly's in 2005. This model consist of four phases shown in table 3.

Phase 1: Quick Assessment Filter: use to filter out those components that does not meet the basic criteria.

Phase 2: Target Assessment Filter: used for in-depth assessment of the selected components. 12 categories are defined to assess any component, out of 12 categories 7 categories are to be selected and allocate a percentage to importance for each one, totaling 100 % over the chosen categories.

Phase 3: Data Collection & Processing: collects measured data used in the corresponding category and calculates the weighting applied for measurements and compared with the normalize scale.

Phase 4: Data Translation: used to calculate BRR rating score based on rating computed in data collection phase for each category and the weights factor[9] .

Table 3. Open brr phases

Software Assessment Phases
Quick Assessment Filter
Target Assessment Filter
Data Collection & Processing
Data Translation

2.5.E-OSS

E-OSS (easiest open source) developed by SIAD-Laboratory in 2015. This selection model consists of four phases:

Phase 1: Definition: used to check and analyze the components on functional, technical and strategic aspect.

Phase 2: Identification: used to create a data sheet of key elements based on the general characteristic of the component describe in four groups.

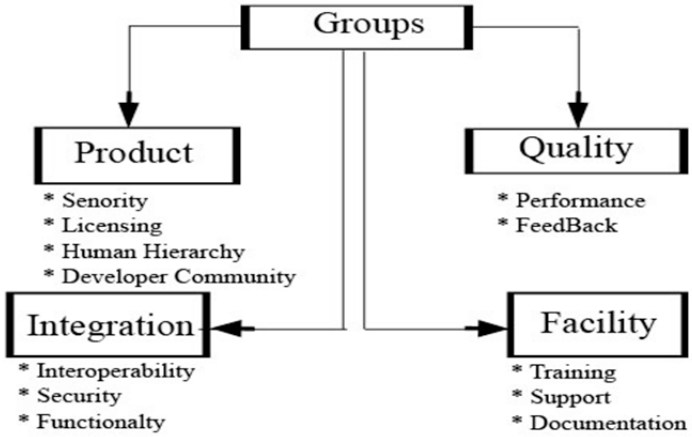

Fig.1. Different catagories of Identification phase of E-OSS

Phase 3: Qualification: used to assign rating for each criteria to obtain overall score to choose the most appropriate components.

Phase 4: Selection. Used to calculate the overall sum of all criteria score, in order to identify the different mature solutions[10] .

3. Comparison of OSS Maturity Models

There are five OSS evaluation and selection methods considered in this research. Basic information of the models is illustrated in table 4

Table 4. Comparison of oss maturity models

Acronym	Name	Corp/Org	Year	Strengths
C-OSMM	Capgemini Open Source Maturity Model	Cap Gemini	2003	Contain product and application indicators. Updation can be on regular basis via feedback from customers.
N-OSMM	Navica-Open Source Maturity Model	Navica Software	2004	Availability and Simplicity of tools for evaluation process.
QSOS	Methodology of Qualification and Selection of Open Source Software	Atos-Origin	2004	Consist of four iterative stages and supported by a tool called O3S
Open BRR	Open Business Readiness Rating	Carnegie Mellon West University, Spike Source, Intel and O'Reilly's	2005	Guarantee better decisions and increase confidence in selected open source software
E-OSS	Easiest Open Source Software Model	SIAD-Laboratory	2015	Easily adopt for small and medium business and also consider interoperability

All models follow well defined methods and are of practical nature except Open BRR which is scientific in nature[11]. N-OSMM and C-OSMM are not iterative whereas other follow iterative process. Scoring for QSOS is strict unlike others shown in table 5.

Table 5. Comparison of oss maturity models characteristics

Acronym	Target Audience	Assessment Model	Scoring Model	Method	Iterative Process
C-OSMM	Consultation services for its customers	Practical	1 to 5 Flexible	Yes	No
N-OSMM	Public availability	Practical	1 to 10 Flexible	Yes	No
QSOS	Professional/ nonprofessional	Practical	0 to 2 Strict	Yes	Yes
Open BRR	large organizations, SMEs, universities, private users,	Scientific	1 to 5 Flexible	Yes	Yes
E-OSS	SME(Small and medium business)	Practical	1 to 5 Flexible	Yes	Yes

The OSS evaluation and selection methods studies in this research contains a number of criteria analysis for better results. These models use different number of criteria. The higher the number of criteria the higher the quality of the component selected. i.e. Number of criteria ∞ Quality of Component

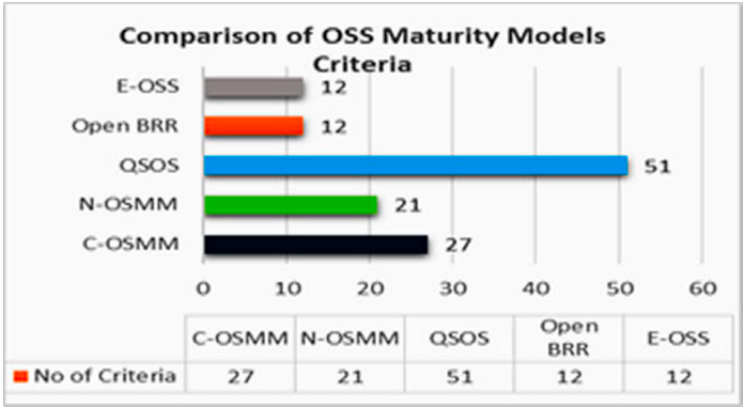

Fig.2. Number of Criteria of OSS Maturity Models

C-OSMM does not specify the calculation of final output score of the evaluation process.

Table 6. Comparison of oss maturity models score calculation method

Acronym	Weighted Score Calculation Method
C-OSMM	No
N-OSMM	Yes
QSOS	Yes
Open BRR	Yes
E-OSS	Yes

None of the models presented interoperability except E-OSS whose basic focus is on interoperability. This property is necessary for OSS to be considered for enterprise level development.

Table 7. Interoperability in oss maturity models

Acronym	Interoperability
C-OSMM	No
N-OSMM	No
QSOS	No
Open BRR	No
E-OSS	Yes

4. Conclusion and Future Work

Components based development is increasingly used in development of software because of reliability, faster delivery reduction in project cost and increase in productivity.

OSS components has become an operational alternate of proprietary software i.e Commercial Off-The-Shelf (COTS) components in product development because of OSS security, cost effectiveness, quality, flexibility and freedom[12, 13, 14, 15]. OSS products / components quality varies widely, which leads to proposed OSS components evaluation methods that are tailored to the specific characteristics of OSS. Comparison of different methods have been performed to figure out strengths and weaknesses of available models.

It has been observed that all existing OSS maturity models selection guidelines follow similar criteria. All maturity models does not focus on interoperability except EOSS. For any component to be considered as enterprise ready interoperability must be needed.

Open BRR, N-OSMM and C-OSMM does not consider IT management and administration as a criteria whereas QSOS consider IT management under training, consulting and support criteria. C-OSS does not count on weighted score method

In order to take advantage of OSS properly, it is recommended to propose a new framework / model that will eliminate the weakness of all models.

References

1. B. Fitzgerald, "A Critical Look at Open Source", Computer, vol. 37, no. 7, pp. 92-94, 2004.
2. C. A. Ardagna, E. Damiani, and F. Frati. FOCSE: An OWAbased Evaluation Framework for OS Adoption in Critical Environments. In Feller et al. [8], pages 3–16.
3. Li, J., Conradi, R., Slyngstad, O.P.N., Bunse, C., Torchiano, M., and Morisio, M.: 'Development with Off-the-Shelf Components: 10 Facts', IEEE Software, 2009.
4. Oyvind Hauge , Thomas Osterlie , Carl-Fredrik Sorensen , Marinela Gerea, An empirical study on selection of Open Source Software - Preliminary results, Proceedings of the 2009 ICSE Workshop on Emerging Trends in Free/Libre/Open Source Software Research and Development, p.42-47, May 18-18, 2009 .
5. Deprez, J.C., Alexandre, S.: Comparing assessment methodologies for free/open source software: OpenBRR and QSOS. In: Jedlitschka, A., Salo, O. (eds.) PROFES 2008. LNCS, vol. 5089, pp. 189–203. Springer, Heidelberg (2008)
6. Duijnhouwer, F.-W., Widdows, C.: Capgemini Expert Letter Open Source Maturity Model, Capgemini (2003).
7. Navica Inc.: The Open Source Maturity Model is a vital tool for planning open source success, http://web.archive.org/web/20040803024715. http://navicasoft.com/pages/osmm.htm (Last visit: July2016).
8. Origin, A.: Method for Qualification and Selection of Open Source Software (QSOS), http://www.qsos.org (Last visited: July 2016).
9. www.openbrr.org: 'Business Readiness Rating for Open Source, RFC 1', 2005.
10.]Y. A. Houaich and M. Belaissaoui. "Measuring the maturity of Open Source software", 6th International Conference on Information Systems and Economic Intelligence (SIIE), 2015, pages133 – 140, IEEE Computer Society, Feb. 2015.
11. K.J Stol and , M.A. Babar"A Comparison Framework for Open Source Software Evaluation Methods", Open Source Software: New Horizons, 319, Springer, IFIP Advances in Information and Communication Technology, , pp.389- 394, 2010.
12. Y. M. Lee, J. B. Kim, I. W. Choi and S. Y. Rhew, "A Study on Selection Process of Open Source Software," *Advanced Language Processing and Web Information Technology, 2007. ALPIT 2007. Sixth International Conference on*, Luoyang, Henan, China, pp. 568-571, 2007.
13. W. J. Sung, J. H. Kim and S. Y. Rhew, "A Quality Model for Open Source Software Selection," *Advanced Language Processing and Web Information Technology, 2007. ALPIT 2007. Sixth International Conference on*, Luoyang, Henan, China, pp. 515-519, 2007.
14. W. Chen J. Li J. Ma R. Conradi J. Ji and C. Liu "An Empirical Study on Software Development with Open Source Components in the Chinese Software Industry" Software Process: Improvement and Practice vol. 13 no. 1 pp. 89-100 2008.

15. C.P. Ayala O. Hauge R. Conradi X. Franch J. Li and K.S. Velle "Challenges of the Open Source Component Marketplace in the Industry" FORTH COMING OSS2009 Proceedings of the Fifth International Conference on Open Source Systems 2009.
16. Sierra Charlie Associates and Peter B Stevens, “Open Source Software Background and Scenarios”, 2005.
17. Open Source Initiative, The Open Source definition, 1997.http://www.opensource.org/osd.html. (Last visited: July 2016).
18. Laila. U and Abbas. A, ”Mathematical Model of Open Source Software Adoption in Pakistan,” International Conference on Open-Source Systems and Technologies (ICOSST) Lahore, December 2007.
19. Laila U and Bukhari F, ”Framework for Open Source Software Adoption in Pakistan”, International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering(CISSE 09), ISBN:978-90-481-9111-6 (print) 978-90-481-9112-3 (online), , Bridgeport, USA, pp 13-16, December 4 - 12, 2009.
20. Glynn E, Fitzgerald B and Exton C, “Commercial Adoption Of Open Source Software: An Empirical Study”, International IEEE Symposium Empirical Software Engineering, pp 225-234, 2005.