June 2026: Top 10 Cited Articles in Software Engineering & Applications

International Journal of Software Engineering & Applications (IJSEA)

ISSN : 0975 - 9018 (Online); 0976-2221 (Print)

https://www.airccse.org/journal/ijsea/ijsea.html

Citations, h-index, i10-index

Citations 6101 h-index 36 i10-index 134

COMPLEXITY METRICS FOR STATECHART DIAGRAMS

Ann Wambui King'ori[1], [2], Geoffrey Muchiri Muketha[3] and Elyjoy Muthoni Micheni[4]

[1]Department of Information Technology, Murang'a University, Kenya
[2]Department of Information Technology, Nkabune Technical Training Institute, Kenya
[3]Department of Computer Science, Murang'a University, Kenya
[4]Department of Management Sciences & Technology, Technical University of Kenya

ABSTRACT

Model-Driven Development and the Model-Driven Architecture paradigm have in the recent past been emphasizing on the importance of good models. In the Object-Oriented paradigm one of the key artefacts are the Statechart diagrams. Statechart diagrams have inherent complexity which keeps increasing every time the diagrams are modified, and this complexity poses problems when it comes to comprehending the diagrams. Statechart diagrams provide a foundation for analysing the dynamic behaviour of systems, and therefore, their quality should be maintained. The aim of this study is to develop and validate metrics for measuring the complexity of UML Statechart diagrams. This study used design science which involved the definition of metrics, development of a metrics tool, and theoretical and empirical validation of the metrics. For the measurement of the cognitive complexity of statechart diagrams, this study proposes three metrics. The defined metrics were further used to calculate the complexity of two sample statechart diagrams and found relevant. Also, theoretical validation of the defined metrics was done using the Weyuker's nine properties and revealed they are mathematically sound. Empirical validations were performed on the metrics and results indicate that all the three metrics are good for the measurement of the cognitive complexity of statecharts.

KEYWORDS

Software Quality, Models, Software quality models, Software components, COTS.

For More Details : **https://aircconline.com/ijsea/V13N3/13322ijsea05.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol13.html**

REFERENCES

[1] Anwer, S., & El-Attar, M. (2014). An evaluation of the statechart diagrams visual syntax. *In Information Science and Applications (ICISA), 2014 International Conference on (pp. 1-4).* IEEE.

[2] Al Obisat, F. M., Alhalhouli, Z. T., Alrawashdeh, T. I., & Alshabatat, T. E. (2018). Review of Literature on Software Quality. *World Comput. Sci. Inf. Technol. J*, 8(5), 32-42.

[3] Azar, D., Harmanani, H., & Korkmaz, R. (2009). A hybrid heuristic approach to optimize rule-based software quality estimation models. *Information and Software Technology*, 51(9), 1365-1376.

[4] Basili V., Shull F. and Lanubille F. (1999). Building Knowledge through families of experiments. *IEEE Transactions on Software Engineering*, 25(4), 456-473

[5] Chandrasekar, A., Rajesh, S., & Rajesh, P. (2014). A research study on software quality attributes. *International Journal of Scientific and Research Publications*, 4(1), 14-19.

[6] Dori, D., Wengrowicz, N., & Dori, Y. J. (2014). A comparative study of languages for model-based systems-of-systems engineering (MBSSE). In *2014 World Automation Congress (WAC)* (pp. 790- 796). IEEE.

[7] Fahad A. (2012). State Based Static and Dynamic Formal Analysis of UML State Diagrams. *Journal of Software Engineering and Applications,* 5, 483-491.

[8] Fitsilis, P., Gerogiannis, V. C., & Anthopoulos, L. (2013). Role of Unified Modelling Language in Software Development in Greece-results from an exploratory study. *IET software*, 8(4), pp. 143-153.

[9] Fenton, N. (1994). Software measurement: a necessary scientific basis. *IEEE Transactions on Software Engineering*, 199-206.

[10] Fenton N. and Pfleeger S. (1997). *Software Metrics: A Rigorous Approach.* 2nd. edition. London, Chapman & Hall.

[11] Genero, M., Miranda, D., & Piattini, M. (2002). Defining and validating metrics for UML statechart diagrams. *Proceedings of QAOOSE*, *2002*.

[12] Jain, L., & Singh, S. (2019). Designing the Code Snippets for Experiments on Code Comprehension of Different Software Constructs. and outputs. International Journal of Computer Sciences and Engineering, Vol.7, Issue.3, pp.310-318. https://doi.org/10.26438/ijcse/v7i3.310318

[13] Jakhar, A.K & Rajnish, K. (2014). A New Cognitive Approach to Measure the Complexity of Software's. International Journal of Software Engineering & its Applications, vol. 8, no. 7, pp. 185- 198.

[14] Jama, O.M., (2009). *A Case Study on Evaluating UML Modelling in Software Testing* (Master's thesis, University of OSLO).

[15] Kitchenham B., Pflegger S. and Fenton N. (1995). Towards a Framework for Software Measurement Validation. *IEEE Transactions of Software Engineering*, 21(12), 929-943.

[16] King'ori, A. W., Muketha, G. M., & Micheni, E. M. (2019). A literature survey of cognitive complexity metrics for statechart diagrams. International Journal of Software Engineering & Applications (IJSEA), 10(4).

[17] Kushwaha, D. S., & Misra, A. K. (2006). Cognitive complexity metrics and its impact on software reliability based on cognitive software development model. ACM SIGSOFT Software Engineering Notes, 31(2), 1-6.

[18] Maurya L.S et al. (2010). Comparison of Software Architecture Evaluation Methods for Software Quality Attributes, *Journal of Global Research in Computer Science*, 1 (4).

[19] Misra, S., Adewumi, A., Fernandez-Sanz, L., & Damasevicius, R. (2018). A Suite of Object Oriented Cognitive Complexity Metrics. IEEE Access, 6, 8782–8796.

[20] Misra, S., & Akman, I. (2008, May). A new complexity metric based on cognitive informatics. In International Conference on Rough Sets and Knowledge Technology (pp. 620-627). Springer, Berlin, Heidelberg.

[21] Misra, S. (2006). Modified Cognitive Complexity Measure. Lecture Notes in Computer Science 4263: 1050-1059. https:// doi:10.1007/11902140_109.

[22] Muketha, G. M., Ghani, A. A. A., Selamat, M. H., & Atan, R, (2010b) A Survey of Business Process Complexity Metrics. *Information Technology Journal*, Vol 9, No. 7, pp1336-1344.

[23] Ndia, J. G. (2019). *Structural Complexity Framework and Metrics for Analyzing the Maintainability OF Sassy Cascading Style Sheets* (Doctoral dissertation, MMUST).

[24] Padmanabhan, B. (2012). Unified modeling language (UML) overview. *EECS810–Principles of*

Software Engineering.
[25] Rabani, S. T., & Maheswaran, K. (2017). Software Cognitive Complexity Metrics for OO Design: A Survey. International Journal of Scientific Research in Science, Engineering and Technology, 3, 691-698.90–101.
[26] Rambaugh, J., Jacobsen, I. & Booch, G. (2005). *The Unified Modelling Language Reference Manual*, second Edition. Pearson Higher Education
[27] Shao, J., & Wang, Y. (2003). A new measure of software complexity based on cognitive weights. Canadian Journal of Electrical and Computer Engineering, 28(2), 69-74.
[28] Siau, K., & Loo, P.P. (2006). Identifying difficulties in learning UML. *Information Systems Management,* 23(3), 43-51.
[29] Schneidewind N. (1992). Methodology for Validating Software Metrics. *IEEE Transactions of Software Engineering*, 18 (5), 410-422.
[30] UML, O. (2012a). Information technology-Object Management Group Unified Modelling Language (OMG UML), Infrastructure.
[31] Wang, Y. & Shao J., (2003). A new Measure of Software Complexity Based on Cognitive weights. Journal of Electrical and Computer Engineering,28(2),69-74.
[32] Wohlin, C., P. Runeson, M. Host, M. C. Ohlsson, and B. Regnell. "Experimentation in Software Engineering-An Introduction. Kluwer Academic Publishers." *Doedrecht the Netherlands* (2000).
[33] Weyuker, E.J. (1988). Evaluating software complexity measures. *IEEE Transactions on Software on Software Engineering* 14: 1357-1365.

Authors

Ann Wambui King'ori is an ICT Lecturer at the Department of Information Communication Technology at Nkabune Technical Training Institute, Kenya. She earned her Bachelor of Technology Education (Computer Studies) from the University of Eldoret, Kenya in 2014, and her MSc. In Information Technology from Murang'a University of Technology, Kenya, 2021. She is currently pursuing her PhD. in Information Technology at Murang'a University of Technology, Kenya. Her research interests include software metrics, software quality, and business intelligence.

Geoffrey Muchiri Muketha is Professor of Computer Science and Director of Postgraduate Studies at Murang' a University of Technology, Kenya. He received his BSc. in Information Science from Moi University in 1995, his MSc. in Computer Science from Periyar University, India in 2004, and his PhD in Software Engineering from Universiti Putra Malaysia in 2011. He has wide experience in teaching and supervision of postgraduate students. His research interests include software and
business process metrics, software quality, verification and validation, empirical methods in software engineering, and component-based software engineering. He is a member of the International Association of Engineers (IAENG).

Elyjoy Muthoni Micheni is a Senior Lecturer in Information Systems in the Department of Management Science and Technology at The Technical University of Kenya. She holds a Ph.D. (Information Technology) from Masinde Muliro University of Science and Technology, Master of Science (Computer Based Information Systems) from Sunderland University, (UK); Bachelor of Education from Kenyatta University; Post Graduate Diploma in Project Management from Kenya Institute of Management. She has taught Management Information System courses for many years at the University level. She has presented papers in scientific conferences and has many publications in refereed journals. She has also co-authored a book for Middle-level colleges entitled: "Computerized Document Processing". Her career objective is to tap computer-based knowledge as a tool to advance business activities, promote research in ICT and enhance quality service.

TECHRISK –A DECISIONAL FRAMEWORK TO MEASURE TECHNICAL DIMENSIONS OF LEGACY APPLICATION FOR REJUVENATION THROUGH REENGINEERING

Er. Anand Rajavat[1] and Dr. (Mrs.) Vrinda Tokekar[2]
[1]Department of Computer Science & Engineering, Shri Vaishnav Institute of Technology and Science, Indore, M. P., India
[2]Department of Information Technology, Institute of Engineering and Technology (DAVV), Indore, M. P., India

ABSTRACT

Competitive business environment wants to modernize existing legacy system in to self-adaptive ones. A variety of options are available to renovate legacy system in to more contemporary system. Recently the phenomenon of "software reengineering ", a methodology to allow old ways of thinking to be replaced with new, fresh approaches to increase productivity and quality of system, has been reported. However evolving legacy system through reengineering is a risky and error –prone task due to extensive changes it requires in the majority of cases. Therefore cost effective reengineering requires identifying and measuring impact of system, managerial and technical risk. We present a technical domain framework TechRisk to identify and measure quality and functional dimensions of legacy system. The objective is to identify those risk factors of technical domain which are critical to the success of reengineering. Proposed decision driven framework TechRisk provide support to identify and eliminate the highest impact risks in the software reengineering process and help to create a successful reengineering solution.

KEYWORDS

TechRisk, Reengineering, Risk engineering, Legacy system, Software quality, Domain.

For More Details : **https://www.airccse.org/journal/ijsea/papers/0711ijsea09.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol2.html**

REFERENCES

[1] Alessandro Bianchi, Danilo Caivano, Vittorio Marengo, Giuseppe Visaggio, "Iterative Reengineering of Legacy Systems",Ieee Transactions On Software Engineering, Vol. 29, No. 3, March 2003.

[2] Alessandro Bianchi, Danilo Caivano,Vittorio Marengo, Giuseppe Visaggio," Iterative Reengineering of Legacy Functions", 17th IEEE International Conference on Software Maintenance (ICSM'01), Florence, Italy, ISBN: 0-7695-1189-9,November 07-November 09.

[3] Anand rajavat,Vrinda Tokaker," MngRisk –A Decisional Framework to Measure Managerial Dimensions of Legacy Application for Rejuvenation through Reengineering",International jurnal of computer application 2011 by IJCA Journal, Number 2 - Article 4 ,DOI 10.5120/1985-2674,2011.

[4] Software Maintenance and Reengineering, 1998,ISBN: 0-8186-8421-6, Digital Object Identifier : 10.1109/CSMR.1998.665778

[5] Harry M. Sneed, "Risks Involved in Reengineering Projects," in WCRE: Proceedings of the 6th IEEE Conference on Reverse Engineering, PP.204, 1999.

[6] Eric K. Clemons Michael C. Row Matt E. Thatcher, "An Integrative Framework for Identifying and Managing Risks Associated With Large Scale Reengineering Efforts," Proceedings of the 28th Annual Hawaii International Conference on System Sciences, PP.960-969, 1995

[7] Cristiane S. Ramos, Káthia M. Oliveira, Nicolas Anquetil," Legacy Software Evaluation Model for Outsourced Maintainer", published in CSMR '04 Proceedings of the Eighth Euromicro Working Conference on Software Maintenance and Reengineering (CSMR'04), IEEE Computer Society Washington, DC, USA ©2004 table of contents ISBN:0-7695-2107-X

[8] Ransom, J., Somerville, I., Warren, I.," A method for assessing legacy systems for evolution ", in Proceedings of the Second Euromicro Conference on Software Maintenance and Reengineering, 1998, ISBN: 0-8186-8421-6 , INSPEC Accession Number: 5884288,PP 128 – 134.

[9] Anand rajavat,Vrinda Tokaker," MngRisk –A Decisional Framework to Measure Managerial Dimensions of Legacy Application for Rejuvenation through Reengineering",International jurnal of computer application 2011 by IJCA Journal, Number 2 - Article 4 ,DOI 10.5120/1985-2674,2011.

[10] Anand Rajavat, Vrinda Tokekar, "ReeRisk –A Decisional Risk Engineering Framework for Legacy System Rejuvenation through Reengineering", Published in Proceedings of Second International Conference on Recent Trends in Information, Telecommunication and Computing – ITC 2011 by Springer LNCS-CCIS, March 10-11, 2011 in Bengaluru, India, CNC 2011, CCIS 142, pp. 152 – 158, 2011, © Springer-Verlag Berlin Heidelberg 2011

AUTHORS

Er. Anand Rajavat Assistant professor
Department of Computer Science & Engineering
Shri Vaishnav Institute of Technology and Science Indore, M. P., India
B.E. (Computer Science and Engineering)
M.E. (Software Engineering)
Ph.D (Pursuing) (Computer Engineering) Areas of Interest:
Software Engineering, Object Oriented Analysis and Design, Computer Architecture

Dr. (Mrs.) Vrinda Tokekar Professor & Head,
Department of Information & Technology, Institute of Engineering & Technology, Devi Ahilya University, Indore (M.P.) India
Ph. D. (Computer Engg.) in 2007 from DAVV, Indore
M.E. (Computer Engg.) in 1992 from DAVV, Indore
B.E. (Hons.) EEE, BITS Pilani in 1984, Areas of Interest:
Computer Networks, Distributed Computing, Security in Wireless Networks, e-Governance, Multimedia Communication, Software Engineering

MANAGEMENT OF TIME UNCERTAINTY IN AGILE

Rashmi Popli and Priyanka Malhotra and Naresh Chauhan

Assistant Professor,Department of Computer Engineering, YMCAUST FARIDABAD

ABSTRACT

Agile software development represents a major departure from traditional methods of software engineering. It had huge impact on how software is developed worldwide. Agile software development solutions are targeted at enhancing work at project level. But it may encounter some uncertainties in its working. One of the key measures of the resilience of a project is its ability to reach completion, on time and on budget, regardless of the turbulent and uncertain environment it may operate within. Uncertainty of time is the problem which can lead to other uncertainties too. In uncertainty of time the main issue is that the how much delay will be caused by the uncertain environment and if the project manager comes to know about this delay before, then he can ask for that extra time from customer. So this paper tries to know about that extra time and calculate it.

KEYWORDS

Agile Software, Slack, Optimistic time, Pessimistic time, Probability of Delay.

For More Details : **https://airccse.org/journal/ijsea/papers/5414ijsea08.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol5.html**

REFERENCES

[1] Siobhan Keaveney and Kieran Conboy , "Cost Estimation and agile development projects" Product-Focused Software Process Improvement, 435-440

[2] Du, G., McElroy, J., &Ruhe, G. (2006). Ad hoc versus systematic planning of software releases–a three-staged experiment. Product-Focused Software Process Improvement, 435-440.

[3] Daniel D. Galorath, "The 10 Step Software Estimation Process For Successful Software Planning, Measurement and Control"galorth incorporated 2006.

[4] S. Bhalerao and Maya Ingle, "Incorporating Vital Factors In Agile Estimation Through Alogorithmic Method" International Journal of Computer Science and Applications, Ó2009 Technomathematics Research Foundation ,Vol. 6, No. 1, pp. 85 – 97

[5] Rashmi Popli, Anita and Naresh Chauhan. "mapping of traditional software development methods to agile methodology"

[6] Logue, K., &McDaid, K. (2008). Agile Release Planning: Dealing with Uncertainty in Development Time and Business Value. Engineering of Computer Based Systems, 2008. ECBS 2008. 15th Annual IEEE International Conference and Workshop on the (pp. 437-442). IEEE.

[7] McDaid, K., Greer, D., Keenan, F., Prior, P., Taylor, P., & Coleman, G. (2006). Managing Uncertainty in Agile Release Planning.Proc. 18th Int. Conference on Software Engineering and Knowledge Engineering (SEKE'06) (pp. 138-143).

[8] Logue, K., &McDaid, K. (2008). Agile Release Planning: Dealing with Uncertainty in Development Time and Business Value. Engineering of Computer Based Systems, 2008. ECBS 2008. 15th Annual IEEE International Conference and Workshop on the (pp. 437-442). IEEE.

[9] RashmiPopli, NareshChauhan," Research Challenges of Agile Estimation" Journal of Intelligent Computing and Applications" July- Dec 2012.

[10] RashmiPopli, NareshChauhan," "Scrum- An Agile Framework", International Journal of Information Technology and Knowledge Management (IJITKM) ISSN: 0973-4414", Vol-IV, Number-I, 20 Aug 2010.

Authors

Rashmi Popli is pursuing her Ph.D in Computer Engineering from YMCA University of Science & Technology, M.Tech(CE) from M.D University in year 2008,,B.Tech(IT) from M.D University in the year 2004.She has 9 years of experience in teaching. Presently she is working as an Assistant Professor in department of Computer Engineering in YMCA University of Science &Technology, Faridabad, Haryana, India. Her research areas include Software Engineering, Software Testing and Software Quality.

Priyanka Malhotra is a research scholar pursuing her M.tech in computer engineering (Compter Networks) from YMCA University of Science &Technology, Faridabad, Haryana, India. Completed B.tech (Cse) from Kurukshetra Unviersity, Kurukshetra

INTEGRATING SOFTWARE REPOSITORY MINING: A DECISION SUPPORT CENTERED APPROACH

Luiz Dourado Dias Junior and Eloi Favero

Department of Electric Engineering, UFPA, Belem, PA

ABSTRACT

Mining software repositories (MSR) research had significantly contributed to software engineering. However, MSR results integration across repositories is a recent concern that is getting more attention from researchers each day. Some noticeable research in this sense is related to the approximation between MSR and semantic web, specially linked data approaches which makes it possible to integrate repositories and mined results. Manifested that way, we believe that current research is not fully addressing the practical integration of MSR results, specially, in software engineering due to not considering that these results needs to be integrated to the tools as assistance to activity performers, as a kind of decision making support. Based on this statement this research describes an approach, named Sambasore, which is concerned with MSR results inter-repository integration and also to decision making support processes, based on tool assistance modelling. To show its feasibility we describe the main concepts, some related works and also a proof of concept experiment applied to a software process modelling tool named Spider PM.

KEYWORDS

Network Protocols, Wireless Network, Mobile Network, Virus, Worms & Trojon.

For More Details : **https://airccse.org/journal/ijsea/papers/3612ijsea05.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol3.html**

REFERENCES

[1] Hassan, A.E., (2008) "The road ahead for Mining Software Repositories," Frontiers of Software Maintenance, pp.48-57.

[2] Holmes, R. & Begel, A., (2008) “Deep intellisense: a tool for rehydrating evaporated information”, In Proceedings of the 2008 international working conference on Mining software repositories (MSR '08). ACM, New York, NY, USA, 23-26.

[3] Layman, L. & Nagappan, N. & Guckenheimer, S. & Beehler, J. && Begel, A., (2008) “Mining software effort data: preliminary analysis of visual studio team system data”, In Proceedings of the 2008 international working conference on Mining software repositories (MSR '08). ACM, New York, NY, USA, 23-26.

[4] Ratzinger, J. & Sigmund, T. & Gall, C. H., (2008) “On the relation of refactorings and software defect prediction”, In Proceedings of the 2008 international working conference on Mining software repositories (MSR '08). ACM, New York, NY, USA, 35-38.

[5] Anbalagan, P. & Vouk, M., (2009) “On mining data across software repositories”, In Proceedings of the 2009 6th IEEE International Working Conference on Mining Software Repositories (MSR '09). IEEE Computer Society, Washington, DC, USA, 171-174.

[6] Keivanloo, I. & Forbes, C. & Hmood, A. & Erfani, M. & Neal, C. & Peristerakis, G. & Rilling, J., (2012) "A Linked Data platform for mining software repositories", Mining Software Repositories (MSR), 2012 9th IEEE Working Conference on , vol., no., pp.32-35, 2-3 June 2012.

[7] Fayyad, U. & Piatetsky-Shapiro, G. & Smyth, P., (1996) “The KDD process for extracting useful knowledge from volumes of data”, Commun. ACM 39, 11 (November 1996), 27-34.

[8] Cimiano, P. (2010) “Ontology Learning and population from text”, Springer, 2010.

[9] Reis, C. L. (2003) “Uma Abordagem Flexível para Execução de Processos de Software Evolutivos”, Tese de Doutorado - PPGC - UFRGS, Março 2003.

[10] “Spem 2.0 Specification”, http://www.omg.org/spec/SPEM/2.0/.Last visited Aug, 2012.

[11] “Spider PM specification”, http://www.spider.ufpa.br/projetos/spider_pm/Spider-PM.pdf. Last visited Aug, 2012.

[12] “RUP 2002”, http://www.wthreex.com/rup/portugues/index.htm .Last visited Aug, 2012.

[13] “Protége Editor”, http://protege.stanford.edu/ .Last visited Aug, 2012.

[14] “Json Format”, http://www.json.org. Last visited Aug, 2012.

[15] “Spider Project”, http://www.spider.ufpa.br/index.php?id=sobre.Last visited Aug, 2012.

[16] “Spider PM specification”, http://www.spider.ufpa.br/projetos/spider_pm/Spider-PM.pdf. Last visited Aug, 2012.

[17] Agrawal, R. & Imieli, T. & Swami, A., (1993) “Mining association rules between sets of items in large databases”, In Proceedings of the 1993 ACM SIGMOD international conference on Management of data (SIGMOD '93), Peter Buneman and Sushil Jajodia (Eds.). ACM, New York, NY, USA, 207-216.

A METRICS SUITE FOR VARIABLE CATEGORIZATION TO SUPPORT PROGRAM INVARIANTS

P.Radhika Raju[1] and Dr. A.Ananda Rao[2]

[1]Research Scholar, Dept. of CSE, JNTUA, Ananthapuramu, A.P, India
[2]Professor in CSE, JNTUA, Ananthapuramu, A.P, India

ABSTRACT

Invariants are generally implicit. Explicitly stating program invariants, help programmers to identify program properties that must be preserved while modifying the code. Existing dynamic techniques detect invariants which includes both relevant and irrelevant/unused variables and thereby relevant and irrelevant invariants involved in the program. Due to the presence of irrelevant variables and irrelevant invariants, speed and efficiency of techniques are affected. Also, displaying properties about irrelevant variables and irrelevant invariants distracts the user from concentrating on properties of relevant variables. To overcome these deficiencies only relevant variables are considered by ignoring irrelevant variables. Further, relevant variables are categorized as design variables and non-design variables. For this purpose a metrics suite is proposed. These metrics are validated against Weyuker's principles and applied on RFV and JLex open source software. Similarly, relevant invariants are categorized as design invariants, non-design invariants and hybrid invariants. For this purpose a set of rules are proposed. This entire process enormously improves the speed and efficiency of dynamic invariant detection techniques.

KEYWORDS

Program invariants, Design variables, Non-design variables, Metrics, Invariants.

For More Details : **https://airccse.org/journal/ijsea/papers/5514ijsea05.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol5.html**

REFERENCES

[1] M. D. Ernst, J. Cockrell, W. G. Griswold, and D. Notkin. Dynamically discovering likely program invariants to support program evolution. IEEE TSE, 27(2):1–25, Feb. 2001.

[2] M. Vaziri and G. Holzmann.Automatic detection of invariants in Spin. In SPIN 1998, Nov. 1998.

[3] AnandaRao A. Automation of Software Version Management Using Metrics, Ph.D thesis, Dept. of Computer Science and Engineering, IIT Madras, Chennai, 2006.

[4] Chidamber S.R. and C.F.Kemerer, A Metrics Suite for Object Oriented Design, IEEE Trans. Softw.Eng., vol. 20, no. 6, pp.476-493, 1994.

[5] S. Hangal and M. S. Lam. Tracking down software bugs using automatic anomaly detection. In ICSE '02: Proceedings of the 24th International Conference on Software Engineering, pages 291–301, New York, NY, USA, 2002. ACM Press.

[6] B. Pytlik, M. Renieris, S. Krishnamurthi, and S. P. Reiss. Automated fault localization using potential invariants. In AADEBUG'2003, Fifth International Workshop on Automated and Algorithmic Debugging, pages 273–276, Ghent, Belgium, September 8–10, 2003.

[7] KarineArnout, and Raphaël Simon. "The .NET Contract Wizard: Adding Design by Contract to languages other than Eiffel". TOOLS 39 (39th International Conference and Exhibition on Technology of Object Oriented Languages and Systems). IEEE Computer Society, July 2001, p 14-23.

[8] Henkel and A. Diwan. Discovering algebraic specifications from java classes. In L.Cardelli, editor, ECOOP 2003 Object Oriented Programming, 17th European Conference, Darmstadt, July 2003. Springer.

[9] Ramakrishnan R. and D.J.RamModeling Design Versions , VL DB'96, Proceedings of 22th International conference on very large databases ,September 3-6, 1996, Mumbai (Bombay), India (vijayaraman T.M, A.P. Buchmann, C. Mohan and N. L. Sarda, eds.), pp. 556-566, Morgan Kauf mann,1996.

[10] Srinath S. , R. Ramakrishnan, and D.J. Ram, A Generic model for Sematics–based versioning in Projects, IEEE Transactions on Systems , Man, and Cybernetic , Part A, vol.30,no. 2, pp. 108-123, 2000.

[11] Bandi R.K. , V.K. Vaishnavi, and D.E. Turk, Predicting Maintenance Performance Using Object-Oriented Design Complexity Metrics, IEEE Trans. Softw. Eng., vol. 29, no.1,pp. 77-87,2003.

[12] Abbott D, A Design Complexity Metric for Object-Oriented Development, Master's thesis , Dept. of computer science, Clemson University,1993.

[13] Chen J-Y and Lu J-F, A New Metric for Object-Oriented Design , Information and Software Technology, pp. 232-240, April 1993.

[14] Weyuker E.J., Evaluating Software Complexity Measures, IEEE Trans. Softw. Eng., vol.14, no. 9,pp. 1357-1365,1988.

Authors

P.Radhika Raju received B.Sc. (Comp. Sci) from Sri Krishnadevaraya University, Ananthapuramu; MCA degree from Indira Gandhi National Open University (IGNOU), India and M.Tech degree in Computer Science from Jawaharlal Nehru Technological University Anantapur, Ananthapuramu, A.P, India. She is now pursuing her Ph.D degree from JNT University Anantapur. She authored a text book and has publications in National and International Journals/Conferences. Her research interest include primarily Software Engineering. She is now working as a Lecturer in department of Computer Science and Engineering, JNTUA College of Engineering, Ananthapuramu, A.P.

Dr. A.Ananda Rao received B.Tech degree in Computer Science and Engineering from University of Hyderabad, A.P, India and M.Tech degree in Artificial Intelligence and Robotics from University of Hyderabad, A.P, India. He received Ph.D degree from Indian Institute of Technology Madras, Chennai, India. He is Professor in Computer Science & Engineering and currently discharging his duties as Director Industrial Relations & Placements and SCDE, JNT

University Anantapur, Ananthapuramu, A.P, India. Dr. Rao has more than 100 publications in various National and International Journals/Conferences and authored three text books. He received one Best Research Paper award, one Best Paper award for his papers. He received many awards such as Best Teacher Award form Govt. of Andhra Pradesh in 2014, Best Computer Science Engineering Teacher award from ISTE, AP Chapter in 2013. His main research interest includes Software Engineering and Databases.

EA-MDA MODEL TO RESOLVE IS CHARACTERISTIC PROBLEMS IN EDUCATIONAL INSTITUTIONS

Mardiana[1] and Keijiro Araki[2]

[1,2]Dept. of Advanced Information Technology, Kyushu University, Fukuoka, Japan
[1]Dept. of Electrical Engineering, University of Lampung, Indonesia

ABSTRACT

Higher education institutions require a proper standard and model that can be implemented to enhance alignment between business strategy and existing information technologies. Developing the required model is a complex task. A combination of the EA, MDA and SOA concepts can be one of the solutions to overcome the complexity of building a specific information technology architecture for higher education institutions. EA allows for a comprehensive understanding of the institution's main business process while defining the information system that will assist in optimizing the business process. EA essentially focuses on strategy and integration. MDA relies on models as its main element and places focuses on efficiency and quality. SOA on the other hand uses services as its principal element and focuses on flexibility and reuse. This paper seeks to formulate an information technology architecture that can provide clear guidelines on inputs and outputs for EA development activities within a given higher education institution. This proposed model specifically emphasises on WIS development in order to ensure that WIS in higher education institutions has a coherent planning, implementation and control process in place consistent with the enterprise's business strategy. The model will then be applied to support WIS development and implementation at University of Lampung (Unila) as the case study.

KEYWORDS

Enterprise Architecture, Web Information system, Higher Education, MDA, SOA.

For More Details : **https://airccse.org/journal/ijsea/papers/4313ijsea01.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol4.html**

REFERENCES

[1] Osvalds, Gundars, (2001) Definition of Enterprise Architecture – Centric Models for The Systems Engineers, TASC Inc.

[2] T. Erl, (2005) Service-Oriented Architecture - Concepts, Technology, and Design, Prentice Hall.

[3] OMG, "OMG Model Driven Architecture," Available: http://www.omg.org/mda.

[4] Republic of Indonesia, (2005) "Government regulations (PP) No.19 of 2005 of national standard of education" ,Jakarta, Indonesia.

[5] Shah, H. & Kourdi, M.E (2007) "Frameworks for Enterprise Architecture," IT Professional , vol.9, no.5, pp. 36-41

[6] Ostadzadeh, S. S, Aliee, Fereidoon S., Ostadzadeh, S. A., (2008), "An MDA-Based Generic Framework to Address Various Aspects of Enterprise Architecture", Advances in Computer and Information Sciences and Engineering, pp. 455–460.

[7] Wegmann, A. and Preiss, O., (2003) "MDA in Enterprise Architecture? The Living System Theory to the Rescue", Proceedings of the 7th IEEE international Enterprise Distributed Object Computing Conference (EDOC'03), pp. 2-13

[8] Fatolahi, Ali, S. S, Stéphane, C. L, Timothy (2007) " Enterprise Architecture Using the Zachman Framework: A Model Driven Approach", Proceedings of the IRMA 2007 International Conference, pp 65-69.

[9] Cáceres, P., Marcos,E.,Vela ,B., (2003), "A MDA-Based Approach for Web Information System Development", Workshop in Software Model Engineering (WISME'03)

[10] Castro,V., Marcos, E., Cáceres, P., (2004) "A User Service Oriented Method to Model Web Information Systems", WISE 2004, LNCS 3306, pp. 41–52

[11] Meliá, S., & Gómez,J.,(2005)" Applying Transformations to Model Driven Development of Web Applications ",ER Workshops 2005, LNCS 3770, pp. 63-73

[12] Castro, V. De., Marcos, E., and Vara, J.M., (2010), "Applying CIM-to-PIM model transformation for the service-oriented development of information systems," Journal Information and Software Technology, pp. 87-105

[13] Carstensen, P. H., Vogelsang, L, (2001), "Design of Web-based information systems—new challenges for systems development?" Ninth European conference on information systems (ECIS), pp 536–547

[14] National Accreditation Board for Higher Education (Badan Akreditasi Nasional Perguruan Tinggi, BAN-PT) Ministry of Education Indonesia, (2008) Book IIIA: Undergraduate program study accreditation, Jakarta, Indonesia, BAN PT.

[15] Directorate General of Higher Education (DGHE), "Dissemination of national higher education database system", Ministry of Education Indonesia, (2010), Jakarta, Indonesia.

[16] Sowa, J. F., Zachman, J.A. (1992) "Extending and formalizing the framework for information systems
architecture". IBM Systems Journal 31, No. 3, 590-616.

[17] The Open Group, TOGAF Version 9.1, http://www.opengroup.org/togaf/

[18] Leist,S., & Zellner,G.,(2006), "Evaluation of current architecture frameworks". In Proceedings of the 2006 ACM symposium on Applied computing

[19] Frankel, David S.,(2003) The Model Driven Architecture: Applying MDA to Enterprise Computing, OMG Press.

[20] Open Group, (2009) The Open Group Architecture Framework: Architecture Development Method.

[21] Rivett,P., Spencer,J., Waskiewicz,F., (2005) TOGAF/MDA Mapping, White Paper, The Open Group

[22] Directorate General of Higher Education (DGHE), (2009), EPSBED, http://evaluasi.or.id/

[23] The OMG Group, (2008) Business Process Modelling Notation, Version 1.1.

[24] Booch, G., Rumbaugh, J., Jacobson, I., (1999) "The Unified Modeling Language: A User Guide", Addison Wesley.

[25] Main Acceleo Site, "Acceleo MDA Generator," http://www.acceleo.org/.

[26] Main PHP Site "PHP," http://www.php.net/.

[27] Main CodeIgniter Site , "CodeIgniter," http://codeigniter.com/.

[28] Chuttur, M.Y., (2009), "Overview of the Technology Acceptance Model: Origins, Developments and Future Directions", Indiana University, USA, Sprouts: Working Papers on Information Systems

[29] Gable, G.,Sedera, D.,Chan, T. (2008), "Re-conceptualizing Information System Success: The IS-Impact Measurement Model", Journal of the Association for Information Systems, 9 (7), pp. 377-408.

[30] Mardiana & Araki,K., (2012) “SIMPEL: An innovative web application interface supporting online course management system,” in Information Technology Based Higher Education and Training (ITHET), pp.212-219.
[31] Main Moodle Site, “Moodle,” http://moodle.org/

Authors

Mardiana

She received B.S. degree in Electrical Engineering at the National Institute of Technology, Indonesia and the M.S degree in Electrical Engineering at the Bandung Institute of Technology, Indonesia, in 1997 and 2002 respectively. Since 1998 until now, she is working as a lecturer at Department of Electrical Engineering, University of Lampung, Indonesia. She is currently a PhD student in Graduate School of Information Science and Electrical Engineering, Department of Advanced Information Technology, Kyushu University, Japan.

Keijiro Araki

He received his B.S., M.E. and D.E. degree in Computer Science and Communication Engineering from Kyushu University, Japan, in 1976, 1978 and 1982 respectively. Since 1984 till 1993 he was an Associate Professor in the same department. From 1993 to 1996 he was working as a Professor at the Graduate School of Information Science, Nara Institute of Science and Technology, Japan. Now, he is a Professor at the Graduate School of Information Science and Electrical Engineering in Kyushu University since 1996.

THE IMPACT OF TEAM CLIMATE ON FAILURE AND SUCCESS OF SCRUM ADOPTION

Mona Najafi Sarpiri[1] and Taghi Javdani Gandomani[2*]

[1]Department of Computer Engineering, Dolat Abad Branch, Islamic Azad University, Dolat Abad, Isfahan, Iran
[2*]Department of Computer Engineering, Boroujen Branch, Islamic Azad University, Boroujen, Iran

ABSTRACT

Software companies are widely using Agile methods in recent years. Scrum is the most popular Agile method which focuses on project management by defining the required roles, responsibilities, and activities. Despite of its simplicity, many reports address the challenges that threat the software teams when adapting to Scrum. Most of these reports highlight the details of the challenges which most of them roots back to the team climate. On the other hand, it seems that Scrum facilitators originate from the team climate, too. This study aimed to show the impact of software team climate on both failure and success of Scrum adoption. The results show that team climate has positive and negative impact on Scrum adoption process.

KEYWORDS

Agile Methods, Scrum, Scrum Adoption, Team Climate, Scrum Failure, Scrum Challenges

For More Details : **https://aircconline.com/ijsea/V8N3/8317ijsea03.pdf**
Volume Link : **https://www.airccse.org/journal/ijsea/vol8.html**

REFERENCES

[1] VersionOne, "VersionOne 11th Annual State of Agile Report," 2017, Available: stateofagile.versionone.com.

[2] K. Beck, A. Cockburn, R. Jeffries, and J. Highsmith. (2001, Feb. 2016). Agile manifesto. Available: http://www.agilemanifesto.org

[3] M. Usman, "Diminution of Issues and Challenges when Using Scrum in Global Software Engineering," International Journal of Technology and Research, vol. 4, no. 2, 2016.

[4] R. K. Gupta and P. Manikreddy, "Challenges in Adapting Scrum in Legacy Global Configurator Project," in 10th International Conference on Global Software Engineering (ICGSE), 2015, pp. 46-50: IEEE.

[5] R. T. Nishijima and J. G. Dos Santos, "The challenge of implementing scrum agile methodology in a traditional development environment," International Journal of Computers & Technology, vol. 5, no. 2, pp. 98-108, 2013.

[6] K. S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process. Michigan: Addison-Wesley Professional, 2012.

[7] P. Abrahamsson, J. Ronkainen, and J. Warsta, "Agile software development methods: Review and analysis," VTT Publications, vol. 478, pp. 1-112, 2002.

[8] M. Cohn, Succeeding with Agile: Software Development Using Scrum. Boston, MA: Addison- Wesley Professional, 2009.

[9] C. Sims and H. L. Johnson, Scrum: a Breathtakingly Brief and Agile Introduction. San Francisco, CA: Dymaxicon, 2012.

[10] A. Marchenko and P. Abrahamsson, "Scrum in a multiproject environment: An ethnographically-inspired case study on the adoption challenges," in Agile 2008 Conference, Toronto, ON, 2008, pp. 15-26.

[11] T. J. Gandomani and M. Z. Nafchi, "Agile transition and adoption human-related challenges and issues: A Grounded Theory approach," Computers in Human Behavior, vol. 62, pp. 257-266, 2016.

[12] T. J. Gandomani, H. Zulzalil, A. A. A. Ghani, A. M. Sultan, and M. Z. Nafchi, "Obstacles to moving to agile software development; at a glance," Journal of Computer Science, vol. 9, no. 5, pp. 620-625, 2013.

[13] J. Srinivasan and K. Lundqvist, "Agile in India: Challenges and lessons learned," in 3rd India Software Engineering Conference, ISEC'10, Mysore, India, 2010, pp. 125-130, New York: ACM.

[14] J. J. Cho, "An exploratory study on issues and challenges of agile software development with scrum," All Graduate Theses and Dissertations, p. 599, 2010.

[15] C. Sigman, "Adapting to scrum: Challenges and strategies," Intercom, vol. 54, no. 7, pp. 16-19, 2007.

[16] L. Cho, "Adopting an agile culture," Chicago, IL, 2009, pp. 400-403.

[17] S. Dorairaj, J. Noble, and P. Malik, "Understanding lack of trust in distributed agile teams: A grounded theory study," in 16th International Conference on Evaluation and Assessment in Software Engineering, EASE 2012, Ciudad Real, Spain, 2012, vol. 2012, pp. 81-90.

[18] T. J. Gandomani, H. Zulzalil, A. A. Abd Ghani, A. B. M. Sultan, and K. Y. Sharif, "Exploring Facilitators of Transition and Adoption to Agile Methods: a Grounded Theory Study," Journal of Software, vol. 7, no. 9, pp. 1666-1678, 2014.

[19] T. Chow and D. B. Cao, "A survey study of critical success factors in agile software projects," Journal of Systems and Software, vol. 81, no. 6, pp. 961-971, 2008.

[20] M. Pikkarainen, O. Salo, R. Kuusela, and P. Abrahamsson, "Strengths and barriers behind the successful agile deployment-insights from the three software intensive companies in Finland," Empirical Software Engineering, vol. 17, no. 6, pp. 675-702, 2012.

[21] K. Conboy, S. Coyle, X. Wang, and M. Pikkarainen, "People over process: Key challenges in agile development," IEEE Software, vol. 28, no. 4, pp. 48-57, 2011.

[22] R. M. Parizi, T. J. Gandomani, and M. Z. Nafchi, "Hidden Facilitators of Agile Transition: Agile Coaches and Agile Champions," in 8th Malaysian Software Engineering Conference (MySEC), Langkawi, Malaysia, 2014, pp. 246-250: IEEE Computer Society.

[23] T. J. Gandomani, H. Zulzalil, A. A. Abdul Ghani, A. B. M. Sultan, and K. Y. Sharif, "How human aspects impress Agile software development transition and adoption," International Journal of Software Engineering and its Applications, vol. 8, no. 1, pp. 129-148, 2014.

[24] A. Pham and P.-V. Pham, Scrum in Action: Agile Software Project Management and Development. USA: Course Technology Ptr, 2011.

[25] N. B. Moe, A. Aurum, and T. Dybå, "Challenges of shared decision-making: A multiple case study of agile software development," Information and Software Technology, vol. 54, no. 8, pp. 853-865, 2012.
[26] J. Ren, Y. Y. Yusuf, and N. D. Burns, "A decision-support framework for agile enterprise partnering," International Journal of Advanced Manufacturing Technology, vol. 41, no. 1-2, pp. 180-192, 2009.
[27] A. L. Asnawi, A. M. Gravell, and G. B. Wills, "Factor analysis: Investigating important aspects for agile adoption in Malaysia," in Asia's Premier Agile and Lean Conference, AgileIndia 2012, Bengaluru, India, 2012, pp. 60-63
[28] T. Niinimäki, A. Piri, P. Hynninen, and C. Lassenius, "Studying communication in agile software development: A research framework and pilot study," in ICMI-MLMI'09 Workshop on Multimodal Sensor-Based Systems and Mobile Phones for Social Computing, MSSSC'09, Cambridge, MA, 2009.

TRACING REQUIREMENTS AS A PROBLEM OF MACHINE LEARNING

Zeheng Li and LiGuo Huang

Southern Methodist University, Dallas, Texas, USA

ABSTRACT

Software requirement engineering and evolution essential to software development process, which defines and elaborates what is to be built in a project. Requirements are mostly written in text and will later evolve to fine-grained and actionable artifacts with details about system configurations, technology stacks, etc. Tracing the evolution of requirements enables stakeholders to determine the origin of each requirement and understand how well the software's design reflects to its requirements. Reckoning requirements traceability is not a trivial task, a machine learning approach is used to classify traceability between various associated requirements. In particular, a 2-learner, ontology-based, pseudo-instances-enhanced approach, where two classifiers are trained to separately exploit two types of features, lexical features and features derived from a hand-built ontology, is investigated for such task. The hand-built ontology is also leveraged to generate pseudo training instances to improve machine learning results. In comparison to a supervised baseline system that uses only lexical features, our approach yields a relative error reduction of 56.0%. Most interestingly, results do not deteriorate when the hand-built ontology is replaced with its automatically constructed counterpart.

KEYWORDS

Requirements Traceability, Software Design, Machine Learning

For More Details : **https://aircconline.com/ijsea/V9N4/9418ijsea02.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol9.html**

REFERENCES

[1] O .Zaidan, J. Eisner, and C. Piatko,"Using" annotator rationales" to improve machine learning for text categorization," in Human Language Technologies 2007: The Conference of the North American Chapter of the Association for Computational Linguistics; Proceedings of the Main Conference, 2007, pp. 260–267.

[2] R.A. Pierce, "A requirements tracing tool," ACM SIGSOFT Software Engineering Notes, vol. 3, no. 5, pp. 53–60, 1978.

[3] J. Jackson, "A keyphrase based traceability scheme," in Tools and Techniques for Maintaining Traceability During Design, IEE Colloquium on. IET, 1991, pp. 2–1.

[4] S. K. Sundaram, J. H. Hayes, and A. Dekhtyar, "Baselines in requirements tracing," ACM SIGSOFT Software Engineering Notes, vol. 30, no. 4, pp. 1–6, 2005.

[5] M. Lormans and A. Van Deursen, "Can LSI help reconstructing requirements traceability in designandtest?" in Software Maintenanceand Reengineering, 2006. CSMR 2006.Proceedings of the 10th European Conference on. IEEE, 2006, pp. 10–pp.

[6] A. DeLucia, F .Fasano, R. Oliveto, and G. Tortora, "Recovering traceability links in software artifact management systems using information retrieval methods," ACM Transactions on Software Engineering and Methodology (TOSEM), vol. 16, no. 4, p. 13, 2007.
De Lucia, R. Oliveto, and G. Tortora, "Assessing IR-based traceability recovery tools
through controlled experiments," Empirical Software Engineering, vol. 14, no. 1, pp. 57– 92, 2009.

[7] J. Cleland-Huang, R. Settimi, C. Duan, and X. Zou, "Utilizing supporting evidence to improve dynamic requirements traceability," in Requirements Engineering, 2005. Proceedings. 13th IEEE International Conference on. IEEE, 2005, pp. 135–144..

[8] D. Port, A. Nikora, J. H. Hayes, and L. Huang, "Text mining support for software requirements: Traceability assurance,"in System Sciences (HICSS), 2011 44th Hawaii International Conference on. IEEE, 2011, pp. 1–11.

[9] J.N. Dag, B. Regnell, P. Carlshamre, M. Andersson, and J. Karlsson, "A feasibility study of automated natural language requirements analysis in market-driven development," Requirements Engineering, vol. 7, no. 1, pp. 20–33, 2002.

[10] Z. Li, M. Chen, L. Huang, and V. Ng, "Recovering traceability links in requirements documents," in Proceedings of the Nineteenth Conference on Computational Natural Language Learning, 2015, pp. 237–246.

[11] J. Guo, J. Cheng, and J. Cleland-Huang, "Semantically enhanced software traceability using deep learning techniques," in 2017 IEEE/ACM 39th International Conference on Software Engineering (ICSE), May 2017, pp. 3–14.

[12] M.-C. de Marneffe, B. MacCartney, and C. D. Manning, "Generating typed dependency parses from phrase structure parses," in Proceedings of the 5th International Conference on Language Resources and Evaluation, 2006, pp. 449–454.

[13] C.-C. Chang and C.-J. Lin, "LIBSVM: a library for support vector machines," ACM Transactions on Intelligent Systems and Technology (TIST), vol. 2, no. 3, p. 27, 2011.

[14] A. Blum and P. Langley, "Selection of relevant features and examples in machine learning," Artificial Intelligence, vol. 97, no. 1–2, pp. 245–271, 1997.

A NOVEL EFFORT ESTIMATION MODEL FOR SOFTWARE REQUIREMENT CHANGES DURING SOFTWARE DEVELOPMENT PHASE

Jalal Shah, Nazri Kama and Nur Azaliah A Bakar

Department of Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia

ABSTRACT

Software Requirements Changes is a typical phenomenon in any software development project. Restricting incoming changes might cause user dissatisfaction and allowing too many changes might cause delay in project delivery. Moreover, the acceptance or rejection of the change requests become challenging for software project managers when these changes are occurred in Software Development Phase. Where in Software Development Phase software artifacts are not in consistent state such as: some of the class artifacts are Fully Developed, some are Half Developed, some are Major Developed, some are Minor Developed and some are Not Developed yet. However, software effort estimation and change impact analysis are the two most common techniques which might help software project managers in accepting or rejecting change requests during Software Development Phase. The aim of this research is to develop a new software change effort estimation model which helps software project manager in estimating the effort for software Requirement Changes during Software Development Phase. Thus, this research has analyzed the existing effort estimation models and change impact analysis techniques for Softwrae Development Phase from the literature and proposed a new software change effort estimation model by combining change impact analysis technique with effort estimation model. Later, the new proposed model has been evaluated by selecting four small size software projects as case selections in applying experimental approch. The experiment results show that the overall Mean Magnitude Relative Error value produced by the new proposed model is under 25%. Hence it is concluded that the new proposed model is applicable in estimating the amount of effort for requirement changes during SDP.

KEYWORDS

Software Change Effort Estimation, Software Requirement Changes, Function Point Analysis, Constructive Cost Model and Software Development Phase.

For More Details :**https://aircconline.com/ijsea/V9N6/9618ijsea02.pdf**
Volume Link : **https://www.airccse.org/journal/ijsea/vol9.html**

REFERENCES

[1] H. Kerzner, Project management best practices: Achieving global excellence: John Wiley & Sons, 2018.

[2] M. Gupta and A. Kalia, "Empirical Study of Software Metrics," Research Journal of Science and Technology, vol. 9, pp. 17-24, 2017.

[3] T. O. A. Lehtinen, M. V. Mäntylä, J. Vanhanen, J. Itkonen, and C. Lassenius, "Perceived causes of software project failures – An analysis of their relationships," Information and Software Technology, vol. 56, pp. 623-643, 6// 2014.

[4] R. Kaur and J. Sengupta, "Software Process Models and Analysis on Failure of Software Development Projects," CoRR, vol. abs/1306.1068, 2013.

[5] M. Bano, S. Imtiaz, N. Ikram, M. Niazi, and M. Usman, "Causes of requirement change - A systematic literature review," in Evaluation & Assessment in Software Engineering (EASE 2012), 16th International Conference on, 2012, pp. 22-31.

[6] J. Shah and N. Kama, "Issues of Using Function Point Analysis Method for Requirement Changes During Software Development Phase.," presented at the Asia Pacific Requirements Engeneering Conference, Melaka Malaysia, 2018.

[7] J. Shah and N. Kama, "Extending Function Point Analysis Effort Estimation Method for Software Development Phase," presented at the Proceedings of the 2018 7th International Conference on Software and Computer Applications, Kuantan, Malaysia, 2018.

[8] J. Shah and N. Kama, "Extending Function Point Analysis Effort Estimation Method for Software Development Phase," in Proceedings of the 2018 7th International Conference on Software and Computer Applications, 2018, pp. 77-81.

[9] Kama and M. Halmi, "Extending Change Impact Analysis Approach for Change Effort Estimation in the Software Development Phase," in WSEAS International Conference. Proceedings. Recent Advances in Computer Engineering Series, 2013.

[10] N. K. Jalal Shah, Saiful Adli Ismail, "An Empirical Study with Function Point Analysis for Software Development Phase Method," presented at the 2018 7th International Conference on Software and Information Engineering (ICSIE 2018), Cairo, Egypt, 2018.

[11] D. Kchaou, N. Bouassida, and H. Ben-Abdallah, "Change effort estimation based on UML diagrams application in UCP and COCOMOII," in 2015 10th International Joint Conference on Software Technologies (ICSOFT), 2015, pp. 1-8.

[12] D. Kchaou, N. Bouassida, and H. Ben-Abdallah, "UML models change impact analysis using a text similarity technique," IET Software, vol. 11, pp. 27-37, 2017.

[13] A. Hira, S. Sharma, and B. Boehm, "Calibrating COCOMO® II for projects with high personnel turnover," presented at the Proceedings of the International Conference on Software and Systems Process, Austin, Texas, 2016.

[14] A. Hira and B. Boehm, "Function Point Analysis for Software Maintenance," presented at the Proceedings of the 10th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement, Ciudad Real, Spain, 2016.

[15] L. M. Alves, A. Sousa, P. Ribeiro, and R. J. Machado, "An empirical study on the estimation of software development effort with use case points," in 2013 IEEE Frontiers in Education Conference (FIE), 2013, pp. 101-107.

[16] H. Rastogi, S. Dhankhar, and M. Kakkar, "A survey on software effort estimation techniques," in Confluence The Next Generation Information Technology Summit (Confluence), 2014 5th International Conference -, 2014, pp. 826-830.

[17] K. Usharani, V. V. Ananth, and D. Velmurugan, "A survey on software effort estimation," in 2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), 2016, pp. 505-509.

[18] R. Britto, V. Freitas, E. Mendes, and M. Usman, "Effort Estimation in Global Software Development: A Systematic Literature Review," in 2014 IEEE 9th International Conference on Global Software Engineering, 2014, pp. 135-144.

[19] A. Idri, M. Hosni, and A. Abran, "Systematic literature review of ensemble effort estimation," Journal of Systems and Software, vol. 118, pp. 151-175, 8// 2016.

[20] M. d. F. Junior, M. Fantinato, and V. Sun, "Improvements to the Function Point Analysis Method: A Systematic Literature Review," IEEE Transactions on Engineering Management, vol. 62, pp. 495- 506, 2015.
[21] B.Chinthanet, P.Phannachitta, Y. Kamei, P. Leelaprute, A. Rungsawang, N. Ubayashi, et al., "A review and comparison of methods for determining the best analogies in analogy-based software effort estimation," presented at the Proceedings of the 31st Annual ACM Symposium on Applied Computing, Pisa, Italy, 2016.
[22] S.Basri, N.Kama, F. Haneem, and S. A. Ismail, "Predicting effort for requirement changes during software development," presented at the Proceedings of the Seventh Symposium on Information and Communication Technology, Ho Chi Minh City, Viet Nam, 2016.
[23] M.Shahid and S.Ibrahim, "Change impact analysis with a software traceability approach to support software maintenance," in 2016 13th International Bhurban Conference on Applied Sciences and Technology (IBCAST), 2016, pp. 391-396.
[24] S.Basri, N.Kama, and R. Ibrahim, "A Novel Effort Estimation Approach for Requirement Changes during Software Development Phase," International Journal of Software Engineering and Its Applications, vol. 9, pp. 237-252, 2015.
[25] O.Fedotova, L.Teixeira, and H. Alvelos, "Software Effort Estimation with Multiple Linear Regression: Review and Practical Application," J. Inf. Sci. Eng., vol. 29, pp. 925-945, 2013.
[26] A.Idri, F.a. Amazal, and A. Abran, "Analogy-based software development effort estimation: A systematic mapping and review," Information and Software Technology, vol. 58, pp. 206-230, 2// 2015.
[27] M.Kaur and S.K. Sehra, "Particle swarm optimization based effort estimation using Function Point analysis," in Issues and Challenges in Intelligent Computing Techniques (ICICT), 2014 International Conference on, 2014, pp. 140-145.
[28] N.K. b. Jalal Shah*a, Amelia Zahari, "AN EMPIRICAL STUDY WITH FUNCTION POINT ANALYSIS FOR REQUIREMENT CHANGES DURING SOFTWARE DEVELOPMENT PHASE," in ASIA International Multidisciplinary Conference 2017, Johor Bharu, 2017.
[29] B.Sufyan, K. Nazri, H. Faizura, and A. I. Saiful, "Predicting effort for requirement changes during software development," presented at the Proceedings of the Seventh Symposium on Information and Communication Technology, Ho Chi Minh City, Viet Nam, 2016.
[30] V.K. Bardsiri, D.N.A. Jawawi, A. K. Bardsiri, and E. Khatibi, "LMES: A localized multi-estimator model to estimate software development effort," Engineering Applications of Artificial Intelligence, 2013.
[31] F.Ferrucci, C. Gravino, and L. Lavazza, "Simple function points for effort estimation: a further assessment," presented at the Proceedings of the 31st Annual ACM Symposium on Applied Computing, Pisa, Italy, 2016.
[32] A.J. Albrecht, "AD/M productivity measurement and estimate validation," IBM Corporate Information Systems, IBM Corp., Purchase, NY, 1984.
[33] P.Vickers and C. Street, "An Introduction to Function Point Analysis," School of Computing and Mathematical Sciences, Liverpool John Moores University, Liverpool, UK, 2001.
[34] S.Sabrjoo, M Khalili, and M. Nazari, "Comparison of the accuracy of effort estimation methods," in 2015 2nd International Conference on Knowledge-Based Engineering and Innovation (KBEI), 2015, pp. 724-728.
[35] V.Anandhi and R. M. Chezian, "Regression techniques in software effort estimation using cocomo dataset," in Intelligent Computing Applications (ICICA), 2014 International Conference on, 2014, pp. 353-357.
[36] B.W. Boehm, Software Cost Estimation with Cocomo II: Prentice Hall, 2000.
[37] S.Basri, N. Kama, and R. Ibrahim, "COCHCOMO: An extension of COCOMO II for Estimating Effort for Requirement Changes during Software Development Phase," 2016.
[38] Asl and Kama, "A Change Impact Size Estimation Approach during the Software Development," in 2013 22nd Australian Software Engineering Conference, 2013, pp. 68-77.
[39] B.Sufyan, K. Nazri, A. Saiful, and H. Faizura, "Using static and dynamic impact analysis for effort estimation," IET Software, vol. 10, pp. 89-95, 2016.

[40] N.Kama and F.Azli, "A Change Impact Analysis Approach for the Software Development Phase," presented at the Proceedings of the 2012 19th Asia-Pacific Software Engineering Conference - Volume 01, 2012.
[41] N.Kama and F.Azli, "A Change Impact Analysis Approach for the Software Development Phase," in 2012 19th Asia-Pacific Software Engineering Conference, 2012, pp. 583-592.
[42] B.W. Boehm, R. Madachy, and B. Steece, Software cost estimation with Cocomo II with Cdrom: Prentice Hall PTR, 2000.
[43] J.W. Creswell, Research design: Qualitative, quantitative, and mixed methods approaches: Sage publications, 2013.
[44] R.De Lemos, H. Giese, H. A. Müller, M. Shaw, J. Andersson, M. Litoiu, et al., "Software engineering for self-adaptive systems: A second research roadmap," in Software Engineering for Self-Adaptive Systems II, ed: Springer, 2013, pp. 1-32.
[45] C.Wohlin and A. Aurum, "Towards a decision-making structure for selecting a research design in empirical software engineering," Empirical Software Engineering, vol. 20, pp. 1427-1455, 2015.
[46] D.Garmus and D. Herron, "Function Point Analysis: Measurement Practices for Successful Software Projects pdf," 2001.
[47] J.J.Cuadrado-Gallego, P. Rodriguez-Soria, A. Gonzalez, D. Castelo, and S. Hakimuddin, "Early Functional Size Estimation with IFPUG Unit Modified," in Computer and Information Science (ICIS), 2010 IEEE/ACIS 9th International Conference on, 2010, pp. 729-733.
[48] Q.S.Management. (2018). Function Point Languages Table. Available: http://www.qsm.com/resources/function-point-languages-table
[49] M.Jorgensen and K. Molokken-Ostvold, "Reasons for software effort estimation error: impact of respondent role, information collection approach, and data analysis method," IEEE Transactions on Software engineering, vol. 30, pp. 993-1007, 2004.
[50] V.Nguyen, B.Steece, and B. Boehm, "A constrained regression technique for COCOMO calibration," in Proceedings of the Second ACM-IEEE international symposium on Empirical software engineering and measurement, 2008, pp. 213-222.
[51] S.-J. Huang, N.-H. Chiu, and L.-W. Chen, "Integration of the grey relational analysis with genetic algorithm for software effort estimation," European Journal of Operational Research, vol. 188, pp. 898-909, 2008.

AUTHORS

Jalal Shah, he is pursing PhD in the field of Software Engineering from Universiti Teknologi Malaysia. He has more than 8 year of teaching & research experience. He is currently working in the area of Software Effort Estimation. He has also published & presented papers in refereed journals and conferences.

Nazri Kama, He is an Associate Professor at Universiti Teknologi Malaysia (UTM) specializing in software engineering. He graduated in Bachelor in Management Information System from Universiti Teknologi Malaysia. Later, he obtained a Master Degree from the same university in Real-time Software Engineering. In 2011, he received a Doctorate in Software Engineering from the University of Western Australia in Australia

Nur Azaliah Abu Bakar, PhD is a Senior Lecturer at Advanced Informatics Department, Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia. She graduated with a Bachelor (Information Technology) in Information Systems Engineering from Multimedia University (MMU) Malaysia (2000). She then obtained her Masters in Information Technology from Universiti Teknologi Mara (UiTM) in 2004. In 2017 she was awarded a Doctor of Philosophy degree in Information Technology (Enterprise Architecture) by Universiti Teknologi Malaysia.

I.T. PROJECT SUCCESS: PRACTICAL FRAMEWORKS BASED ON KEY PROJECT CONTROL VARIABLES

Godfred Yaw Koi-Akrofi, Eleanor Afful and Henry Akwetey Matey

Department of IT Studies, University of Professional Studies, Accra

ABSTRACT

The objectives of this study were to research into the interdependencies IT project control variables, and also come out with frameworks to help IT project managers understand how to effectively control these variables to ensure the success of IT projects. The study employed six control variables: Cost, Time (Schedule), Scope, Quality, Risk, and Benefits. A qualitative approach was adopted, where selected IT program and project managers of the Telecom industry in Ghana were interviewed individually and in a group based on a set of questions. The findings, espoused in the frameworks, reiterated the theory of the dependence of one control variable on the other, and the fact that varying one affects the others positively or negatively in relation to IT project success, as is the case for the iron triangle. Again, key activities of the control variables necessary to ensure IT project success were discovered.

KEYWORDS

Information, Technology, Control, Variables, Projects.

For More Details : **https://aircconline.com/ijsea/V10N5/10519ijsea04.pdf**

Volume Link : **https://www.airccse.org/journal/ijsea/vol10.html**

REFERENCES

[1] J. Smyrk, “What does the term “IT project” actually mean?: a challenge to the IT profession,”. PHILICA.COM Observation number 36, 2007.

[2]

[3] OECD,"ICT investment (indicator)," 2018, DOI: 10.1787/b23ec1da-en November [4] (Accessed on 2018). Retrieved from: https://data.oecd.org/ict/ict-investment.html 24

[5] K. C. Laudon, and P. A. Laudon, "Managing Information Systems: Managing the digital firm," 12th Edition, Prentice-Hall, 2012.
[6]
[7] Gartner, “Analysts to Discuss Latest IT Spending Outlook During Gartner Webinar,” 2018,
[8] Accessed on 24 November 2018. Retrieved from: https://www.gartner.com/newsroom/id/3871063
[9] G. Y. Koi-Akrofi, H. O. Quarshie, and J. Koi-Akrofi, “IT project failures in organizations in Ghana,” Journal of Emerging Trends in Computing and Information Sciences, Vol. 4, No. 1, 2013.
[10]
[11] G. Y. Koi-Akrofi, “Delivering Successful IT Projects: a Literature-Based Framework,” Texila International Journal of Management. TIJ, TAU, Vol. 3, issue 2, 2017.

[12] K. Lyytinen, and R. Hirschheim, “Information failures—a survey and Classification of the empirical literature,” Oxford Surveys in Information Technology, 4:257–309, 1987.
[13] K. T. Yeo, “Critical failure factors in information system projects,” International Journal for Project Management, Vol. 20, No. 3, pp. 1241-246, 2002.
[14]
[15] M. Goulielmos, “Outlining organizational failure in information systems development,” Disaster Development and Management Journal, Vol. 12, No. 4, pp. 319-27, 2003.
[16] R. Schmidt, K. Lyytinen, M. Keil, and P. Cule, “Identifying Software Project risks: An International Delphi Study,” Journal of Management Information Systems, 17(4), 5-36, 2001.
[17]
[18] The Standish Group, "CHAOS report: IT Project failures and successes," 1995. Accessed July 27, 2019, from https://net.educause.edu/ir/library/pdf/NCP08083B.pdf
[19] B. Flyvbjerg, N. Bruzelius, and W. Rothengatter, “Megaprojects and Risk: An Anatomy of Ambition,” Cambridge University Press, Cambridge, 2003.
[20]
[21] S. R. Meier, “Best project management and systems engineering practices in pre-acquisition practices in the federal intelligence and defense agencies,” Proj. Manag. J. 39 (1), 59–71, 2008.
[22] R. Miller, and D. R. Lessard, "The Strategic Management of Large Engineering Projects," MIT Press, Cambridge, MA, 2000.
[23]
[24] P. W. G. Morris, and G. H. Hough, “The Anatomy of Major Projects,” Wiley & Sons, Chichester, UK., 1987.
[25] P. L. Bannerman, “Defining project success: a multilevel framework,” Paper presented at PMI® Research Conference: Defining the Future of Project Management, Warsaw, Poland. Newtown Square, PA: Project Management Institute, 2008.
[26]
[27] J. A. Canon, “Why IT Applications succeed or fail. Industry and Commercial Training,” Vol 26, No. 1, pp. 10-15, 1994.
[28]
[29] T. Cooke-Davies, “The ‘real’ success factors on projects,” Int. J. Proj. Manag. 20 (3), 185–190, 2002.
[30] J. Fortune, and D. White, “Framing of project critical success factors by systems model,” Int. J. Proj. Manag. 24 (1), 53–65, 2006.
[31]
[32] R. Atkinson, “Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria,” International Journal of Project Management 17, 337-342, 1999.
[33] M. S. Dobson, “The Triple Constraints in Project Management. Virginia: Management Concepts,” 2004.
[34]
[35] C. Wayngaad, J. C. Pretorius, and L. Pretorius, “Theory of the Triple Constraint- A Conceptual Review,” Proceedings of the 2012 IEEE IEEM, (pp. 1991-1997), 2012.
[36] AXELOS LIMITED, “Managing successful projects with PRINCE2,” TSO, 2009.