Research Article

International Journal of Advanced Computer Research, Vol 7(32)
ISSN (Print): 2249-7277 ISSN (Online): 2277-7970
http://dx.doi.org/10.19101/IJACR.2017.732008

Effectiveness of GenNext framework on critical parameters of ERP implementation: a statistical comparison of traditional methodology and Gennext framework

Sunil Kaushik[1*], Ashish Bharadwaj[1], Vinay Awasthi[1] and Rajiv Sharma[2]
University of Petroleum and Energy Studies, Dehradun, Uttarakhand, India[1]
Ministry of Science and Technology, Government of India, New Delhi, India[2]

Received: 13-May-2017; Revised: 08-August-2017; Accepted: 14-August-2017

Abstract
Enterprise resource planning (ERP) implementations are known for high failure rates and crossing the defined budget and schedule. A new framework GenNext is introduced to arrest these issues. The objective of this paper is to validate the effectiveness of the framework and compare the benefits with respect to traditional methodology. Five projects were executed by the traditional methodology and using GenNext framework. The cost of quality (COQ), effort, number of defects and defect injection rate (DIR) were measured and compared. Projects executed using GenNext framework were efficient in effort saving, reduction in defects, COQ and DIR.

Keywords
ERP Implementation, Framework, GenNext, COQ, DIR.

1.Introduction
Implementing ERP system is usually costly and time intensive [1]. Software industry, thus ERP implementations use the Waterfall or any flavor of Waterfall as traditional methodology [2]. The traditional model has the advantages such as the design before code and works well even if the team consists of less experienced members and it would be continued in use for some time [3, 4]. Studies have found various reasons and issues in traditional ERP implementation model and have found out that requirement volatility, delay in the initial phases hampering testing and integration issues, i.e. lack of seeing the whole process are the most common issues [5]. Survey of various people working at different strata of the ERP implementaton suggests that industry is in need of a new framework for ERP Implementation using Agile methodologies [6]. A new framework GenNext framework proposed to optimize the ERP implementation process for reducing defects, reducing effort deviation, reducing the cost of quality (COQ) and reducing the defect injection rate (DIR) per 100 person hrs (DIR) [7].

*Author for correspondence

Previous,study in the supply chain industry has found a combination of lean thinking and Agile to be efficient in solving the problem similar to problems faced by ERP or any commercial off-the-shelf (COTS) implementation [8].

2.GenNext framework
GenNext framework is based on the values and principals of amalgam lean thinking and Agile methodologies [7]. Other details are given below.

2.1Values of GenNext framework
GenNext Framework is created on the basis of the following:
P1–Continously improve and optimize the flow and value of the system.
P2 –Manage change and respond to pulls.
P3–Relationship by co-development and delivery of working software.
P4–Product success after functional success.
P5–Trustworthy empowered and self managing team.

2.2Principles of GenNext framework
GN-1: Customer Satisfaction
GN-2: Accept changing requirements from users and provide them the option to change requirement even late in the cycle.

GN-3: Deliver frequently and possibly at a constant pace.
GN-4: Elliminate non value adding activities and wastes.
GN-5: Cooperation between users and developers throughout the implementation cycle.
GN-6: Self organizing team of motivated individuals and respect for everyone.
GN-7: Seamless communication.
GN-8: Measure progress of delivery.
GN-9: Technical excellence and quality.
GN-10: Keep everything simple.
GN-11: Amplified learning should be continually reflected in the work and delivery.
GN -12: Optimize the whole value chain.
GN-13: Create a Pull Environment.

GenNext framework divides the whole implementation process in 3 major phases which is shown in *Figure 1*.
1. Propose
2. Construct and Configure
3. Delivery and Maintenance

Figure 1 Phases in GenNext framework

3.Methodology

ERP Implementation projects are time and effort intensive. One ERP implementation takes 6 months to one year to complete. Hence, only 5 projects have been considered for training purpose of ERP implementations using traditional methodology. It includes various parameters such as total effort, effort deviations, no of defects and COQ calculations. Similarly, five projects have been considered for training purpose of ERP implementations using GenNext framework. The same parameters were measured. All the efforts were fixed schedule project, i.e. deadline will not change, however the effort can go up and down to achieve the deadlines. The results obtained were validated statistically using the t-test. T-test is used to analyse two populations' means of samples with small sample sizes.

4.Hypothesis formation

Following hypothesis was made for each vital parameter.

Effort

H_0*: Efforts elapsed in projects using traditional methodology and GenNext are same and there is no difference. Thus, GenNext is insignificant in optimizing effort.*
Ha*: Efforts elapsed in projects using traditional methodology and GenNext are not same and there is a significant difference. Thus, GenNext is significant in optimizing effort.*

COQ

H_0*: COQ in projects using traditional methodology and GenNext are same and there is no difference. Thus, GenNext is insignificant in optimizing COQ.*
H_a*: COQ in projects using traditional methodology and GenNext are not same and there is a significant difference. Thus, GenNext is significant in optimizing COQ.*

Defects

H_0*: Defects in projects using traditional methodology and GenNext are same and there is no difference. Thus, GenNext is insignificant in optimizing defects and thus quality.*
H_a*: Defects in projects using traditional methodology and GenNext are not same and there is a significant difference. Thus, GenNext is significant in optimizing Defects and thus quality.*

DIR

H_0: *DIR in projects using traditional methodology and GenNext is same and there is no difference. Thus, GenNext is insignificant in optimizing DIR.*
H_a*: DIR in projects using traditional methodology and GenNext are not same and there is a significant difference. Thus, GenNext is significant in optimizing DIR.*

5.Hypothesis validations and discussions

Effort is the First and foremost parameter to be optimized by GenNext Framework. All the projects were planned of 3740 person hours. The comparisons of efforts consumed in both methodologies are given in *Table 1*. The effort deviation in the traditional methodology is in the range of 40% and project using the GenNext methodologies had a mean effort deviation of 17% for a range of 16-19%. The t-test results given in *Table 2* show that t-value is 18.72 and the p-value is < .00001. This leads us to reject the null hypothesis and suggests that GenNext is significant in optimizing the effort.

Table 1 Effort comparison

	Traditional			GenNext		
Project ID	**Planned Effort (P hrs)**	**Actual Effort (P hrs)**	**Effort Deviation**	**Planned Effort (P hrs)**	**Actual Effort (P hrs)**	**Effort Deviation**
P1	3740	5238	40.05	3740	4386	17.27
P2	3740	5175	38.37	3740	4364	16.68
P3	3740	5332	42.57	3740	4486	19.95
P4	3740	5384	43.96	3740	4348	16.26
P5	3740	5274	41.02	3740	4476	19.68

Table 2 T-test result for table 1

Summary		
	Group 1	**Group 2**
Mean	41.194	17.968
Variance	4.7145	2.9807
Standard Deviation	2.1713	1.7265
n	5	5
t	**18.7222**	
p	**<0.00001**	
degrees of freedom	**8**	
critical value	**2.306**	

The cost of quality in traditional methodology projects was found to be approximate 34%, whereas for GenNext project it was 29%. The details are in *Table 3*. However, both methodologies posted the COQ above the planned COQ of 25%. Nevertheless, GenNext was able to decrease the COQ by 5%. The high COQ in GenNext project was associated with lack of automation of integration testing. The backbone of the GenNext framework is automation. The COQ can further be optimized using the automating the integration testing. Statistical evaluation is given in *Table 4*. The COQ of the projects using traditional and GenNext methodology, results are significantly different and to reject the null hypothesis.

The DIR per 100 person hrs was found to be approximately 11 defects per 100 person hrs in case of projects those were executed using traditional methodology. The projects executed using GenNext methodology were in 6.5 defects per 100 person hrs on average as shown in *Table 5*. The planned DIR is 7 defects per 100 person hrs. Projects executed using GenNext methodology faired well in delivering the performance. The calculated t value exceeds the critical value (7.8021>2.306) and the p-value is .000026 as shown in *Table 6*.

The result is significant at $p < .05$. So the means are significantly different and we can safely reject the null hypothesis. DIR in projects using traditional methodology and GenNext are same and there is no difference. Thus, GenNext is insignificant in optimizing DIR.

Table 3 COQ Comparison

	Traditional Methodology	**GenNext Framework**	**Planned**
P1	33.33	28.91	25
P2	32.46	28.41	25
P3	33.91	29.02	25
P4	34.62	29.25	25
P5	35.27	29.67	25

Table 4 T-test result for table 3

Summary		
	Group 1	**Group 2**
Mean	33.918	29.052
Variance	1.1981	0.2136
Standard Deviation	1.0946	0.4622
n	5	5
t	**9.1582**	
degrees of freedom	**8**	
critical value	**2.306**	

Table 5 DIR Comparison

	Traditional	**GenNext**	**Planned**
P1	11.07	6.57	7
P2	9.12	6.94	7
P3	9.77	6.78	7
P4	10.27	6.12	7
P5	11.62	6.98	7

Table 6 T-test result for table 5

Summary		
	Group 1	**Group 2**
Mean	10.37	6.678
Variance	0.9963	0.1233
Standard Deviation	0.9981	0.3511
n	5	5
t	**7.8021**	
degrees of freedom	**8**	
critical value	**2.306**	

Huge number of defects in an ERP implementation not only decreases the quality but also slows down

the pace of implementation. The projects executed using the traditional methodology resulted in the defects range of 500 to 600 defects whereas projected using GenNext methodology resulted the 260 to 300 defects as shown in *Table 7*. In one of the GenNext project, the defect count rose to 334 which was very higher than the other GenNext project but which was way less than traditional methodologies. *Table 8* shows the statisitical validation of results and shows that results are statistically signifcant and different to each other. The t value is 9.32 which is higher than critical value and p value was less than 0.00001 which is less than 0.5. Hence, we can reject the null hypothesis. Defects in projects using traditional methodology and GenNext are same and there is no difference. Thus, GenNext is insignificant in optimizing defects and thus quality.

Table 7 Defect comparison

	Traditional	**GenNext**
P1	580	288
P2	472	303
P3	521	304
P4	553	266
P5	613	334

Table 8 T-test result for table 7

Summary		
	Group 1	**Group 2**
Mean	547.8	299
Variance	2944.7	619
Standard Deviation	54.2651	24.8797
n	5	5
t	**9.3193**	
degrees of freedom	**8**	
critical value	**2.306**	

6.Conclusions and future work

The current paper validates the results obtained by applying GenNext framework with an intention to investigate if it actually delivers results or not. GenNext significantly reduces the effort, defects and cost of quality. The projects under study showed very small effort deviation with high customer satisfaction whereas traditional model was seen capturing a significant effort deviation and thus low customer satisfaction. Validity of GenNext remains non questionable in smaller ERP projects, but validation is yet to be done with respect to the implementation's environment including multi country / geography and multi COTS implementations.

Acknowledgment

None.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

[1] Mabert VA, Soni A, Venkataramanan MA. Enterprise resource planning survey of US manufacturing firms. Production and Inventory Management Journal. 2000; 41(2):52-8.

[2] Thomas M. It projects sink or swim. British Computer Society Review. 2001.

[3] Singh D, Thakur A, Chaudhary A. A comparative study between waterfall and incremental software development life cycle model. International Journal of Emerging Trends in Science and Technology. 2015; 2(4):2202-8.

[4] Raccoon LB. Fifty years of progress in software engineering. ACM SIGSOFT Software Engineering Notes. 1997; 22(1):88-104.

[5] Kaushik S, Bharadwaj A, Awasthi V, Sharma R. Applicability and issues in traditional model of ERP implementations: an industry perspective. International Journal of Advanced Computer Research. 2017; 7(30):88-93.

[6] Kaushik S, Bharadwaj A, Awasthi V. Need for blending Agile methodologies and lean thinking for ERP implementation: an industry point of view. In international conference on next generation computing technologies 2015 (pp. 751-5). IEEE.

[7] Kaushik S, Bharadwaj A, Awasthi V, Sharma R. GenNext: framework for optimizing ERP implementations. Indian Journal of Science and Technology. 2017; 10(24): 1-7.

[8] Vinodh S, Aravindraj S. Evaluation of leagility in supply chains using fuzzy logic approach. International Journal of Production Research. 2013; 51(4):1186-95.

Sunil Kaushik is a PhD research scholar from UPES; MBA B.E (Hons) is an ERP implementation program /technology manager having worked with MNCs for over 15 Years in India and abroad. He is a certified in various module of Oracle Apps ERP. achievements, etc.
Email: Sunil.kaushik@rediffmail.com

Dr. Ashish Bharadwaj has received PhD in Computer Science from University of Petroleum & Energy Studies. He has published many Papers at both National and International levels. He has served as CIO of many Indian MNCs and Member of the SAP Executive Advisory Council on Higher Education and Research and the SAP Global Solutions Advisory Group.

Dr. Vinay Avasthi has received PhD in Computer Science from University of Petroleum & Energy Studies. He has published many Papers at both National and International levels. He has rich experience in Academic & Research includes Data mining, Networking algorithm, distributed computing, cloud computing and IOT. He is the member of ACM, CSI and ISTE. He is also the recipient of CSI Significant Contribution Award 2012-13.

Dr. Rajiv Sharma has received PhD from IIT Kanpur. He is currently serving as Scientist ,'G', Ministry of Science and Technology where he Heads Technology Mission handling divisions and managing several mission critical projects of Nano Science & Technology, Solar Energy, Water and Supercomputing. He has served as Executive Director of IUSSTF, USA. He has rich experience in Industry and Academic & Research.