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COMPARISON BETWEEN AGILE METHODOLOGY AND HEAVYWEIGHT METHODOLOGY: A SURVEY

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Abstract—Agile development methodologies have been gaining acceptance in the mainstream software development community for more than 50 years. There are several software development methodologies in use today. Some companies have their own customized methodology for developing their software but the majority speaks about two kinds of methodologies. On one side, we have heavyweight methodologies, which certify their support to comprehensive planning, thorough documentation, and expansive design. On the other side, we have agile methodologies which subsume individuals over processes, working software over documentation, collaboration over negotiation, and responding to change over following a plan .There has been little detailed reporting of the usage, penetration and success of these methodologies in traditional, professional software development organizations**.**

Index Terms: Innovation process, new product development.

AM: Agile Methodology.

HM: Heavyweight Methodology.

SD: Software Development

ASD: Agile Software Development.

SDM: Software Development Methodology.

I. INTRODUCTION

The name "agile" came about in 2001, when seventeen process methodologists held a meeting to discuss future trends in software development. They noticed that their methods had many characteristics common so they decided to name these processes agile, meaning it is both light and sufficient.

Agile software development is a group of methods. It combines a philosophy and a set of guidelines. In this we would like to understand how ASD methodologies are used, what kind of acceptance and spread they have, and what kind of successes and failures occur in each of these communities. For this, questionnaires are developed to identify what methodologies software practitioners in government and commercial organizations follow to develop software for different sizes of projects. Some of the information's are taken from the internet and some of the Information's are taken from their opinions on agile methodology and heavyweight methodology.

II. LITERATURE REVIEW

To examine the use of agile practices in software projects, we performed a literature review that extracted the available information on the agile and heavyweight methodology. In this research paper, the survey report is categorized in terms of introduction, awareness, and challenges they are facing, together with the suggested solution from them. The challenges with developing software systems led to a switch from traditional software methodologies towards the agile software methodologies. The Agile software methodologies have become more and more popular in recent times, and have been adopted by many organizations. This literature suggests that, the agile methodologies are more effective in project management, particularly in dealing with the complexity of modern software systems and the rapidly changing business environment.

According to the Naresh Kumar Nagwani, Pradeep Singh (Department of Computer Science and Engineering. National Institute of Technology, Raipur), Changes are common to software development models today and hence change-oriented software engineering is in the picture, in the area of research. Agile development is invented for handling changes.

According to the 8th annual state of agile survey invited individuals from different software development community, a total of 3501 responses were collected, and analyzed. They prepared a report that 81% of the software organizations will follow the process of agility. in 2009 ,this percentage was just 31%.from 2010 to 2012,this was increased only 4%;and from 2012 to 2012-2014,it was suddenly, jumped from 35%to80%.

According to the S.Nithila, K. Priyadharshani, Y. S. G. Attanayake, T. Arani and C.D. Manawadu, Srilankan Institute of Information Technology, Agile software development represents a major departure from traditional, plan-based

approaches to software engineering. A survey was conducted among agile professionals, gathering survey data from 109 agile projects from 25 countries across the world.
Multiple regression techniques were used, both at the full regression model and at the optimized regression model via the stepwise screening procedure. The results revealed that only 10 out of 48 hypotheses were supported, identifying three critical success factors for agile software development projects: (a) Delivery Strategy, (b) Agile Software Engineering Techniques, and (c) Team Capability.

III. AGILE MANIFESTO VALUES AND PRINCIPLES

In February 2011, 17 software developers discussed and published "agile manifesto" that defines basic values and principles for agile software development process.

The Agile Manifesto values are as follows:

VALUE I: Individuals and interactions are more important than processes and tools.

VALUE II: Working software is more valued than comprehensive documentation.

VALUE III: Customer collaboration are emphasized over contract negotiation.

VALUE IV: Responding to change is emphasized over following a plan.

The Agile Manifesto principles are as follows:

PRINCIPLE I: Customer is everything, increases his satisfaction by rapid delivery of software.

PRINCIPLE II: Welcome and inclusion of late changing requirements.

PRINCIPLE III: Continuous delivery of working software (in small time periods).

PRINCIPLE IV: Enhancement of technical excellence and good design by keeping continuous attention.

PRINCIPLE V: Simplicity is essential.

PRINCIPLE VI: Progress measurement through working software.

PRINCIPLE VII: Face to face communication is the best communication;

PRINCIPLE VIII: Develop projects in healthy environment with trustworthy motivated employees.

PRINCIPLE IX: Have self organizing teams.

PRINCIPLE X: Self judgment at regular intervals to become more effective.

PRINCIPLE XI: Sustainable development, ability to maintain a constant pace.

PRINCIPLE XII: Co-operation between developers and business persons.

These are basic principles that every organization should follow while adapting agile methods because somewhere all agile methods are based on these principles.

IV.METHODOLOGY

In this paper, the information is gathered form quantitative research method which is used to find the comparison between agile and heavyweight technology.
The research methodology was based on a comprehensive survey in different organizations by questionnaires and the previous result available on the internet by different organizations and researchers. The main objectives of the study and the research problem are generic to any Information technology industry and company .As a whole the survey and its findings could easily be generalized with very minor alterations.
Different agile methods like scrum, pair programming, crystal clear and Kanban are used in providing agility. These methods are related to each other. Crystal clear deals with communication between different teams, Kanban controls the production and development process and ensures that every process should be completed within a time bound. Scrum helps to incorporate changing requirements and support co-location of team members and so creates self organizing teams. Finally, they produce the final product and which is commonly called as Agile.

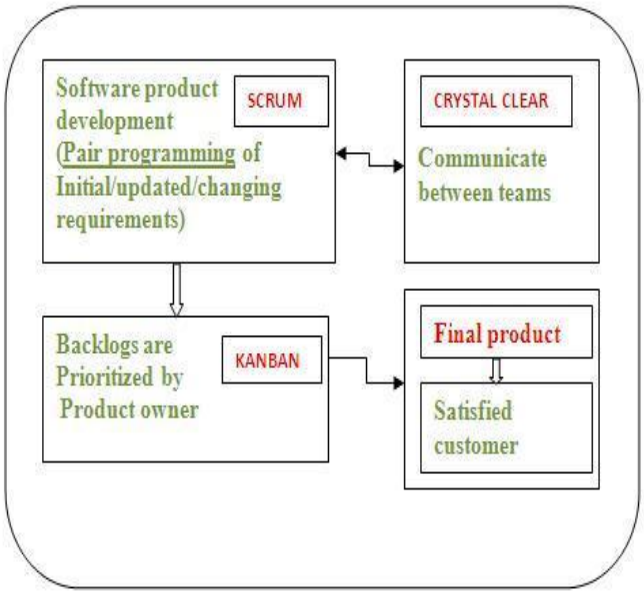

FIG. 1: KEY METHOD OF AGILE

V.QUESTIONNAIRES

The questionnaires are regarding the business organization characteristics, the software development methodology used by that organization; software development project size (small

scale, medium scale, large scale), and some general questions. The questionnaires used in this paper are questions are taken from previous different survey based research papers. The information given by the business organizations will be completely confidential and hidden.

Q1. What type of organization are you employed in?

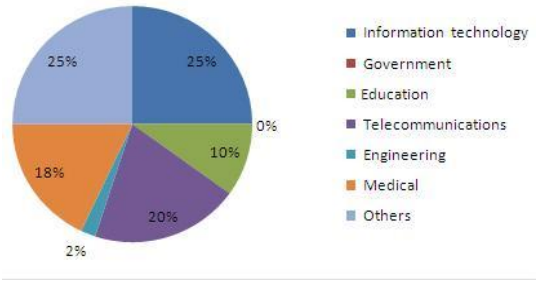

FIG.2: TYPES OF ORGANIZATIONS

Q2. How many software professionals are employed by your organization, approximately?

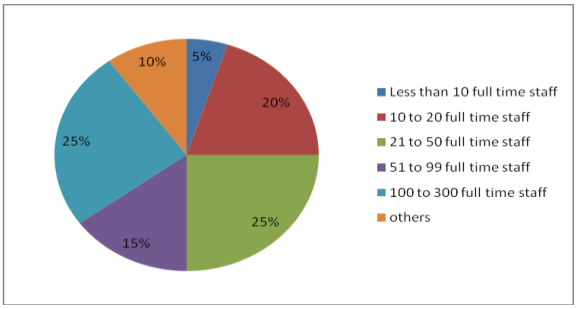

FIG.3:NO.OF PROFESSIONALS

Q3. When your company is adopting new technologies and methods?

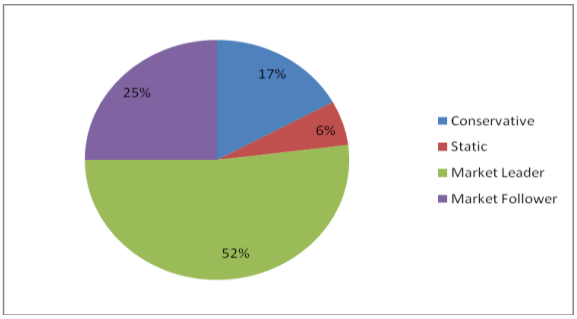

FIG.4: WHEN ADOPTING NEW TECHNOLOGY/METHODS

Q4. Does your company use any Software Capability Quality standards?

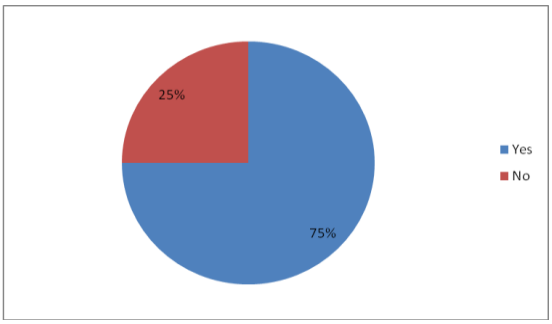

FIG.5: PERCENTAGE OF AM USED

Q5. What type of software development methodology are you used in your organization?

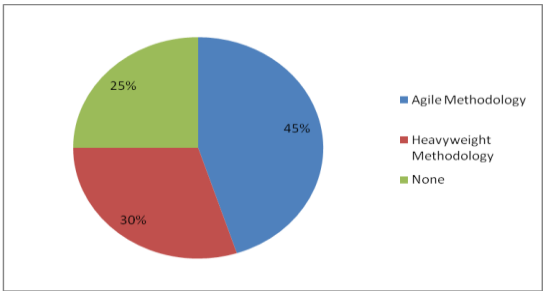

FIG.6: TYPES OF SDM USED

Q6. How would you rate your knowledge of Agile Methodologies?

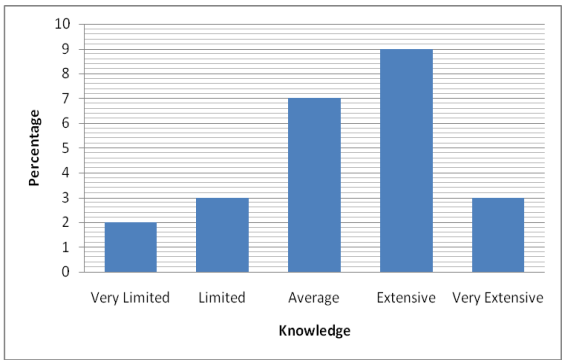

FIG.7: KNOWLEDGE OF AM

Q7. How would you rate your knowledge of Heavyweight Methodologies?

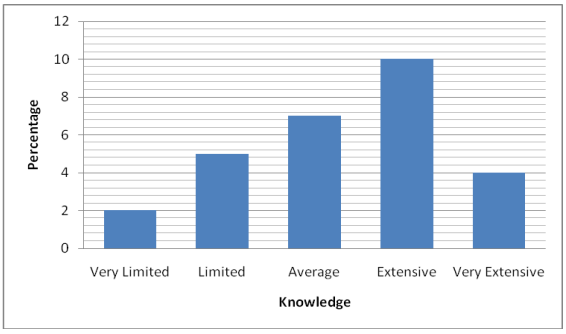

FIG.8: KNOWLEDGE OF HM

Q8. What type of project scale followed by your company?

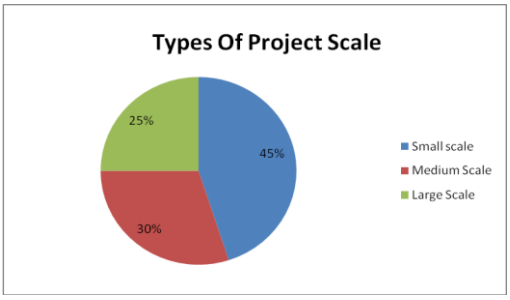

FIG.9: PROJECT SCALE FOLLOWED

Q9.Which Agile Methodology do you mostly use for different kinds of Software development?

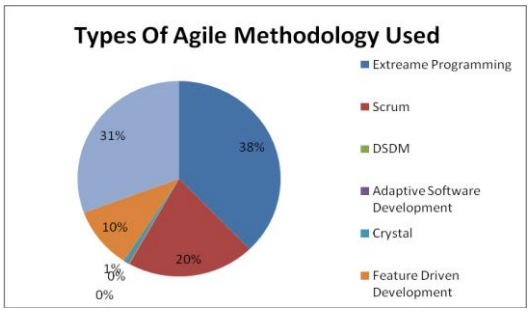

FIG.10: AM USED IN SD

Q10. Which Heavy Methodology do you mostly use for different kinds of Software Development?

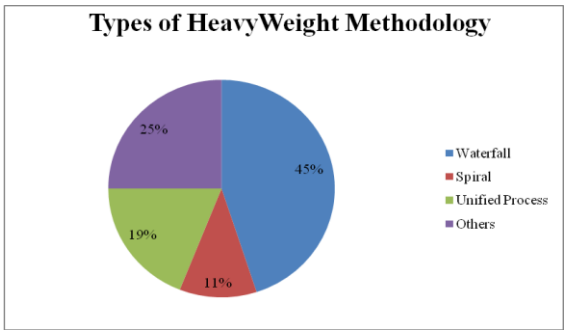

FIG.11: HM USED IN SD

Q11. Which of the listed aspects of Agile Methodologies most appeal to you compared with Heavyweight Methodologies, for the 3 sizes of software development project?

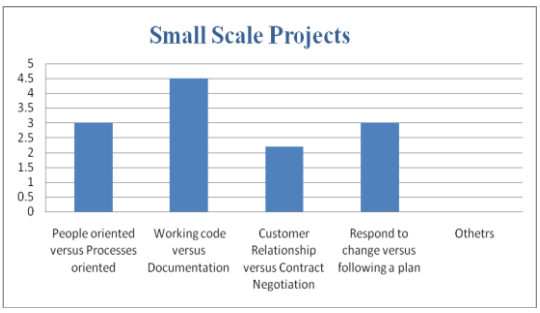

FIG.12: AM LIKED IN SMALL SCALE PROJECTS

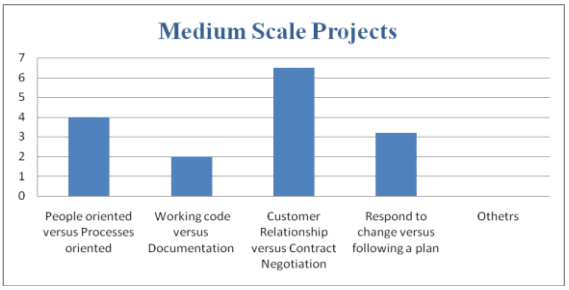

FIG.13: AM LIKED IN MEDIUM SCALE PROJECTS

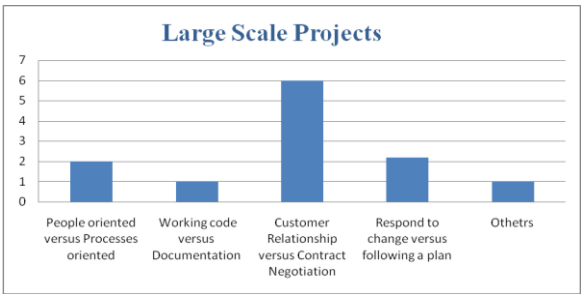

FIG.14: AM LIKED IN LARGE SCALE PROJECTS

Q12. Which aspect of agile methodologies, do you dislike the most for different kinds of software development?

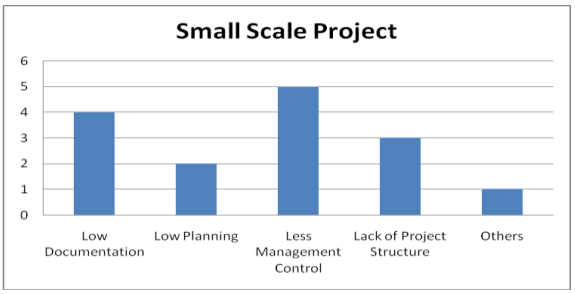

FIG.15: AM DISLIKED IN SMALL SCALE PROJECTS

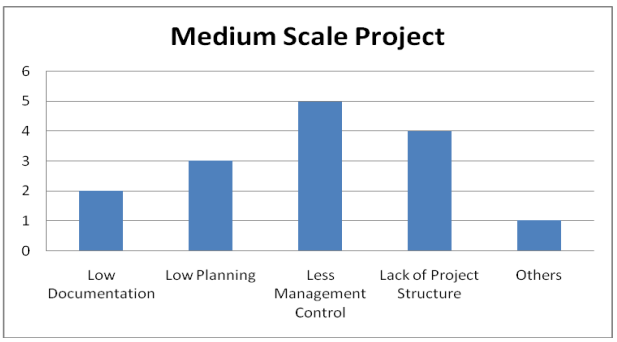

FIG.16: AM DISLIKED IN MEDIUM SCALE PROJECTS

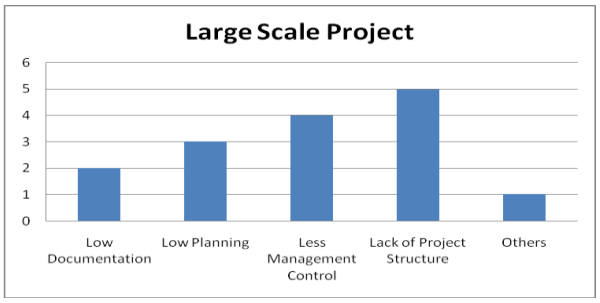

FIG.17: AM DISLIKED IN LARGE SCALE PROJECTS

Q13. Which aspect of Heavyweight methodologies, do you dislike the most for different kinds of software development?

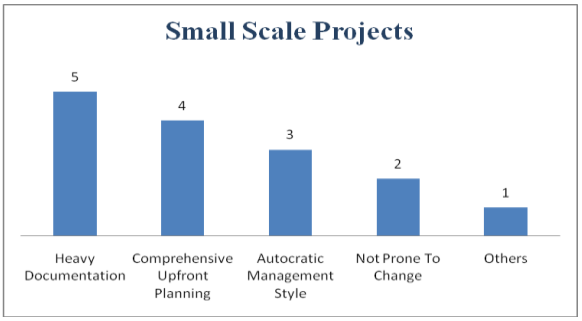

FIG.18: HM DISLIKED IN SMALL SCALE PROJECTS

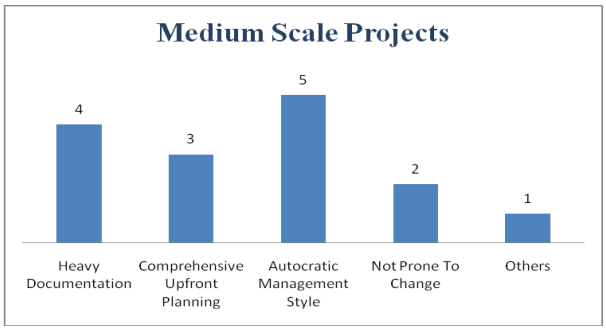

FIG.19: HM DISLIKED IN MEDIUM SCALE PROJECTS

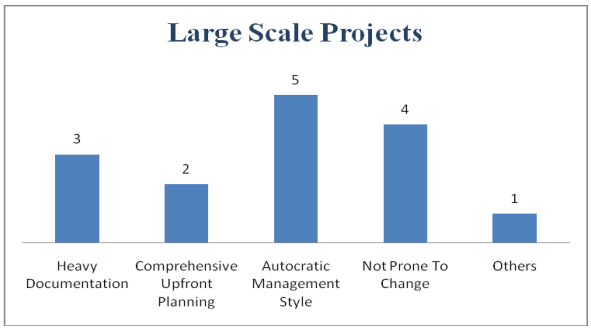

FIG.20: HM DISLIKED IN LARGE SCALE PROJECTS

Q14. How do you believe that the cost of employing Agile Methodologies compares with Heavyweight Methodologies for the 3 sizes of software development project effects?

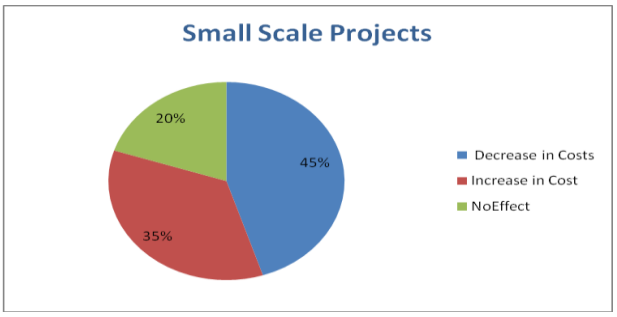

FIG.21: EFFECT OF AM ON COST IN SMALL SCALE PROJECTS

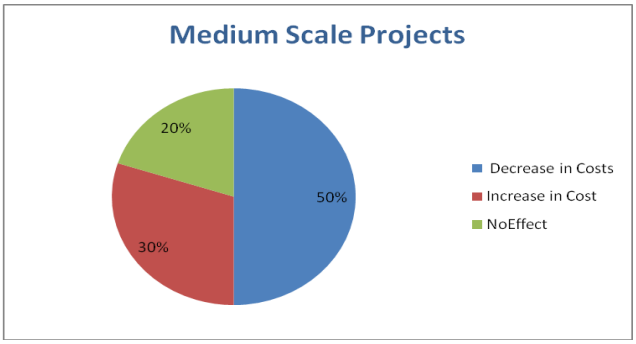

FIG.22: EFFECT OF AM ON COST IN MEDIUM SCALE PROJECTS

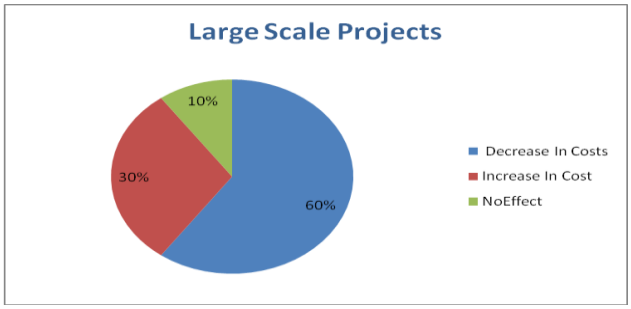

FIG.23: EFFECT OF AM ON COST IN LARGE SCALE PROJECTS

Q15. Do you believe that taking on of agile methodologies rather than Heavyweight methodologies have any effect on Software Quality for different levels of development?

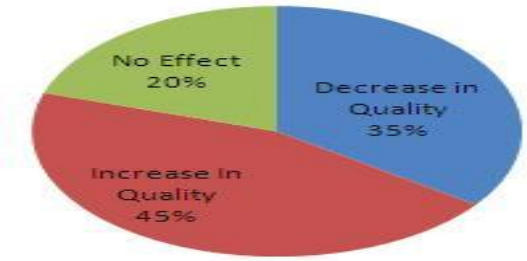

FIG.24: EFFECT OF AM ON QUALITY IN SMALL SCALE PROJECTS

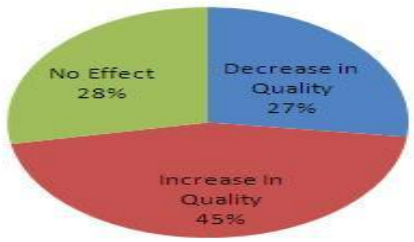

FIG.25: EFFECT OF AM ON QUALITY IN MEDIUM SCALE PROJECTS

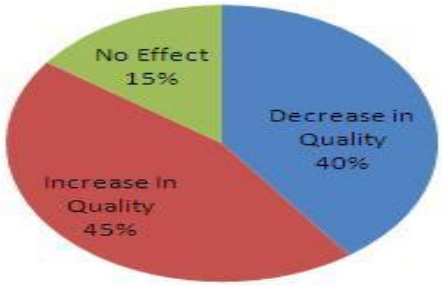

FIG.26: EFFECT OF AM ON QUALITY IN LARGE SCALE PROJECTS

Q16. What do you believe is the most common problem experienced while practicing agile methodologies for different kinds of software development?

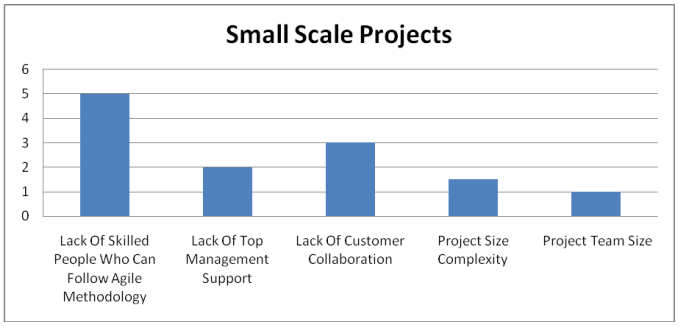

FIG.27: COMMON PROBLEMS IN AM IN SMALL SCALE

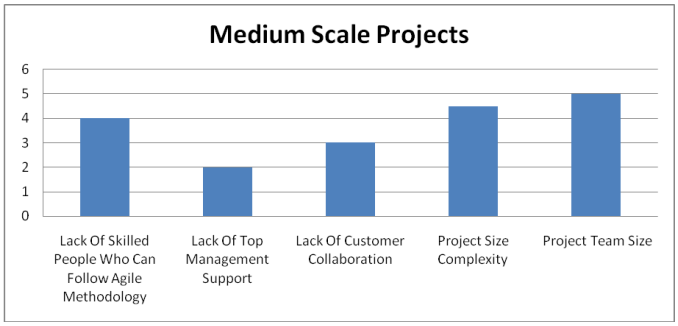

FIG.28: COMMON PROBLEMS IN AM IN MEDIUM SCALE

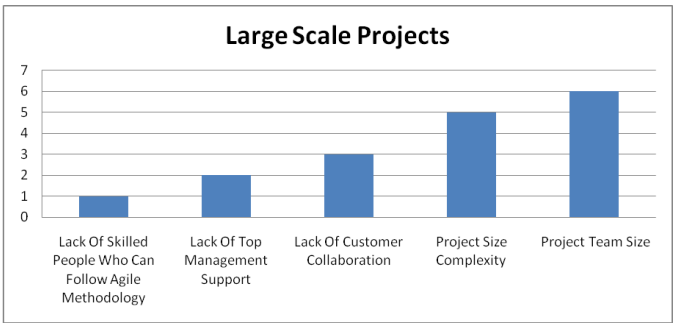

FIG.29: COMMON PROBLEMS IN AM IN LARGE SCALE

Q17. What is the Average Size of teams that work on Software Development in each project category, in your organization?

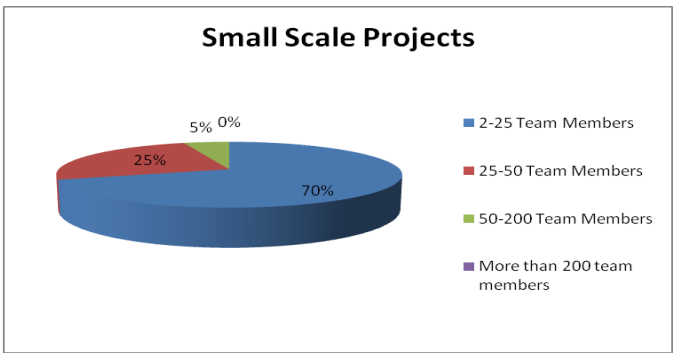

FIG.30: AVERAGE SIZE OF TEAM IN SMALL SCALE PROJECT

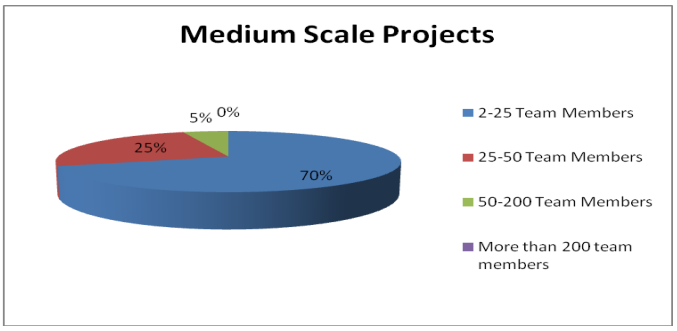

FIG.31: AVERAGE SIZE OF TEAM IN MEDIUM SCALE PROJECT

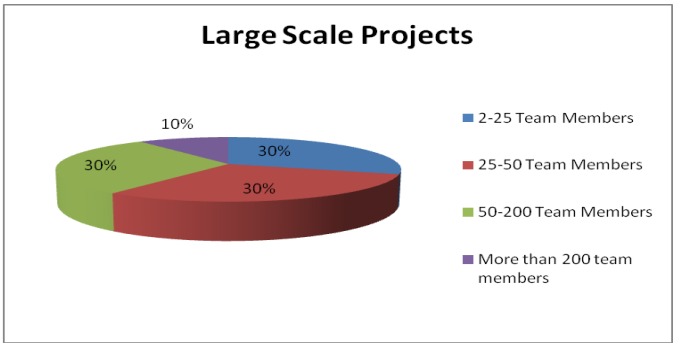

FIG.32: AVERAGE SIZE OF TEAM IN LARGE SCALE PROJECT

Q18. What do you believe is the most suitable methodology for the different kinds of Software Development?

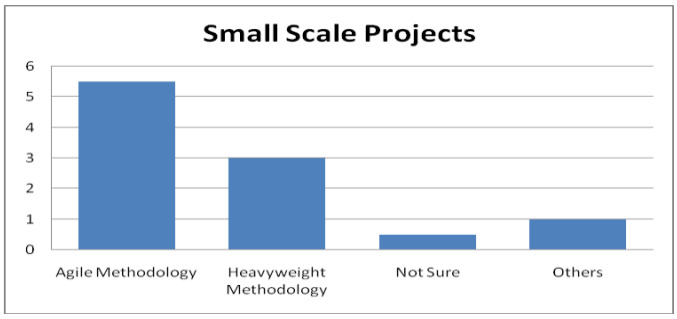

FIG.33: MOST SUITABLE METHODOLOGY IN SMALL SCALE PROJECT

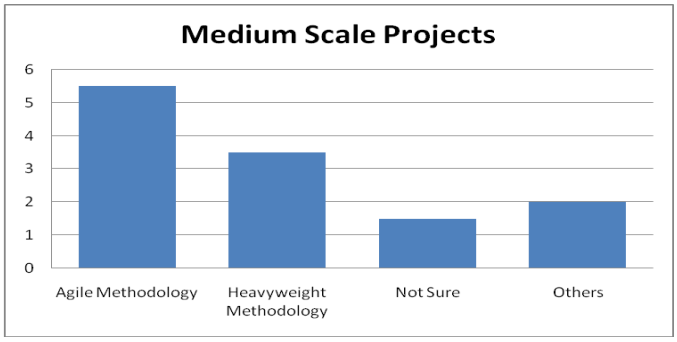

FIG.34: MOST SUITABLE METHODOLOGY IN MEDIUM SCALE PROJECT

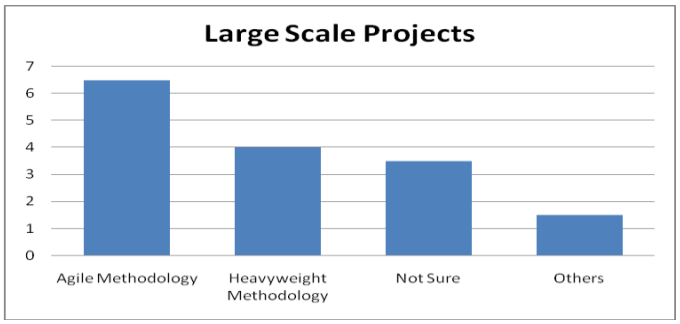

FIG.35: MOST SUITABLE METHODOLOGY IN LARGE SCALE PROJECT

Q19. Do you use any other methodology other than agile and heavy methodologies for different kinds of software development?

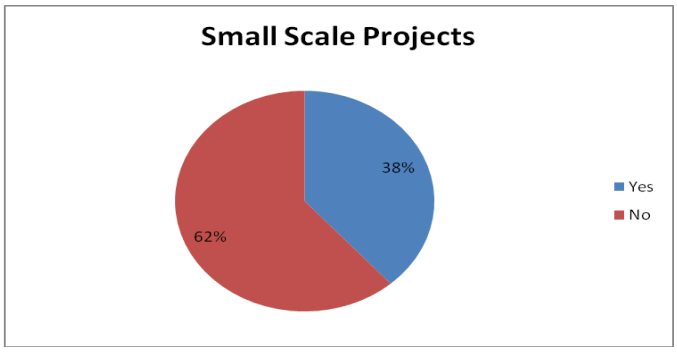

FIG.36: USE OF OTHER METHOLOGY OTHER THAN AM & HM IN SMALL SCALE PROJECT

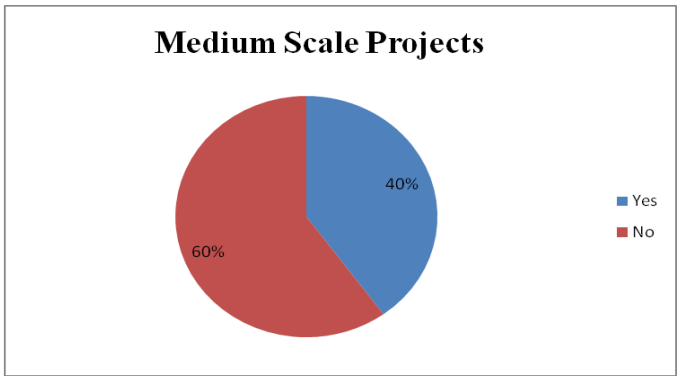

FIG.37: USE OF OTHER METHOLOGY OTHER THAN AM & HM IN MEDIUM SCALE PROJECT

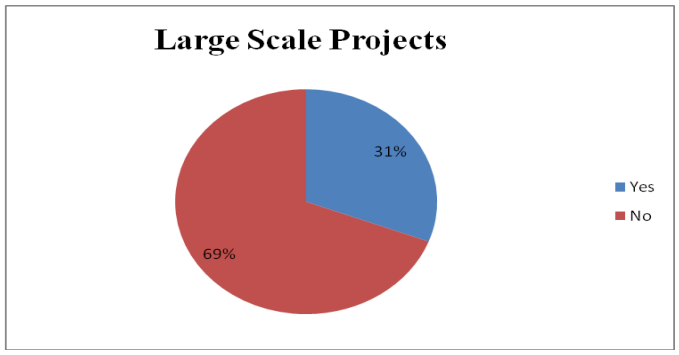

FIG.38: USE OF OTHER METHOLOGY OTHER THAN AM & HM IN LARGE SCALE PROJECT

Q20. To what extent, do you follow different kinds of agile techniques for different kinds of software development?

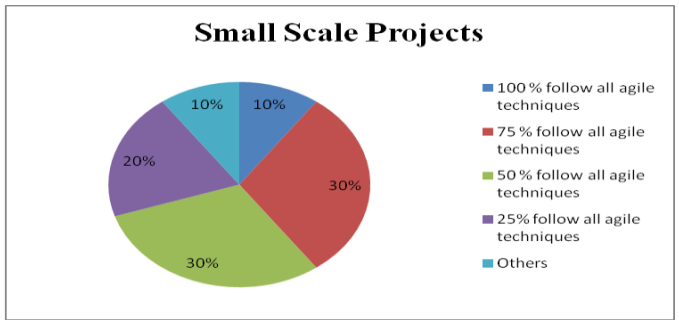

FIG.39: EXTENT OF AGILE TECHNIQUE IN SMALL SCALE PROJECTS

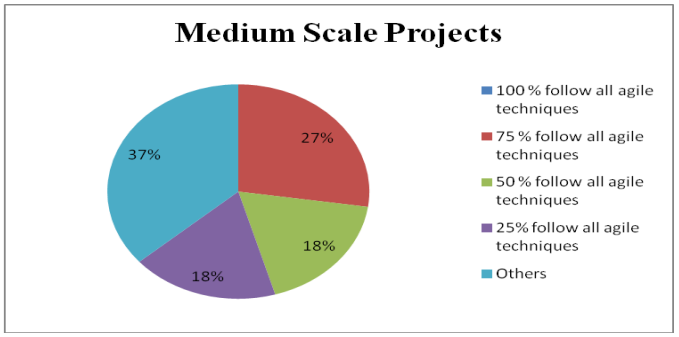

FIG.40: EXTENT OF AGILE TECHNIQUE IN MEDIUM SCALE PROJECTS

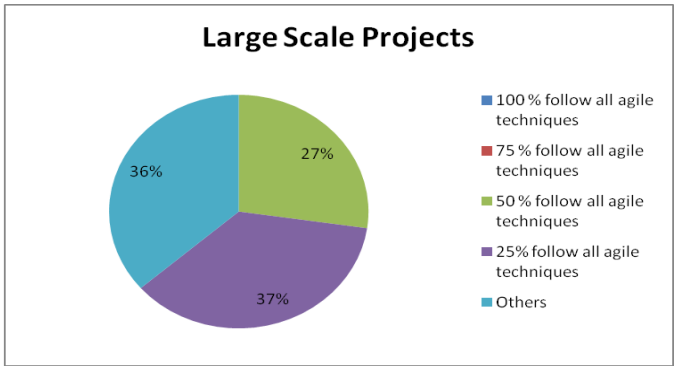

FIG.41: EXTENT OF AGILE TECHNIQUE IN LARGE SCALE PROJECTS

Some general questions are:

Q21. Which of the following best describes your position in the organization?
Q22. Would you like to receive the report summarizing this study?
Q23. Would you like to provide details of other people who might be suitable to answer this questionnaire?

VI.CONCLUSION

This project analyzes the current state of research with regard to Agile Methodologies.
Agile methodologies are serving their best, and commonly they are focusing on people relations, customer satisfaction, producing best product, cost benefit analysis and much more. Agile Methodologies are more and more used in SD industries and even in large companies, Such as Microsoft, IBM has started to use agile methodology. This shows increasing importance of agile methodologies.
The survey report is based on the answer given by the employees working in different types of sectors (education, medical, telecommunication, government etc.); some of the values are taken from the previous research papers based on AM and HM and some of the values are taken out from internet. After joining the values collected by different sources, the result is concluding out that:

- 25% of people are employed in IT sector, 18%of people are employed in medical sector,10% employed in education field and rest of the employs are employed in other sectors.
- 52% people said that the market leader will first adopt the new methods, 17% peoples are conservative (only follows when technology proven) and 6% said that they will not accept new technology.
- 45% organizations used agile, 30%used heavyweight methodology, 25% used other technologies.
- There are a maximum percentage of peoples who have extensive knowledge of agile as well as heavyweight methodology.
- 51% stated that costs were reduced, 31% stated that cost were increased and 16% stated that there was no effect on a cost reduction.
- 45% stated that quality was better or significantly better, 34% stated that quality was reduced and 22%stated that no effect on quality.
- 83% stated that business satisfaction was better or significantly better, because when the project size is reduced then the project members are also reduced so, there is not a scope of misunderstanding because there is a transparency in a communication.

In general, some of the SD projects can takes benefit by following an agile approach while some of projects takes benefit by using another traditional approach. It is already known that When it comes to methodologies, each project is different in respect of their project scale and project team so one thing is clear that there is no "one-size-fits-all" solution. One another conclusion that can be drawn from this paper is that AM brings lots of benefits to the industries without any doubts.

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REFERENCES

[1] Alistair Cockburn *'The Agile Software Development'*2000.

[2] Andrew Begel, Nachiappan Nagappan,*'Usage and Perceptions of Agile Software Development in an Industrial Context: An Exploratory Study'*, Microsoft Research.

[3] Ashish Agrawal, Malay Tripathi, Sadhana Singh, L.S.Maurya,*'AGILE:Boon for today's software industry-A Review International Journal of Scientific and Research Publications*, Volume 3, Issue 12, December 2013, ISSN 2250-3153.

[4] Daniel Glen O' Sheedy *'A Study of Agile Project Management Methods used for IT Implementation Projects in Small and Medium-sized Enterprises'2011.*

[5] David Cohen, Mikael Lindvall, And Patricia Costa *'An Introduction To Agile Methods*' 2004.

[6] Ernest Mnkandla *'A SELECTION FRAMEWORK FOR AGILE METHODOLOGY PRACTICES: A Family of MethodologiesApproac*'2009. Johannesburg.

[7] Gamage Asha Lakmini Senanayake,*'The effectiveness of scrum in project management in the Srilanka context'*2009.

[8] Lea Hannola, Joel Friman and Jyri Niemimuukko,*'Application of agile methods in the innovation process'*, Int. J. Business Innovation and Research, Vol. 7, No. 1, 2013.

[9] M.A.Awad,*'A Comparison between Agile and Traditional Software Development Methodologies*'2005, The University of Western Australia.

[10] Magnus Thorstein Sletholt, Jo Hannay, Dietmar Pfahl, Hans Christian Benestad, Hans Petter Langtangen,' *A Literature Review of Agile Practices and Their Effects in Scientific Software Development'*.

[11] MALIK HNEIF, SIEW HOCK OW,*'REVIEW OF AGILE METHODOLOGIES IN SOFTWARE DEVELOPMENT'* International Journal of Research and Reviews in Applied Sciences, Volume 1, Issue 1(October 2009), ISSN: 2076-734X, EISSN: 2076-7366 .

[12] S.Nithila, K. Priyadharshani, Y. S. G. Attanayake, T. Arani and C.D. Manawadu,' *Emergence of Agile Methodologies: "Perceptions from Software Practitioners in Sri Lanka*"', International Journal of Scientific and Research Publications, Volume 3, Issue 11, November 2013, ISSN 2250-3153.