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Compressing Effort and Schedule in ERP Implementations with Iterative Methodologies : Few Industrial Cases

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***Abstract*: Tough competition in the Enterprise Resource Planning or the ERP marketplace has led to the need for optimizing resources to improve productivity, cost effectiveness and smooth operations to provide immediate support and response. This ensures the customers are kept satisfied. Selecting an ERP solution that can satisfy specific business requirements enable smooth implementation. However, ERP failures indicate that 1/3 of the companies fail to realize even half the benefits of an ERP, while 3/4 implementations over run the allocated budget and 1/2 end up exceeding the planned and scheduled duration. This research focuses on Agile Methodologies and Lean Thinking. The authors implemented effort and schedule comparison their research that prove and outshines the traditional ERP implementation methodologies.**

***Keywords* : About Agile Methodologies, Effort Compression, Lean Thinking , Schedule compression.**

I. INTRODUCTION

ERP failure report by Panorama Consulting suggests that ERP systems have low success rates and they fail to deliver up to the expected benchmark. The reason behind the ERP failures is attributed to technological failure, change-management failure of the organization or high expectations. Studies have shown that organizations are finding it difficult to implement ERP and to reap the benefits. Less than 10% of ERP projects are spent within allocated budget and is completed within time schedule for ERP implementation. Close to one fifth of the ERP implementation projects are unsuccessful and less than one third of the projects can actually be termed as successful implementations. Figure 1 illustrates that for the past few years, approximately 60% of the projects have reported cost over, 62% projects have overshot the original schedule and approximately 50% even failed to realize 50% benefit of ERP.

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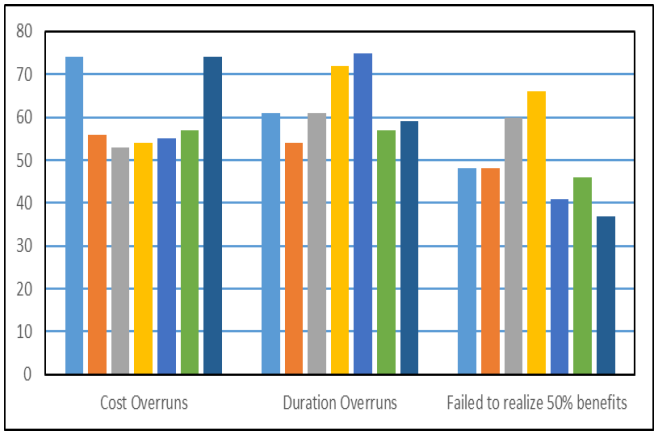

Figure 1: ERP Failure Report

ERPs are complex software systems or applications and they encompass various dimensions of the organization [4,24.25]. Benefitting every part of the organization is central idea of any ERP implementation. Thus, ERP implementation is a difficult task because of the constraints involved [20,10,11,15,18]. ERP Implementations are different from software development because both differ in the way they are created [17,12]. Boubekri [6] advises that implementation strategy should focus on strategic business objectives and should consider the complex business integration. He further advocates that implementation approach should consider business requirements from organizational, technical and human perspective. ERP Implementations require all the activities to be broken into parts called phase or stage so that it can be controlled easily [27,30,10,13]. The convolution of any ERP Implementation depends directly on to the modules being implemented [14,3,7,29]. Aladwani [1] has listed three specific strategies for successful ERP implementations; these are categorized in Table 1 below.

Table I: Strategies of successful ERP Implementation

Management Strategies	- Project Management - Organizational Structure - Change Management
Technical Strategies	- Understanding of system. - Qualified technical and functional resources. - Understanding of business and state of the art processes
Human Strategies	- Attitude Management - Inclusion of people in ERP Implementations.

II. EXISTING ERP IMPLEMENTATION MODELS

Compared to number of researches on finding critical success factors, researches on ERP implementation models are very less [21,8]. Researchers refer to ERP implantation techniques as model, few researchers refer this as methodology, and few researchers call this as framework. In this thesis, model and methodology are used interchangeably. The models can be categorized into two parts:

- Methodologies or Models available in academic and scientific community.
- Models provided by ERP vendors such as Oracle and SAP.

This section describes various models of both categories and compares the models in individual category.

A. BANCROFT MODEL

Bancroft et al., [5] carried out extensive studies and proposed a model for ERP implementation. In the model, they proposed five steps process for ERP implementation. Four of the steps were pre-implementation and one-step is actual implementation. The steps are as follows –

- **Focus Phase** – This phase is referred as planning phase and all the initiation activities such as formation of various teams and plan is done in this phase.
- **As-Is phase** – This phase is also referred as analysis phase. The existing processes and business process review is done during this phase.
- **To-be phase** – This phase is also referred as design phase. Based on the outcome of analysis, new processes are designed at high level and detailed level.
- **Configuration** – The main activities of this phase is configuring the ERP system and testing the system with near real time data.
- **Go Live** – The actual roll out of the application happens in this phase only. The users are trained on the new system and other support is provided to the user.

B. ROSS AND VITALE MODEL

Ross and Vitale [26], based on their experience, came up with a model of ERP Implementation. They proposed four phases in an ERP implementation project, are given below.

- **Design Phase** – This phase is similar to the planning phase in which critical decisions are taken for ERP implementation.
- **Implementation Phase** – This phase contains all the exercises for readiness of final implementation.
- **Cutover Phase** – This phase encompasses the activities for sign off and implementation phase.
- **Continuous Improvement Phase** – All the necessary new requirements are added to the system and system is maintained up to date for requirements.

C. ERP LIFECYCLE MODEL

Estevez and Pastor [9] presented the ERP Life cycle model that comprised of six stages, which are as follows –

- **Adoption decision phase** – This phase contains the requirement gathering phase and decision of one process over another is taken in this phase.
- **Acquisition phase** - This phase consists of product selection based on various factors such as industry solution, implementation and training cost.
- **Implementation phase** – This phase consists of procuring ERP, configuring and customizing ERP and user training activities.
- **Use and Maintenance phase** – The implemented solution is used by the user and measures to remove disruptions and business changes are taken in this phase.
- **Evolution phase** – The implemented system is integrated with other systems to ensure maximum benefits for the organization.
- **Retirement phase** – The implemented solution is replaced by another MIS system for organizational needs.

D. PROCESS MODEL

Markus and Tanis [19] proposed four phases for successful ERP implementation. The four phases are related to key activities, key people and coordination between them. Process model follows traditional system development methodology. The four phases are as given below.

- **Chartering Phase** – This phase includes business case preparation, financial approval, acquisition of team and preparation of schedules.
- **Project Phase** – This phase includes ERP Configuration, integration with various systems, data migrations, user trainings, rollout and infant care.
- **Shakedown Phase** – System begins to operate optimally in this phase.
- **Onwards Phase** – New features are added to make system usable as per changing business.

E. PROJECT MODEL

Parr and Shanks [23] proposed a model, which concentrates on project implementation and the critical success factors of each phase. They emphasize that an organization should learn from its past failed projects and should take necessary action from those. They suggest that a large project should be broken into multiple small projects. The model has following phases.

- **Planning**- The planning phase of this model involves package selection, scope finalizaion and implementation approach and selection of team. The phase also includes the formation of Steering Committee.
- **Project phase** – This phase involves creation of functional and technical designs, reengineering of existing process and UATs.
- **Cutover and Rollout** – Data from legacy system is migrated to ERP. The cutover strategy is made. Final system is configured and given to the user for usage.
- **Enhancement** – The system is repaired, extended and transformed for new requirements of Government policies.

F. ASAP8 BY SAP

ASAP eight methodology is provided by SAP and this can be categorized into Vendor provided methodology with six phases. These six phases are illustrated in Figure 2. The SAP ASAP 8 methodology provides pointers, accelerators, tools templates and empowers team to build solution faster [17].

Figure 2: ASAP 8

ASAP 8 methodology is a new methodology; details of the phases in this methodology are given below –

- **Discover –** This phase unearths the needs of ERP and includes activities like package selection, cost benefit analysis and implementation partner selection.
- **Prepare –** This phase includes all the actual project initiation activities such as estimating hardware, server, infrastructure, preparation of project charter, assignment of a project manager and resources are done in this phase only. Agile team in ASAP 8 is given below in Figure 8 [17].
- **Explore –** This phase is a critical phase of the implementation. It includes the requirement gathering, fit-gap analysis and blueprinting. The output of this phase in list of customization and configurations required for the implementation.
- **Realize –** Customizations are developed and standard functionalities are configured in this phase. This phase also includes the SIT by project team and UAT by business users.
- **Deploy –** After the UAT approval, cutover is planned and developments are migrated to Production environment so that users can use it. Project team provides support, training and infant care for initial days and hands over the system to support team.
- **Run** – System is run as a transaction system for capturing data and analysis. The new customizations are made and deployed in the Production as and when they are requested.

G. ORACLE UNIFIED METHOD (OUM)

Oracle, another ERP provider, has given a methodology called as Oracle Unified Method, previously called as AIM – Application Implementation Methodology. Oracle [22] has suggested that OUM extends the leading industry standard, Unified Software Development Process into Oracle ERP projects. The five phases of this methodology are given below as

- **Inception** – This phase captures the objective of ERP implementation from all stakeholder. The objectives are captured at high level and refined to ensure that all stakeholders are in accord on objectives. The SOW is written in this phase and risks are associated with each objective,
- **Elaboration** – This phase includes the detailing of the requirements and identifying the required customizations and configurations for the solution. The Proof of Concepts (POC), if any, are done in this phase and design is confirmed in this phase.
- **Construction -** This phase includes the development of customizations based on the design made in the last phase. Configurations are also done in this phase as per the given list of set ups. In other words, system is made ready for beta testing in this phase.
- **Transition –** This phase includes the SIT and UAT by the user. Any defects found during the testing are also fixed in this phase. This phase equips the system for user acceptance. The cutover and deployment is planned in this phase.
- **Production –** System is deployed in this phase and full support to cater to the issues is provided. In addition, change management procedures to absorb new requirements are devised to ensure smooth functioning of the system.

ERP Projects involves not only the change in software enabling business but also it involves the change in the ways business is carried out. Hence, ERP implementation requires a lot of change management effort. Figure 3 below illustrates the various models available in academia and methodology used by two main ERP vendors.

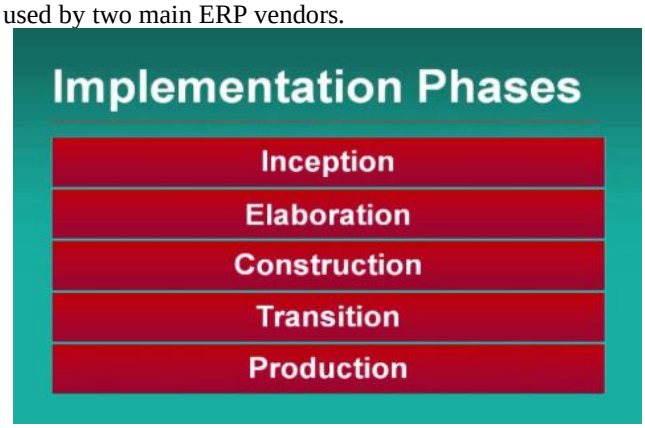

Figure 3: OUM Methodology.

III. COMPARISON OF ERP IMPLEMENTATION MODELS

ERP Implementations involve changes in the business process or, sometimes, complete reengineering of business requirements. Hence, ERP implementation projects are very different from any software development project. All the frameworks / models provide an effective approach to successfully implement ERP. As discussed earlier, the available models can be categorized in two categories. Models in both categories are first compared with each other and then are compared inter-category i.e. models in scientific community and vendor specific models are compared first and then both categories are compared to each other.

All the given models in scientific community understand that maintenance and enhancement is a vital part for functioning of ERP while Bancroft model [5] does not talk about any such phase. The model of Ross [26] talks about transformation of ERP while Esteve's model [9] talks about the evolution of the ERP where in ERP is integrated with other business applications and helps in decision making in business process. Esteve's model [9] talks one-step ahead and talks about the activities to retire the ERP system. Various models discussed in scientific community are compared in Figure 4.

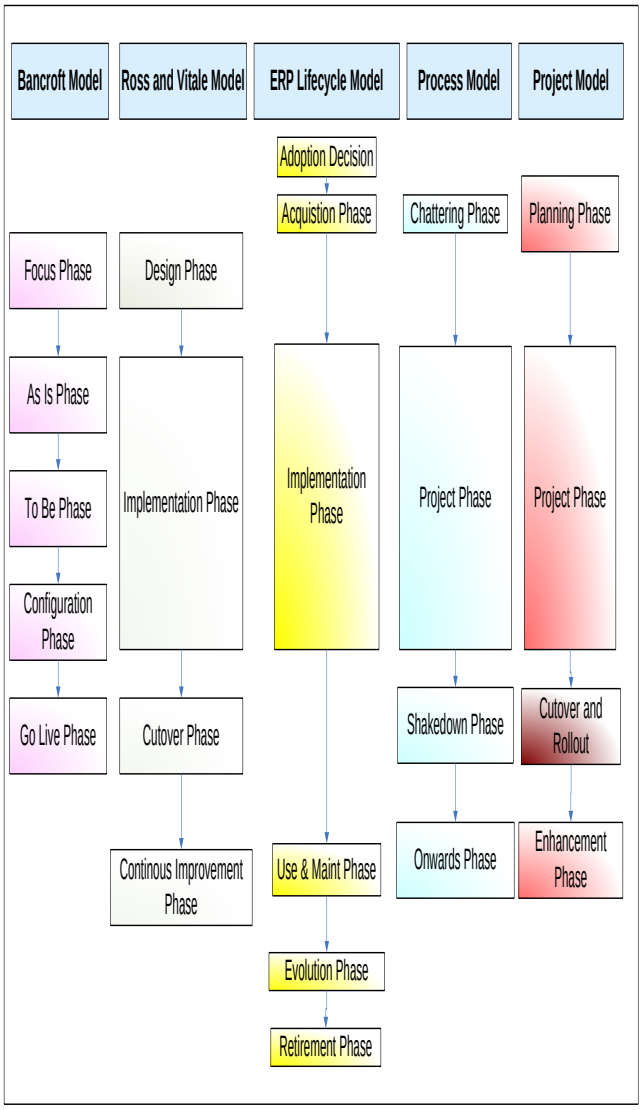

Figure 4: Comparing ERP Implementation Models in Scientific Community

All the models given above are inflicted with the following issues –

- High cost or effort involved in change.
- Lack of feedback mechanism.
- Big bang approach that may lead to issues in change management.
- Lack of incremental delivery.
- Lack of mechanism to focus on business values and prioritize the work as per business needs.
- No platform to promote integrated working.

Vendor specific or consultant specific methodologies seem to be more evolved than methodologies discussed in the scientific community [21]. Majorly used ERP are provided by SAP and Oracle, which in turn prescribe two methodologies - ASAP 8 provided by SAP and OUM provided by Oracle. SAP markets ASAP 8 as Agile way of implementing SAP or any ERP and on similar lines, Oracle also echoes that OUM can be used with Agile [16,22]. On deeper analysis, it is seen that ASAP 8 methodologies delivers the functionalities by dividing them in various phases, timeboxing each phase and reusing the accelerators and OUM also delivers in an iterative fashion [22]. Iterative deliveries are phased deliveries in normal waterfall projects. The whole idea of Agile is to build incrementally absorbing the customer requirements. Both Vendor specific methodologies speaks about similar things. However, both approaches lack the following:

- Incremental delivery, but iterative delivery is missing
- Lack the idea of removing waste i.e. the Lean approach.
- No reflection of learning from past.
- No prioritization mechanism.
- Silent on handling requirements coming later in the lifecycle.
- Lack of feedback mechanism.

Agile has been proposed as solution to the issues and researchers have proposed Lean Thinking as solution to the current issues. Figure 5 depicts the state of the projects executed using various methodology [28].

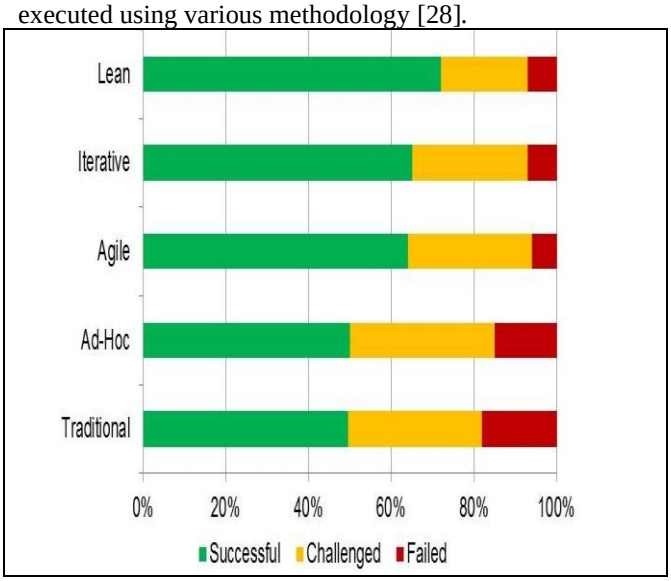

Figure 5: Chaos Report on ERP Methodologies

IV. EFFECT ON EFFORT AND SCHEDULE (AGILE & LEAN)

Implementation effort of the Oracle Module – iSupplier, iSourcing, iProcurement in 3 projects at different organization and for this research codified and measured as

- P1 – iSupplier
- P2 - iSourcing
- P3 - iProcurement

These three projects were implemented using OUM, Agile, Lean Thinking and GenNext methodologies. The difference in effort are attributed to the level of customization and complexity.

Agile Methodology – Scrum was used in implementing the modules, Figures 5 to 8 below illustrate the effort comparison with Agile and OUM, respectively, with that of planned effort.

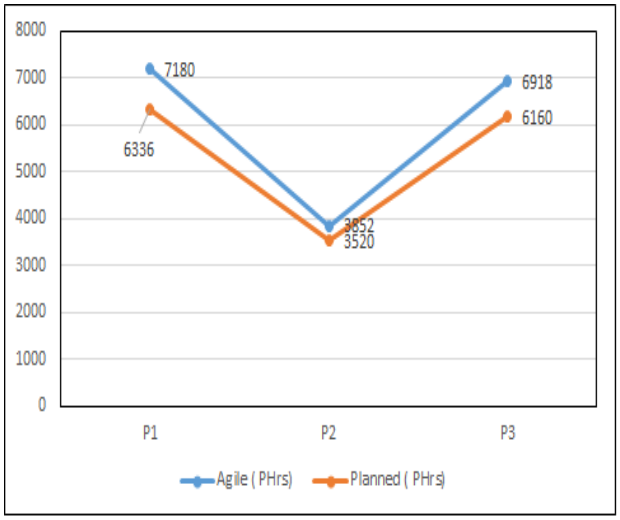

Figure 6: Effort comsumed using Agile Methodologies with Planned Effort.

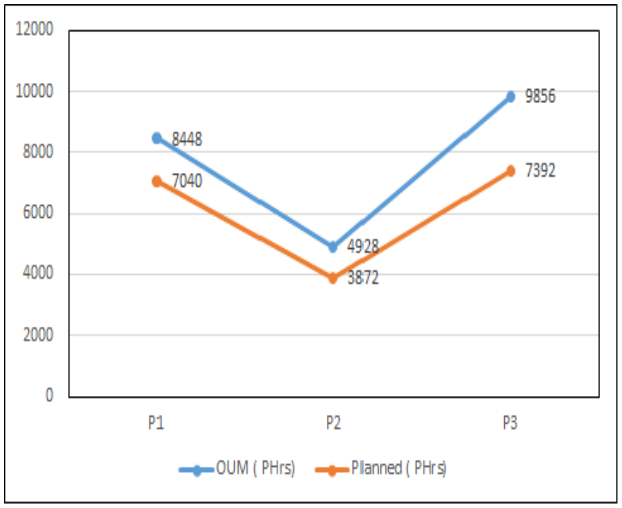

Figure 7: Effort comsumed using OUM with Planned Effort

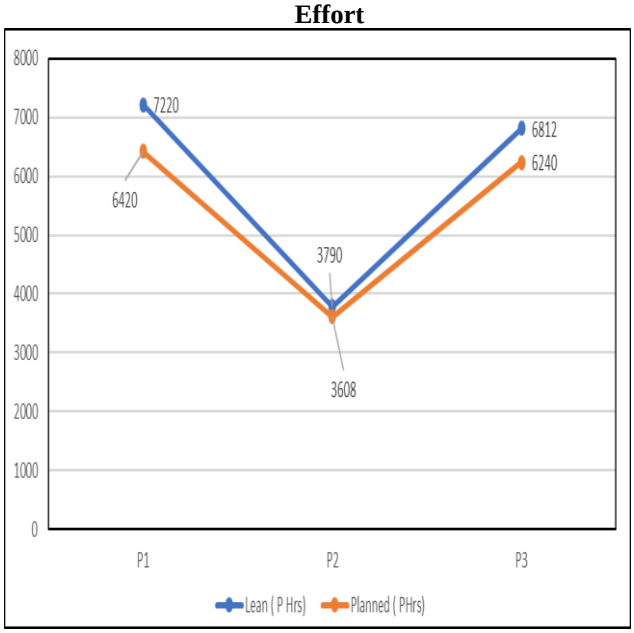

Figure 8: Effort comsumed using Lean Thinking with Planned Effort

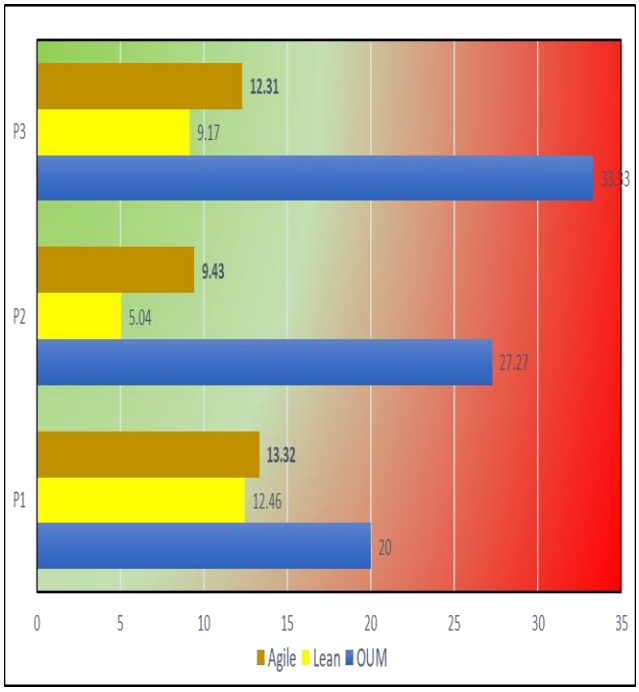

Figure 9: Effort Deviation using Agile and OUM with Planned Effort – a comparision

From the above results, it can be concluded that both methodologies consumed more effrot than planned. However, it can also be concluded that projects using Agile Methodology consumed lesser effort than the projects executed using Agile Methodology. However, it can also be concluded that Agile worked as accelerator while compared to OUM and was able to complete the project faster. On the other hand , project executed using Lean Thinking were also executed faster than the OUM method. Also, Lean Thinking helped in executing the projects faster than Agile in two out of three cases. A comparatove conclusion can not be drawn on Lean Thinking and Agile Methodologies. The impact of complexity, team's experience and experience of scrum master vs Shusha need to be envisaged.

In Agile, the processes of the modules were divided in three releases and each release had two sprints. An extra technical sprint and complete regression testing was involved at the end of all the releases to ensure the code is architecturaly correct and conforms to perfornance standards of the organization. While Lean Thinking projects included the philosphy of Limiting the WIP, maintaining a pipeline and hence leveling the workflow, smaller batch size and removal of non value adding activities. Lean Thinking works in tandem with theory of constraints and , thus, optimizes all the small interlinked activities to optimize the complete flow. Lean Thinking with the the philosphy of value creation propelled with KANBAN can reduce the effort and turn around time. With the above data, it can be concluded that Lean Thinking, if implemented correctly, can do wonders and yield good results in ERP implementation. However, scalability of Lean Thinking in green field implementation is yet to be ascertained.

Any project is bound by the constraints of schedule , cost and quality. Though, in the professional community , it is preferred to measure a project in terms of effort because effort translates in to the money value. However, schedule and effort are not always liner i.e. schedule can not be crashed by x number by deploying same number of resources. There are always few constraints which stops translating effort in to schedule. Hence, schedule can be considered as a parameter comparing the projects. The constraints can elongate the schedule and hence can add waiting time , impede the flow.

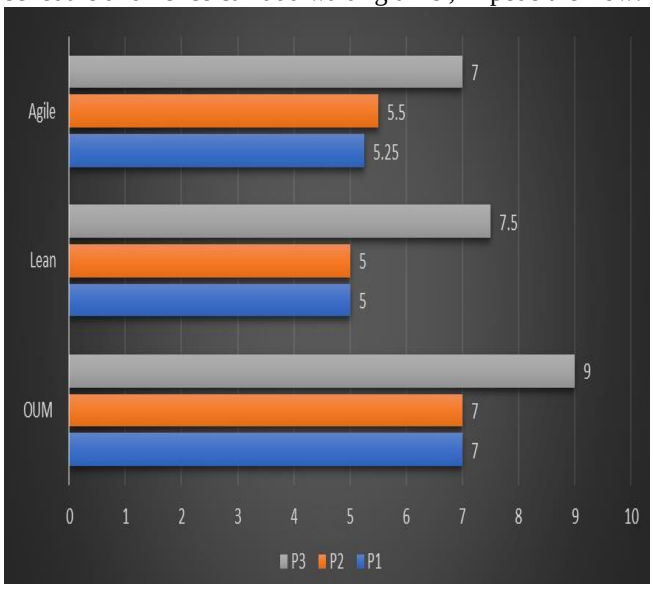

Figure 10 : Comparing End to End Schedule of All Projects using Agile Methodologies, Lean & OUM

Figure 10 suggests that both Agile and Lean have reduced the schedule by 20% to 30%. The aceeleration incase of Agile Metholodologies and Lean Thinking over OUM can be attributed to deliver the workable and incremental product at constant interval of time maintaining a constant pace or velocity. The Level scheduling , ensuring constant flow, pull environment and removal of non value adding activities not only hellped in moving the deliverable faster but also ensure it to be on time. On the other hand ,feature driven development and test driven development helped projects using agile methodologies to deliver faster and accurate. In OUM, the delay in project can be attributed to the long requirement analysis phase and chnages or fixes in the UAT envioronment. It is commonly seen that users are not able to provide the correct requirements and new requirements often creep up when the ERP process is offered for UAT. Lean Thinkinig and Agile methodologies are best to handle these scenarios.

V. CONCLUSION

Lean Thinking works on the philosophy of building quality by creating knowledge, deliver fast by removing waste and reducing the batch size with an idea of continuous improvement, which is concurred by Agile Methodologies, which also talks about feedback loop. However, Lean Thinking is able to perform better than Agile because of the inherent tools such as visual management of flow, level scheduling of load, which reduced variability and burden. All the documents stressed in the OUM were also delivered as part of projects with Lean Thinking and Agile Methodologies but a fraction of times was used in preparing the same for example – document did not have unnecessary literature , had screenshots of whitebaord diagrams made during discussion, the screens and customizations were re-used which also saved time , effort and schedule.

It can thus, be concluded that Lean Thinking and Agile Methodologies have performed better in other software development projects and should do well in case of ERP implementations. However, no larger ERP implementation and customization projects use the Lean Thinking and Agile Methodologies. In the wake of above points, a new model innovative ERP Implementation is necessary; the new model can either be based on Lean Thinking or Agile Methodologies or amalgam of both. The new model for ERP implementation should be adaptive yet predictive and should have the feedback mechanism with a dimension of reflecting the learning.

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