A Note on Waste Management in Software Engineering

Dr. S. SRIDHAR
Professor & DEAN
RV Centre for Cognitive & Central Computing Facility
R.V. College of Engineering, Mysore Road, Bangalore

Abstract: Waste Management in S/W Engineering at various stages are discussed in this note. Industry Practices, Case studies (Oil Industry), Case studies (Airport), Companies dealing with Waste and finally Conclusion on waste management are presented. This note is a kind of review article based on references considered.

I. INTRODUCTION
Software is a set of items or objects that form a “configuration” that includes programs, documents, data. If the configuration is not okay, then it becomes waste! Many software like system software, real-time software, business software, engineering/scientific software, embedded software, PC software, AI software, WebApps (Web applications) become waste in tune with time! So constant updation is necessary. The Software project management, Formal technical reviews, Software quality assurance, Software configuration management, Document preparation and production, Reusability management, Measurement and Risk management like activities are not updated, in tune with state of art technology, then Software becomes waste!

Ways to Manage waste in Software
Remember:
High quality = project timeliness

Why? Less rework! If Project is not on time with less rework, then it becomes waste! Analysis & Design models may lead to waste, if not done properly! The following are to be handled carefully:- abstraction—data, procedure, control, refinement—elaboration of detail for all abstractions, modularity—compartmentalization of data and function, architecture—overall structure of the software, Structural properties, Extra-structural properties, Styles and patterns, procedure—the algorithms that achieve function, hiding—controlled interfaces

Important areas where to focus
If Modular Design is not done properly then this leads to waste.

If Interface Design is not proper then software becomes waste with the following—lack of consistency, too much memorization, no guidance/help, no context sensitivity, poor response, Arcane/unfriendly, Place the user in control, Reduce the user’s memory load, Make the interface consistent.

If Testing is not done, then software becomes waste in terms of: Operability—it operates cleanly, Observability—the results of each test case are readily observed, Controllability—the degree to which testing can be automated and optimized, Decomposability—testing can be targeted, Simplicity—reduce complex architecture and logic to simplify tests, Stability—few changes are requested during testing, Understandability—of the design.

If tester fails, then software is waste! Exhaustive Testing to avoid waste, Selective Testing to avoid waste, Test Case Design leads to waste, if NOT properly done! Namely, White-Box Testing to avoid waste, Basis Path Testing to avoid waste, Loop Testing to avoid waste, Black-Box Testing to avoid waste and Other Black Box Techniques to avoid waste like: error guessing methods, decision table techniques, cause effect graphing

Testing Strategy
Testing Strategy to avoid waste are: Unit Testing to avoid waste, Unit Test Environment to avoid waste, Debugging: to avoid waste, The Debugging Process to avoid waste, The OO Mindset to avoid waste.

If Building a Class is not proper then software becomes waste; Domain Analysis to avoid waste; Selecting Classes: Criteria to avoid waste.

Object-Oriented Design is important to avoid waste.

Proper mapping of OOA onto OOD to avoid waste. Object-Oriented Testing to avoid waste like: begins by evaluating the correctness and consistency of the OOA and OOD models, testing strategy changes, test case design draws on conventional methods, but also encompasses special features.

If the Attributes involved in Web-Based Applications are not proper, then these applications become waste! They are as follows:-
Network intensive: By its nature, a WebApp is network intensive. It resides on a network and must serve the needs of a diverse community of clients.

Content-Driven: In many cases, the primary function of a WebApp is to use hypermedia to present text, graphics, audio, and video content to the end-user.

Continuous evolution: Web applications evolve continuously. WebApp Quality Factors to avoid waste properly then it becomes waste.

Content Analysis: The full spectrum of content to be provided by the WebApp is identified, including text, graphics and images, video, and audio data. Data modeling can be used to identify and describe each of the data objects.

Interaction Analysis: The manner in which the user interacts with the WebApp is described in detail. Use-cases can be developed to provide detailed descriptions of this interaction.

Functional Analysis: The usage scenarios (use-cases) created as part of interaction analysis defines the operations that will be applied to WebApp content and imply other processing functions. All operations and functions are described in detail.

Configuration Analysis: The environment and infrastructure in which the WebApp resides are described in detail.

Design for WebE is important avoid waste, namely, Architectural design — laying out the page structure of the WebApp, Navigation design — defining the manner in which pages will be navigated, Interface design — establishing consistent and effective user interaction mechanisms

Project Management
Project Management for WebE to avoid waste: Many of the analysis activities should be performed internally even if the project is outsourced. A rough design for the WebApp should be developed internally. A rough project schedule, including not only final delivery dates, but also milestone dates should be developed. The degree of oversight and interaction by the contractor with the vendor should be identified.

Industry Practices (Oil Gas Industry)
Wrong software practices lead to wastage as follows:-

- Well Information System (WIS)…INR 5 lacs per day per well
- Prediction of Migration Velocity…INR 2 cr per well
- Seismic migration processing…INR 2 cr per well
- Also US$ 5 per Std. Seismic record…approx 50000 US$ per day in Regional data processing centres
- ES for migration velocity …INR 50,000 per day
- Seismic accounting software …INR 3 cr per project
- Seismic information system (SIS)…INR 25,000 per well
- Bit-type selection software…INR 1 lac per day
- Hydraulic module software…INR 5 lac per hour and may lead to blow-out! And collapse of well
- Optimization Study for wells …INR 25 lac per well
- Drilling variables database…INR 5 lac per well and also lead to memory occupation leading to slowing down the system
- Well data codification techniques …INR 10 lac per well and leading to wrong decision making too

Industry Practices (Airport)
- Wrong software practices lead to wastage as follows:- (Based on practice in UAE)
  - Web-enable Accounting system…UAE Dh 50,000 per day per airline
  - Web-enable PIS & Roster …UAE Dh 30,000 per airline
  - Web-enable P & S System ..UAE Dh 2 lacs per day
  - Web-enable Payroll System ..UAE Dh 10 lacs per day
  - Web-enable Budget system ..UAE Dh 25 lacs per day
  - Web-enable Cargo system ..UAE Dh 300 lacs per day
  - Web-enable Fixed Asset system …UAE Dh 50 lacs per asset per month ARS, car pass system…UAE Dh 5 lacs per day
  - E-Business system for Cargo..UAE Dh 50 lacs per day operations
  - E-Business system for Airlines…UAE Dh 20 lacs per airline operation

Top Company on Waste Management
There are many companies working on waste management in software and a few are listed below:-
II. CONCLUSIONS

Thus, managing waste can be done as follows :- Following the norms of software engineering principles systematically without cheap methods will lead to Waste Management effectively; If NOT, it leads to waste of time, energy and money. Hence Waste Management in S/W Engineering is essential to save our country as in the case of other zero waste like water, petrol, power etc.

REFERENCES


