Addressing Software Related Issues On Legacy Systems -A Review

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Addressing Software Related Issues On Legacy Systems – A Review

Mubashir Ali, Shahzad Hussain, Mahmood Ashraf, Mahnoor Khalid Paracha

Abstract: In current technological era, organizations and systems are moving towards automation. Software development always played a sensitive role and software maintenance continually bring challenges for developers. The problem of legacy systems is continuously travels with time. Technologically outdated software or computer systems are known as legacy systems. While software or system development, whatever technique or technology adopted by developers, current developed systems will be the legacy of future. Due to constant advancement in computing, legacy systems are not supporting the technologically updated software. Replacing or updating legacy systems and development of requirement oriented new systems as substitute brings many challenges like budget, time, data movement, training etc. Most of the small level and middle level companies are not able to face these challenges. This paper will conduct an extensive review to highlight the software related issues and their respective solution on legacy systems. The old legacy systems will be used with technologically updated software to fulfill the current requirements. This solution made the scope wider by reusing the available system, refining it with latest features, providing architecture of updated software installation and maintenance that reduce the overall cost and risk which occurs in the development of new systems.

Index Terms: Legacy Systems, Outdated Systems, Reusability, Software Installation, Installation Issues, System Upgradation, Solutions

1 INTRODUCTION

Legacy system is defined as software system that has been introduced many years ago by using last technologies, rules and methods but that systems are still a part of our business. Many hardware and software which are old and outdated are known as legacy systems. Legacy software mean software based on old technology, software, computer system "relating to an outdated or previous computer system". There are many organizations that are running many legacy systems even today and they find it hard to update and manage these types of software. These systems have high of cost, do not take advantages of the latest computing environments and are difficult to manage, update and modify [1]. Many legacy systems are crucial for organizations and difficult to fully move over new systems like railway ticket reservation system for a transport system, flights, buses, billing system in a mall, etc. Changings in the legacy software are

- Difficult the working of the organization and some other stakeholders.
- Affect in loss of experiences and information.
- Affect in loss of business laws if it is only on the traditional software which run successfully until the date [2].

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To provide some evolution guidelines of a system, our paper give detail of reengineering, software evolution types, covering, care and whether to redesign or preserve traditional systems. We address software aging and their connection in maintainability. We use different technique of software maintenance and show that the updated meaning of maintenance as some finalized development phase after software delivery is outdated. We also discuss program portability and outline the different approaches. These approaches are may be migration-based, legacy software specially trying to save and secure as much as possible of the last system, where the software is transferred on to different degrees [3]. The [4] are many reasons of changing softwares but there are three main type of maintenance that enables the legacy systems to cope with updated softwares,

A. Corrective Maintenance

The first reason needed for the improvement in software is for fault repair. There is no any software without any fault free, and some software's will become faults apparent and needed to be fixed. The organizational managers ensure that the software must follow the system architecture while corrective maintenance.

B. Perfective maintenance

A next reason for improvement in software is for commercial nature. For organizations, software may be need to change for business best performance. In organization the software mostly used for inside services of organization according to the given structure of the organization.

C. Adaptive maintenance

Change in software for technical or legal reasons lead to adaptive maintenance. The software must be performing function and operation on different hardware and it's needed to upgrade the system. Rest of the paper summarized as following, section-2 discussed about the significance of software legacy systems and review the literature to highlight the previous work. Section-3 elaborates the challenges while faced in software installation on legacy system and draw the goal to address the problem statement. Section-4 tabularize the available approaches to address the software related

issues for legacy systems. It also discusses the technique with pros and cons regarding specific environments. Section-5 concludes the research work.

2 LITERATURE REVIEW

Many big organizations have legacy systems at their center. They have various software, applications and IT methods that are still widely used and fundamental to the overall running of system. Software development is playing an important role in software industry. Legacy system is the adjustment and analysis of application system in order to represent it in a brand new form using restructuring, retargeting, redesigning, source code translation, code reduction, and functional transformation. All these techniques help in improving the qualities of the legacy system [1]. A new model of system to extract static structure of legacy system. Design a model to extract and identify a new features of system according to the requirement of the user. Create model like that which has efficient and effective process for banking and insurance companies [2]. A modernization process of software legacy system was divided into different processing steps which cut understanding the goals of the evolutional changes that will have to be made to the legacy system. Modernization and generally transforms a legacy system in 3 phases: Initialization phase, Extraction phase and Modernization phase [3]. For use old system with new features we should use strategy to expand the life of legacy student information system while eliminating its weakness although that can be generate good results [4]. Provided a reference point for future research by categorize it and classifying different sort of component identification, component selection methods and emphasizing their respective powers and weak points with their solution [5]. Before create changes in old system authors studied about software maintenance issues and discuss the solution of these issues [2]. By addressing these issues, we would be able to fulfill the demands of modern technologies, organizations have to update software features and modernize their core technologies. Available technologies are used to find solution of the problems of Legacy Software System [1]. In this way, a set of techniques, tools and terms related to software modernization have been proposed [6]. So it is important the study about maintenance of Legacy software systems and their modernization have been extensively researched and studied about the new requirements that are not available in old system [7].

3 CHALLENGES

There are many challenges occur during the maintenance of legacy systems,

- Data Loss
- Security Vulnerabilities
- Cost Affect
- Usability
- Unknown Dependencies
- Performance Effect
- Integration Issues

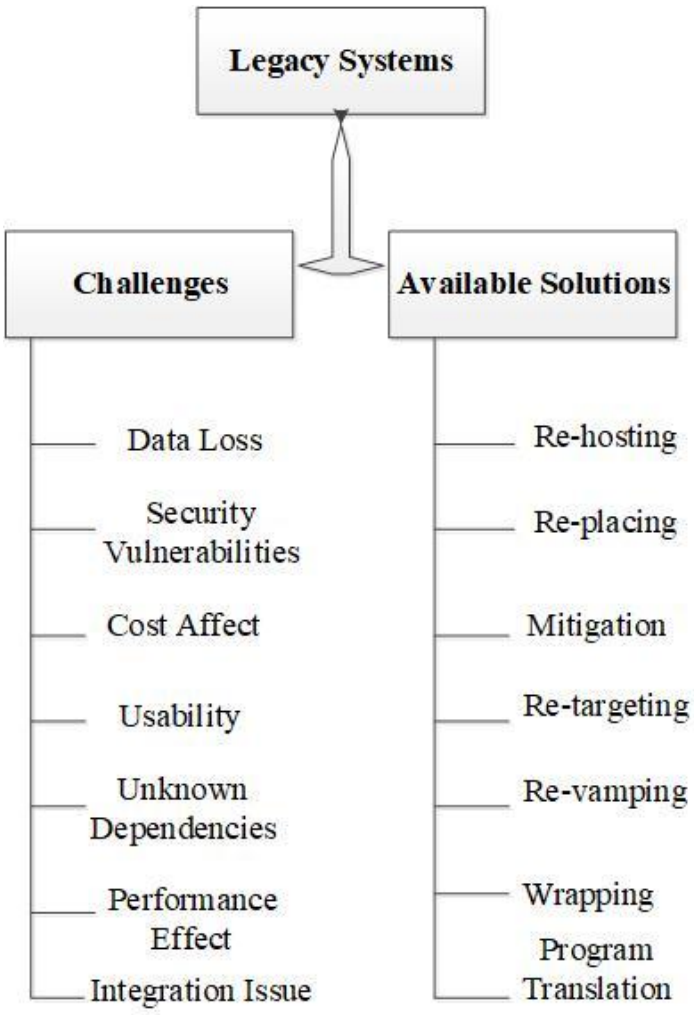

***Figure. 1**. Legacy System Challenges with Available Solutions*

3.1 Goal

Create a model to generate new legacy system by adding new features in old system. Create more effective and efficient model for industry use. The main goal of legacy system to use old systems with new features that will enhance the working of existing systems.

4 MODERNIZING LEGACY SYSTEMS

Replacing and modernizing legacy system with the new software by using various reengineering process.

A. Re-hosting

Use legacy software in different platform without any changes, that is Re-hosting. This will decrease the maintenance cost of legacy hardware.

B. Re-placing

Replacement techniques is used whenever existing system cannot fulfill the all requirement of any organization/business. But in software legacy systems, replacing is done rewriting or adding new functionalities in old softwares. The well-proven software works fine on it limits.

C. Mitigation
Adding new functionalities in new versions of software to address the error occurred in current versions. This technique is known as mitigation. This is a technique to move the legacy applications to more flexible environments.

D. Re--targeting
Transformation of legacy system into new system with some additional features and functionalities. Converting a system platform into a new hardware platform.

E. Re-vamping
The process of revamping is used to replace the user interfere design in new design. It was a most visible part of any software/application. It is improving the visibility and usability of system.

F. Wrapping
The wrapping process modifies the interaction logics in new version of any old system. This process is cost effective.

G. Program translation
This process of translation is used to made the cross compatibility of software on different hardware and platforms.

***Table. 1**. Existing Approaches to Address Software Related Issues on Legacy Systems*

SR.NO	Year	Author	Sub-ordinate	Contribution
1	2019	Michael et al.	New life for legacy system.	Proposed strategy to expand the life of legacy student information system while eliminating its weakness so it will cope with evolutionary changes [4].
2	2019	Sana et al.	Maintenance and installation of software on legacy systems.	Study about software installation and maintenance issues on legacy systems and presented vector based state of the art techniques to mitigate these issues [2].
3	2019	Shabnam et al.	Software part identification and selection : A research review.	This paper provide a reference point for future research by classifying different component identification, selection methods and emphasizing their respective power and weak points with their solution [5].
4	2019	Altexsoft	Legacy system modernization.	Proposed model to modernize the legacy systems to fulfill the demands of modern technologies, organizations have to update software features and modernize their core technologies.
5	2019	Valentina et al.	Migrating the Monolithic Systems to Micro services.	Compared the technical depth before and after the migration of monolithic systems to micro services by maintaining old legacy systems [12].
6	2018	Safa et al.	Micro service based architecture for legacy environments.	Discussed micro service based architecture is rapidly becoming one of the most effective means to re-architect legacy enterprise systems and to reengineer/redesign them into new modern systems according to requirements in low cost [13].
7	2018	Aparna et al.	A Re-Engineering Approach to modernizing legacy system.	They proposed a new technique based upon re-engineering to refill the life of legacy systems, Furthermore they discussed legacy modernization, software maintenance, business rules and automation management [14].
8	2018	Muzammil et al.	Software quality assurance re-engineering with legacy restructure.	This paper provides information about reverse engineering, forward engineering, restructuring, refactoring with several types of restructuring process to assure the quality working of legacy systems [15].

9	2018	Mazen et al.	A challenge of a Tertiary Systematic Literature Review.	A review study on all the secondary tertiary systematic literature studies, done by using the process of refactoring in context of legacy systems [16].
10	2018	Sivagnana et al.	Formal model of legacy system.	This paper discussed about different formal models which are used in process to revive the legacy system [17].
11	2017	Crotty et al.	Managing legacy system costs.	Paper identifies the characteristics of legacy systems and also define cost to maintain and update the old system [18].
12	2017	Shoaib et al.	A Systematic Literature Review of software migration framework.	To enhance software migration processes, they illustrate different methods and framework [19].
13	2017	Seetharama et al.	Legacy system modernization techniques.	Number of problems occurred while software installation and maintenance on legacy systems. This paper provide few modern techniques to overcome these challenges [1].
14	2016	Everton et al.	A Systematic Mapping Study on Legacy System Modernization.	This paper presented a mapping study for maintaining legacy systems towards business needs and advanced technologies. A set of techniques, tools and terms related to software modernization have been proposed [6].
15	2016	Ravi et al.	Revisiting Legacy Software System Modernization.	This paper elaborates the software legacy systems in context of new requirements that are not available in old systems [7].
16	2016	Srinivas et al.	Analysis of software Legacy System during Software Application Development.	They analyzed different techniques which are used for understanding the legacy systems while developing new softwares or existing software evolution [20].
17	2016	Andreas et al.	A Case Study of Soft-migration to Software Evolution.	Study about software migration to software evolution by considering different software evolution types, drivers, cost effects and benefits of evolution approaches [21].
18	2016	Mitleton et al.	Solution to coevolution of Legacy Systems	This paper proposed an architecture for encouraging co-evolution of legacy systems that requires an enabling infrastructure, which provides the conditions for self-organization, emergence and exploration of the space of possibilities [22].
20	2011	Oladipo et al.	methodology of software reverse engineering technique	In this paper researchers define different techniques that are used for modernizing legacy system processes [8].
21	2010	Anna et al.	Approaches and techniques for legacy software modernization	Basic approaches to legacy software modernization.[9]
22	2006	Tzerpos et al.	Legacy system	Justifies that how the new function will be added in old systems according to requirements [11].

The table define complete analysis and information about software legacy system. We study about these new functions that are added in old system for good performance of system according to requirement [14] that is defined by many different researchers. It is also observed that Legacy software systems and their modernization system that have been researched carefully and studied deeply about the new requirements that are available or that are not available in old system. This table also define many different framework, methods and procedures which provide following steps for developers that are used to enhance software recreation process. Also discussed about a redeveloping/transformation of about legacy software system by using different processes of modernization.

5 CONCLUSION

Mostly companies and businesses are not able to face the legacy challenges. Day by day growing technologies transforming the existing systems into legacy systems. This paper conducted an extensive review to highlight the software related issues and their respective solution on legacy systems. Challenges of legacy systems are highlighted and state of the art well-known software installation and mitigation techniques are elaborated. Furthermore, the recent existing solutions are tabularized. The old legacy systems will be used by new technologically updated software that fulfill all the advanced requirements. The reconsideration of existing legacy systems save cost, efforts and provide benefits in terms of reusability and user satisfaction.

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7 CONFLICT OF INTEREST

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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