**THE UNIVERSITY OF ZAMBIA**

**SCHOOL OF NATURAL SCIENCES**

**DEPARTMENT OF COMPUTER**

**SCIENCE**

**Name:** TONY MULENGA CHIBESAKUNDA

**Computer Number:** 13031104

**Course:** CSC 4631 ASSIGNMENT 1

**Lecturer:** Mr. MOFYA PHIRI

**Due Date:** 24th April 2018

Nasa uses heritage systems in this space programs. A heritage system is a system which is based on a proven system design [1]. A design is a set of engineering drawings, plans, etc. which are used to manufacture a system [2]. Heritage is the degree to which a system is proven. The NASA Systems Engineering Handbook defines heritage as

“the original manufacturer’s level of quality and reliability that is built into parts and which has been proven by (1) time in service, (2) number of units in service, (3) mean time between failure performance, and (4) number of use cycles. High-heritage products are from the original supplier, who has maintained the great majority of the original service, design, performance, and manufacturing characteristics. Low heritage products are those that (1) were not built by the original manufacturer; (2) do not have a significant history of test and usage; or (3) have had significant aspects of the original service, design, performance, or manufacturing characteristics altered. An important factor in assessing the heritage of a COTS product is to ensure that the use / application of the product is relevant to the application for which it is now intended. A product that has high heritage in a ground-based application could have a low heritage when placed in a space environment.”(Highlighted by author)

Nasa incorporates legacy systems into their new programs as they are being proven and subjected to plenty verification, validation and testing procedures, during their reuse. Some modifications are made to the legacy system components or to respond to certain issues such as change to environment and constraints such as policies set by governing bodies, an example would be the use of a nuclear powered propulsion used in the 1960s; that is no longer used now

The main function of the Saturn V is to transport heavy payloads into Low Earth orbits and beyond which was in accordance with the function of the NASA’s space launch system of which the function was proved by the Apollo and Skylab missions. Payload capacity to Low Earth Orbit was compared and looking at the capability of Saturn V it was unable to meet the requirements of the new application and significant testing wasn’t carried out but assumption was made in terms of risk in a slightly different environment.

Most of the infrastructure at the Kennedy Space Center is still present, in particular the launch complex LC-39A and LC-39B. LC-39B is currently prepared for the future launch of the SLS. The crawler-transporter still exists, which was used for transporting the Saturn V and Space Shuttle. Upgrading for transporting the SLS recently started. The lifting capacity is going to be increased to 8,200t [22]. The interface between avionics and ground systems has to be analyzed in more depth, as most of the original systems are probably no longer compatible. The infrastructure for transporting the Saturn V components can still be used in principle. For example, the booster components were transported by ships from the Michoud Assembly Facility to the Kennedy Space Center.

Based on how much change had occurred since Apollo with regard to requirements for human-rating, more advanced manufacturing technologies were employed

Capabilities and Modification assessment was also carried out which showed that some components inherited where either active or recently retired and component designs were mostly modified

An “inheritance matrix” was used for developing a quantitative model for capability assessment in conjunction with modification assessment

**Recommendations**

Proven software that was used as heritage components needed to be verified, validated, and tested (VVT) sufficiently on the new system architecture in which it operated.

Systems proven in one environment needed to be qualified and tested in a different environment, as in the case of the Mars Observer mission.

In order to reduce risks, heritage assessment methodology needed to be treated as a whole, by including the VVT assessment, modification assessment and capability assessment instead of only taking the component’s flight history into consideration.

Sacrificing VVT in order enhance existing technological capabilities should not be considered as a strategy because components are not properly tested and thus leading to failures.

Capabilities like choosing a specific supplier should not have been victim of the political process.