The Results of a Case Study to Evaluate the Application of LIS Implemented by CITL Portsaid Branch in Support of Education andIndustry

M. W. Youssef
Previous Head of The Information Centre of
the Shoura Assembly (Egyptian Parliament) - First Deputy Minster
Cairo, Egypt.
drwagdyyoussef@yahoo.co.uk

A. Asfour
Assistant Dean of
The College of International Transport and Logistics (CITL)
Arab Academy for Science, Technology and Maritime Transport
Port Said, Egypt.
dr.amll.asfour@gmail.com

***Abstract**:-*The territory of the Suez Canal haswitnessed continuous development activitiesthroughoutthe year 2015, in the heart of those developments resets all activities of logistics. In the light of those developments, the authors of this paper presented in previous work a design of a database and built a logistics information system to support various logistics activities. This paper presents the results of evaluating the application of the implemented LIS system in several places. Some of those places are related to the governmental sector and the other belongs to the private sector. Evaluation methodology based on collecting feedbacks from actual system users. The areas of evaluation are reliability, availability, and serviceability, running cost, time and security. The developed system was tested against manual systems that still exist in abundance and sophisticated LIS such as SAP and Oracle ERP.

***Keywords**: supply chain, holistic supply chain system, rational Supply Chain decisions, supply chain Information Systems, Computer databases and Database design.*

*****

1. Introduction

Egypt is positioned to become one of the nations to gain the most and to prosper in the emerging global economy. It is important to put in place the infrastructure and logistics systems that will enable Egypt to play a real role as an African hub point of entry and exit for trade between Asia, the Middle East, and Europe in the dominant directions from south to north where oil and gas transit (Presentation of Suez Canal Corridor Development Project 2013). Egyptian transport planners have been busy for years trying to mobilize the nation`s resources for the project development of the economic zone of the Suez Canal region. A project that aims to create an industrial and logistical spine and is expected to become the main axis of the Suez Canal area [1]. The Government of Egypt has announced its intention to develop the Suez Canal area along the Suez Canal waterway, transforming it into an international logistics center and a global hub to ensure the long-term growth of the Egyptian economy.

Throughout the year 2015, the territory of the Suez Canal was active as a beehive with new projects. The future of the city of Portsaid was looming as the new heart of logistics in the region. An extension to the port of Portsaid with around twelvekilometers, new city extension, new tunnels going under the Suez Canal connecting the west side of the city to the east side residing in Sinai and new vast storage spaces to buffer the international trade.

To give beneficial outcomes to the logistics information system application course enrolled in the college of international transport & logistics the authors asked students to design suggested data base of logistics then we developed a basic information system to connect all external and internal parties along the supply chain. The main goal of the developed supply chain system was to rationalize the supply chain manager`s decision by adding the visibility and control to the suggested system. Authors tried to develop a supply chain system with low cost that can help many companies especially small business.

Section one was the introduction, section two presents research objectives and targeted strategy.Description of the implemented LIS is presented in section three. The basis of the research case study is presented in section four. Section five discusses the results of the case study.Section six, discussesthe paper`s conclusions and section seven are the proposed future work.

2. Research Objectives and Targeted Strategy

In [2] logistics strategy planners always make biasjudgments on logistics strategy formulation based solely on their experience. In addition, it is difficult for them toacquire, retrieve and manipulate various types oforganizational knowledge without the help of decision support systems. Hence, there seems to be no systematic approach for logistics service providers to capture the relevant knowledge for logistics strategy formulation.From that sense, the authors of this paper, took the advantage of belonging to The College of International Transport and Logistics (CITL), Port-Said branch, to design an LIS integrating database and building a logistics information system to serve the prospective activities.That work was published in [3], [4] and [5]. What made that possible, is having The College of International Transport and Logistics (**CITL**) as one of the hubs in the different fields of logistics, supply chain management, international transport and related industries in Egypt. It is considered the educational center for logistics excellence in the Middle East and North African regions. The Portsaid branch is responsible for covering previous activities in the northeast and east regions of Egypt and Sinai. Based on its experience, it built a

Logistics Information Centre aiming at putting theory into practice by teaching students how to build information systems serving different logistics activities.

In [4], a proposed design of logistics information systems` database to enhance the effectiveness of supply chain manager decisions was presented. In that work a logistics information system database was designed tooffer visibility and establish tight control over the flow of goods and services from point of origin to point of consumption.The proposed logistics information system for implementing an integrated product tracking system was explained. That system is designed to offer companies a tool helping them to have products and services to be delivered to customers to satisfy their needs and simultaneously achieving companies` objectives. The main objective is to make companies able to manage the efficient flow of products which will lead to having the correct materials, to arrive at the correct location, at the correct time, with the correct quantity, and with the most competitive cost.

In [5], a proposed holistic supply chain information systemto support supply chain manager decisions was presented. This paper shows how the presented LIS in previous work [4],[5] established a basis for a decision support system for supply chain managers when dealing with different sources, stocked, distributed through different channels and delivered to the end customers. It explains how that LIS simplifiedthe complicated task of integrating different components in the supply chain and resolves several crucial supply chain management issues that affect the range of a firm's activities and its competitiveness in the market [4]. It showed that thepresented LIS can help supply chain managers to perform his/her tasks, duties and responsibilities effectively, those tasks and duties are:

1. Review or/ and update supply chain practices in accordance with new or changing environmental policies, standards, regulations, or laws.
2. Select transportation routes to maximize profits or to minimize costs by combining shipments or consolidating warehousing and distribution.
3. Diagram supply chain models to help facilitate discussions with customers.
4. Develop material cost forecasts or standard cost lists.
5. Assess appropriate material handling equipment needs and staffing levels to load, unload, move, or store materials.
6. Appraise vendor manufacturing ability through on-site visits, measurements and sharing alternatives.

In [5], Holmberg, Stefan (2009) presented a systems perspective on supply chain measurements.In order to verify the developed system, authorsinstalled a version of the system in three companies that were interested in automating their logistics operations. Those companies are: Fringe Group, ACS Egypt and ABS for computer networks.The basis of the comparisons are reliability, availability, serviceability, running cost, time and security.The following sections describe comparisons between the developed system and SAP ERP and Oracle ERP.This comparison showed how the presented LIS in a reliable, affordable and secure LIS for its users. With reasonable cost the system establishes itself as a decision support system for supply chain managers when dealing with different sources, stocked, distributed through different channels and delivered to the end customers. It simplifies a complicated task of integrating different components in the supply chain and resolves several crucial supply chain management issues that affect the range of a firm's activities and its competitiveness in the market. Shortly, users were happy and the paper shows why.

3. Description of the Implemented LIS

This section describes the implemented LIS conceptual model explaining the basic principles of the basis of selection of this model component, the relationships between those components and the rationale behind the model components selection.It also presents the LIS database design to reflect model components and finally explains how this LIS can help with a better decision making process by supply chain managers.

3.1The implemented LIS Conceptual Model

Different logistical supply chain models were discussed in [6] and in [7]. This research proposed a basic model relayed on connecting all componentsof the basic supply chain directly together through an integrating database. The proposed basic model is presented in Figure 1.

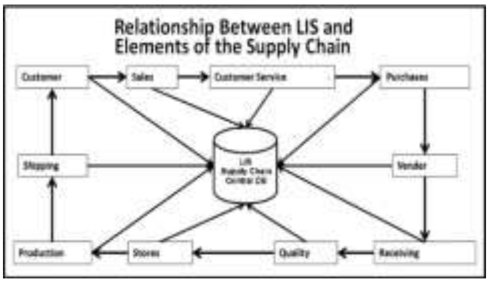

Figure 1

This model was then translated into IS Functionality oriented model in order to convert it into database design and writing the software to extract information from that database. Figure 2, describes the IS components corresponding to each one of the activities presented in Figure 1.

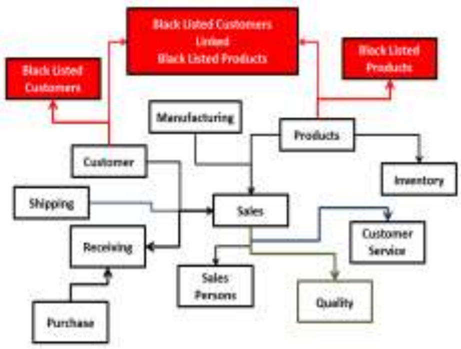

Figure 2

3.3 The Database Design in the Proposed LIS Model

The LIS database act as the heart of the system with the ability to integrate different supply chain activities in a central hub. When connected to that hub, a supply chain manager will have the ability to see all components of the supply chain and all the activities going on within this supply chain. This visibility will give a supply chain manager a full control over different activities as the kernel database offered both visibility and control over all parts of the designed system. Accordingly, when situated in any location in Figure 1, supply chain managers can visualize location of any product or service in the company supply chain. The design went through every activity in the system as explained in Figure 3.

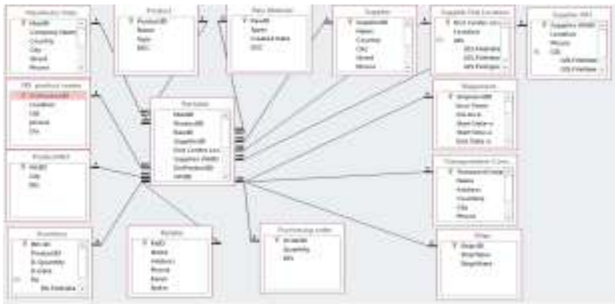

Figure 3

3.4 The DesignAugmented LIS Model

Several researcher discussed a holistic approach to supply chain transformations in [8] and in [9]. In this research, an augmentation of design of the LIS supply chain tracking system was presented. The foundation pf this work is presented in [2] and in [3].Figure 4shows that the augmented system combining all activities, their functionalities and their relationships all over the system components. That allowed two features to exist: the first is a holistic visibility for the supply chain managers; and the second, it offers a product flow visibility for whoever interested in a specific activity. That visibility over the activities enables control over different activities of the supply chain. The augmentedLIS design is presented in figure 4.

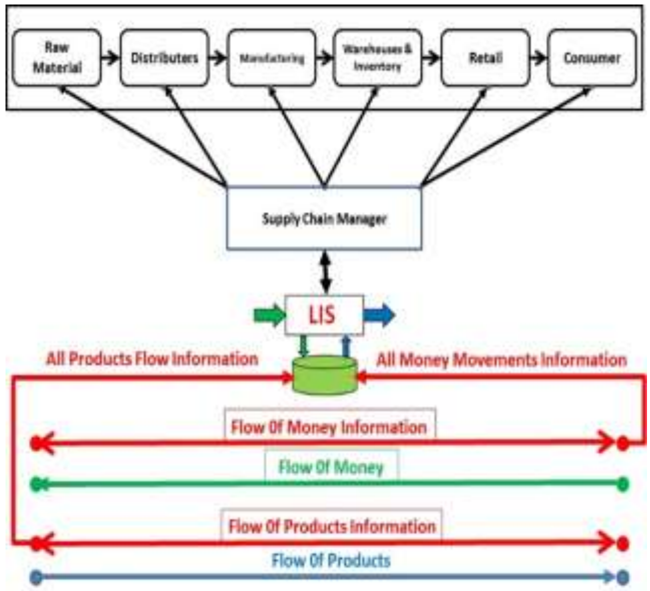

Figure 4

Figure 5, presents the integration of the basic conceptual model of elementary supply chain activities within the augmented model.

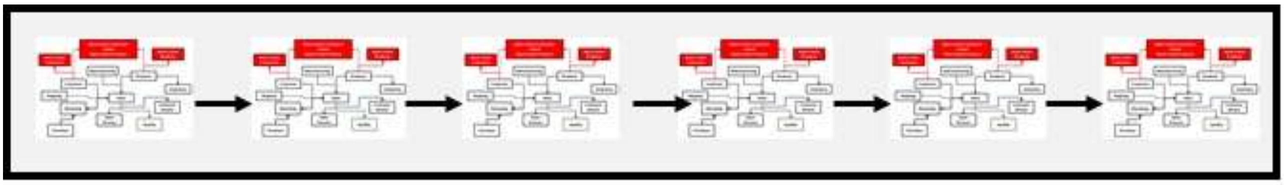

Figure 5

4. Case Study

This section presents the results of a case study that was implemented in three companies using ten testing criteria, the selected criteria were driven from various back grounds varying from industry to services and trade.

4.1Profiles of Companies of Application

For testing the developed LIS, three companies were selected, all work in both areas of physical products and services. Those companies are: Fringe Group, Advanced Computer Systems (ACS) Egyptand ABS Egypt. The three companies' activities require trading products and shipping goods to both local and abroad places. That requires having control over their shipments and continuous review of their financial matters, especially payments back tracking. Accordingly, they needed a logistic information system (LIS).

4.1.1Fringe Group

Fringe Group, is an Egyptian resident company with contacts with USA and Gulf region. Its fixed capital is 250,000 Egyptian pounds and the number of fixed employees is around 20 people with a variable number of additional employees based on the size of the projects in their pipeline.

Its activities cover several areas such as: Software development, ERP development and support, RFID applications and computer networks with more emphasis on security solutions.

4.1.2Advanced Computer Systems (ACS) Egypt

ACS Egypt, is the leading asset management company in Egypt and the Middle East. Its fixed capital is 50,000 Egyptian pounds and the number of fixed employees is around 15 with the ability to add some more people when required. As the company activities cover several countries in the Middle East, a logistic information system was required.

4.1.3ABS Egypt

ABS Egypt, is a large computer network company that is located in Egypt. Its fixed capital is 150,000 Egyptian pounds and thenumber of fixed employees around 25 people. The company activities cover several projects all in Egypt, but dispersed over several governorates.

5. The Results of the Case Study

In this study, the developed LIS was installed in each one of the three companies mentioned above, they originally did not an LIS but them various software to handle some financial matters, their warehouses or inventory control.They accepted to install the system under the provision that it should save time, which in turn will reflect on financial benefits, but the other prospective was to test several other important factors such as: reliability, availability, and serviceability of the software. The LIS impact on the three companies`benefits were translated in financial impact, time management, and return on investment. The study took six months and around 30 persons were involved in it. The following are a brief description of the findings.

5.1 Getting the Flavor of the Big Guns

In table 1, a brief comparison between the big four in the market. The objective of this is to show how expensive it is and tedious to have one of those systems [10].

Table 1
Comparison between the big four companies

Element of Comparisob	SAP	Oracle	Microsoft Dynamics	Infor
Market Share	23%	16%	9%	16%
Short-list Rates	45%	31%	18%	8%
Selection Rates When Short Listed	21%	14%	9%	19%
Implementation Duration	19.5 months	23.4 months	24.9 months	16.2 months
Total Cost of Ownership	$2.2 million	$2.7 million	$1.7 million	$2.1 million
Payback Period	9 months	21 months	22 months	24 months
Disruption at Go-live	57%	60%	71%	47%
Percentage Realizing at Least 50-percent of Anticipated Business Benefits	21%	14%	21%	11%

5.2 A Brief Presentation of LIS test Findings

Notice that, while the terms Reliability, Availability and Serviceability (**RAS**) were originated as a hardware-oriented term, systems thinking has extended the concept of reliability-availability-serviceability to systems in general, including software. [11]In addition to RAS, the developed LIS was tested using the following criterion:

1. Reliability.
2. Availability.
3. Serviceability.
4. ROI and payback.
5. Deployment size.
6. Deployment expectations.
7. Benefits.
8. Cost comparisons.
9. Hardware requirements.
10. Personnel requirements.
11.

5.2.1 Reliability(R)

In this research, reliability was measured as the probability that a system will produce correct outputs up to some given time (t). [7]Reliability is calculated in terms of mean time between failures (MTBF), with:

Reliability (R) = expr(-t/MTBF). [12]

Time (t) in this research was calculated as 12 working hours a day, six working day, for six month. That makes (12 hours*6 days a week *4.5 weeks * 6 month)that is equal to (**1944**) hours. Throughout this period, the system has not fallen once. That makes (**R**) equal to **100%,** for the period of the test.

That happened because the developed LIS was equipped by features that help to avoid, detect and repair faultswhenever possible. One of its important features is it does not silently continue and deliver results that include uncorrected or corrupted data. Instead, it detects and, if possible, corrects the corruption. That was achieved by:

(1) verifying results by inquiring different databases relevant to the running operation from several paths;
(2) the system is equipped by end of transactions sensors, if an operation was not completed to the end, the result is discarded and the system retries this operation one more time for both transient (soft) or intermittent errors.
(3) For uncorrectable errors, isolating the fault and reporting it to higher-level recovery mechanisms.
(4) Finally, If the error beyond correction,the system tend to stop the affected program or the entire system and reporting the corruption.

5.2.2 Availability (A)

In this research, Availability (A) is calculated as the probability that a system is operational at a given time, i.e. the amount of time the LIS is actually operating as the percentage of total time it should be operating. In short, Availability is typically given as a percentage of the time a system is expected to be available.The developed LIS availability was reported in terms of minutes or hours of downtime per month. The system availability was 99.999 percent ("five nines").

That was achieved by adding several routines to verify and seek different route by accessing different paths leading to different tables to answer a give question. That feature allowed the system to stay operational even when faults do occur. By accessing the developed LIS database through different routing paths, the system is capable of disabling the malfunctioning portion, seek a new route and continue operating at a different path, which might be longer in some extreme cases. An anti-crash triggers were implanted in the system at different exceptional errors traps to prevent system crashing and causing the system to be nonoperational.

5.2.3 Serviceability(S)

The simplicity and speed with which a system can be repaired or maintained is called Serviceability or maintainability [6]. Accordingly,Serviceability and Availability are contradicting values, if the time to repair a failed system increases, then availability will decrease. Serviceability includes various methods of easily diagnosing the system when problems arise.

As presented in section two, the developed LIS was designed in modular blocks, equipped with several error capturing traps and have different routes for database access that allowed the early detection of faults and avoided system downtime.

5.2.4Return on Investment (ROI) and Payback.

Return on investment is calculated by dividing the average monthly net benefits over a 3 month period by the initial costs:

$$\frac{\mathbf{(M1+M2+M3 \ldots. + Mn)/n}}{\mathbf{initial\ cost}}$$

As the cost of the developed LIS was pretty reasonable, (**5K per module**), around (**85%**) of the developed LISusers achieved a positive return on investment (**ROI**) after an average deployment time of (**3.5**)months. As difficulties were concentrated around the finance department, thestudy estimated that after a new cycle of training more than 90 percent of the developed LISusers could expect a positive (**ROI**) within (**5**)months.

5.2.5 Deployment size.

The range of deployment size for the developed LIS was from 10 users to 50 users with the potential of 500 concurrent users.

5.2.6 Deployment expectations.

Eighty five percent (85%) of the developed LIS deployments were completed on time versus. The remaining 15% belonged to the financial department and took another month.

5.2.7 Benefits.

Respondents indicated that:

- Eighty five percent (85%) of the developed LIS users responded that the systemincreased productivity.
- Fifty two percent (52%) of Oracle customers reduced IT costs.
- Sixty nine percent (65%) of the developed LIS users responded that the system improved information organization and access.
- Forty percent (40%) of the developed LIS users responded that the system improved operations management.
- Thirty nine percent (39%) of the developed LIS users responded that the system improved financial management.

Generally, the developed LIScustomers received benefits from increased productivity, improved operations management, and improved information organization and access; however, finance departments found those returns were not significant enough to deliver a positive response, researchers believe that their response will change after another cycle of training.

5.2.8 Cost comparisons

Refer to table 1, thedeveloped LIS cost with (5000 pounds / module) is not comparable to the cost of any of the big four prices.

5.2.9 Hardware requirements

No specific hardware is required, nevertheless, it should be proportional to the number of modules and number of users to maintain a reasonable performance.

5.2.10 Personnel requirements for deployment

The study found that the developed LIStakes fewer internal personnel to deploy than any of the big four systems. The developed LIS required an average of 10 man-months of internal personnel were needed for complete deployment thatcannot be compared to either Oracle or SAP numbers [13].

5.2.11Personnel Training Requirements

The developed LIS required less training to deploy than both Oracle and SAP. It requires 12 hours on average to understand all aspects of system deployment [13].

6. Conclusions

This paper presented the results of testing the acceptance of a developed LIS in several companies. As the test results as presented in section four shows that the system was will accepted among the system users in the three companies that were participating in the test.

Test basis depended on measuring some system quality measurements parameters, those parameters are: Reliability; Availability; Serviceability; ROI and payback; Deployment size; Deployment expectations; Benefits; Cost comparisons; Hardware requirements; and Personnel requirements. The proposed system has proven acceptable on all parameters. That was achieved because the system was equipped by performance checkpoints, several error traps and alarming signals to guarantee that the system was running as designed.

7. Future Work

To give beneficial outcomes to the logistics information system application course enrolled in the college of international transport & logistics the authors asked students to design suggested data base of logistics then we developed a basic information system to connect all external and internal parties along the supply chain The developed LIS was tested in three companies that were heavily involved in the area of information technology and computer networks. Despite being large companies with a long list of products moving to all parts of Egypt and several other counties in the middle east, by the are characterized by being mighty efficient. The developed LIS still needs more tests in companies with varied activities working in areas such manufacturing, agricultural products and trade.

The system can also be improved by integrating it with a marketing system. The marketing sub-system can extract marketing data from various databases of the system and use it in building marketing models to either increase potential customers or put more emphasis on the current promising users.

References

[1] Abbas, Hussein H. and Abd El Halim, Abd El Halim Omar , The Role of Suez Canal Development in Logistics Chain , http://download.springer.com/static/pdf/109/chp%253A10.1007%252F978-1-4939-2178-2_10.pdf?originUrl=http%3A%2F%2Flink.springer.com%2Fchapter%2F10.1007%2F978-1-4939-2178-2_10&token2=exp=1456349142~acl=%2Fstatic%2Fpdf%2F109%2Fchp%25253A10.1007%25252F978-1-4939-2178-2_10.pdf%3ForiginUrl%3Dhttp%253A%252F%252Flink.springer.com%252Fchapter%252F10.1007%252F978-1-4939-2178-2_10*~hmac=f8e08e5c98fc832c05bffcb8010674e5aa9e8cba016794bc8d85f400122b4bdb

[2] Chow, Harry K.H., Choy, K.L., Lee, W.B., Chan, Felix T.S., Design of a knowledge-based logistics strategy system, Expert Systems with Applications 29 ,272–290

[3] M. W. Youssef and A. Asfour, "A Proposed Holistic Supply Chain Information System to Support Supply Chain Manager Decisions". International Journal of Advanced Research in Computer Science and Software Engineering (**IJARCSSE**), Volume 5 Issue 12 publishes in December-2015 - [ISSN(Online): 2277 128X], [ISSN(Print): 2277 6451].

[4] M. W. Youssef and A. Asfour, "A Proposed Logistics Information System For Implementing an Integrated Products Tracking System". International Journal of Advance Research in Education, Technology & Management (**IJERMT**), Volume 5 Issue 12 publishes in December-2015 - [ISSN(Online): 2278-9359].

[5] M. W. Youssef and A. Asfour, "A Proposed Design of Logistics Information Systems Database to Enhance the Effectiveness of Supply Chain Manager Decisions". International Journal of Advance Research in Education, Technology & Management (**IJERMT**), Volume 4 Issue 8 publishes in August-2015 - [ISSN(Online): 2278-9359].

[6] The Supply Chain Management Institute – framework.

[7] Holmberg, Stefan (2009) : A systems perspective on supply chain measurements, International Journal of Physical Distribution & Logistics Management, Volume 30 Number 10, pp: 847-8684

[8] "Supply Chain Council, SCOR Model".

[9] Misra,Vikas, Khan, M.I.& Singh, U.K. (2010): Supply Chain Management Systems: Architecture, Design and Vision, Journal of Strategic Innovation and Sustainability, vol. 6(4), pp 101 :108

[10] Hermans, Mark and Mohamed, Meraj (2005-2006): A Holistic Approach to Supply Chain Transformations, **PRTM** white paper, http://networkdesignbook.com/wp-content/uploads/2012/12/45339_SupplyChainTransformations_PRTM_LT-Whitepaper.pdfNagurney, Anna (2006). Supply Chain Network Economics: Dynamics of Prices, Flows, and Profits. Cheltenham, UK: Edward Elgar. ISBN 1-84542-916-8.

[11] Neumann, Peter G.: holistic systems, http://www.csl.sri.com/users/neumann/holistic.pdf

[12] Jump up^ For example: Laros III, James H. (2012). Energy-Efficient High Performance Computing: Measurement and Tuning. SpringerBriefs in Computer Science. et al. Springer Science & Business Media. p. 8. ISBN 9781447144922. Retrieved 2014-07-08. Historically, Reliability Availability and Serviceability (RAS) systems were commonly provided by vendors on mainframe class systems. [...] The RAS system shall be a systematic union of software and hardware for the purpose of managing and monitoring all hardware and software components of the system to their individual potential.

[13] ^ Jump up to:a b c E.J. McClusky and S. Mitra (2004). "Fault Tolerance" in Computer Science Handbook 2ed. ed. A.B. Tucker. CRC Press.

[14] Jump up^ Spencer, Richard H.; Floyd, Raymond E. (2011). Perspectives on Engineering. Bloomington, Indiana: AuthorHouse. p. 33. ISBN 9781463410919. Retrieved 2014-05-05. [...] a system server may have excellent availability (runs forever), but continues to have frequent data corruption (not very reliable).

[15] Oracle and SAP are Big Software, but for how long? Choked by the cloud, or death by a 1,000 cuts, 13 May 2013 at 15:03, Jessica Twentyman.