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# Estimating Total Cost of Ownership

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***Abstract:*** **Evaluation of Total Cost of Ownership (TCO) of a new application is the primary focus of this paper. In acquiring new applications, an organization can choose the most appropriate choice from several that are available. Each choice comes with its unique TCO. The options discussed in this paper include Service (SaaS), Proprietary and Open Source solutions. Various requirements may influence the management to acquire a new application. These factors play a vital role in determining the cost of ownership of the software solution. Calculating TCO involves analyzing various componential costs. The two principal categories are direct and indirect costs. After examining the critical cost divisions involved in TCO calculation, the paper culminates in identifying the stages in the computation process, the users, and applications of TCO.**

***Keywords:*** **Total Cost of Ownership (TCO), software solution, application, direct and indirect costs. formula for Calculating TCO, Return on Investment (ROI).**

## 1. INTRODUCTION

Companies need to estimate both the indirect and direct cost that they will incur in the processes of owning a software solution. The total cost of ownership (TCO) refers to the sum of the costs involved in the process of acquiring a new application. Calculating TCO is a crucial stage in determining the Return on Investment (ROI) of a company. Many organizations ignore or undermine the significance of this cost. Software and other Information Technology solutions are classified under assets.

Most companies acquire assets for instance software so that they can improve efficiency, reduce wastages, and for better management among other reasons. Often, software ownership is associated with numerous costs. Evaluating the cost of ownership is of importance to asset managers, corporate buyers who can use the TCO estimate for decision making (Thomas, 2018). Conventionally, the total cost of ownership is associated with an initial cost of purchase and the support costs. The initial costs of owning a software solution are only a small fraction of the total cost of owning and operating a software solution. TCO models are widely employed by organizations in decision-making processes concerning the procurement of a software solution (Arjunan, & Kamath, 2018).

In computing the total cost of ownership, most Information Technology persons only factor the cost of purchasing hardware and the software. These costs are superficial as they are expected to be present when procuring a solution. The cost of managing and maintaining the software solutions is usually significant, and its significance cannot be overlooked. Costs involved with owning a solution are grouped efficiently into direct and indirect costs (Thomas, 2018). Direct costs relate to the actual procurement expenses, while indirect costs refer to the costs incurred in ensuring that the software solution is available to the end user. Ownership costs are also dependent on the available choices of solutions. An organization can opt to acquire a traditional application (proprietary and open source) or a Software as a Service (SaaS). Each option has its associated costs.

**Software as a Service (SaaS) Model:**

The SaaS model is based on a recurrent payment plan and is characteristically a pay as you go model. The cost of the application is proportional to usage. A typical SaaS model does not depend on any hardware infrastructure to be installed by the client, as SaaS uses the current internet setup. The responsibility of the SaaS dealer is offering support, training, infrastructure, and taking care of security risks, while the customer is responsible for the annual fees. This model is intended to deliver business applications throughout the internet. A SaaS is architecturally multi-tenant (Arjunan, & Kamath, 2018).

**Proprietary and Open Source Model:**

With conventional software, large upfront licensing fees and yearly support costs are involved, whereby essential functionalities are included in a pre-purchase licensing agreement with annual renewals. A proprietary or open source software requires hardware deployment, servers (backup) and network distribution. One advantage of these software packages is their customizability factor, which however comes with extra costs. Where the number of end users will be increased, the base costs will also rise significantly due to the need for additional hardware infrastructure (Singh, Bansal, & Jha, 2015). The company is responsible for the maintenance and management of the software, and logical and physical security. Predominantly, these solutions are a single tenant architecture. Both proprietary and open source solutions will be considered in this paper.

**The Requirements that Inform Purchase of a New Application End-User Needs:**

Users of a software application are concerned with the ease of use of an application. Thus, the management of an organization can acquire a new application to meet end-user demands. Some of the requirements include the capacity of the software to simplify daily tasks for the user and the ease of mastering the new application by the end user. Summarily, the user of the software is concerned with the user-friendliness and the availability of the application (Cocco, Concas, & Marchesi, 2016).

**Business Requirement:**

The concern of the business revolves around the ability of the software to solve the firm's problems. The application procured should fit in the critical business process. The ease of implementation is also a concern for the business. Therefore, an organization requires a software solution that meets its budget requirements and solves the needs of that business (Singh et al. 2015).

**Corporate Needs:**

Corporate needs revolve around the need to boost revenue and check the expenses of the company. Organizational needs are weightier than the end-user and business needs. Usually, the corporate level is not concerned with how the application is delivered as long as revenue and costs needs are fulfilled (Cocco et al. 2016).

**Operational and Information Technology (IT) Needs:**

The IT department is the functional unit tasked with maintaining and supporting a new application. Therefore, this department is integral to the purchase of the software, as it will help in essential duties like the collection of user requirements, maintenance, and support. Most IT divisions are inclined towards the procurement of a traditional software instead of a

SaaS, because they believe that with SaaS, they have little control (Jagroep, Werf, Brinkkemper, Blom, & Vliet, 2017).

## 2. COMPONENTS OF TOTAL COST OF OWNERSHIP

**Direct costs:**

The first cost in this category is attached to the researching process. In this process, the team tasked with procuring the software conducts a study of the work environment to identify the need that warrants a software solution. They also consider the available solutions, which can be purchased to solve the work issue. The main cost in this category is labor cost, which comprises of traveling costs, material costs, and consultation fees.

Second in the direct cost category is designing costs. The next phase after gathering user requirements is designing the system according to the needs. The step involves drafting a blueprint that will be used in the actual development of the application. Logically, this componential cost will be much higher if the total system overhaul is the guiding principle. Third among the direct costs is the sourcing cost. This is incurred while getting the most viable option in the market, through market research or solicited bids. It is prudent for a company to have several parties place their bid from which they can choose the best option (Thomas, 2018).

The fourth cost associated with owning a new application is that of purchasing or acquisition cost. Once the source of the software has been identified, the next phase involves the actual procuring. The process consists in negotiating on the software and the corresponding hardware. This cost will include all taxes applicable to the purchase. Also, it is essential to include the end-user systems. Some software might require that the existing hardware is upgraded or entirely changed (Thomas, 2018). Cost of delivering the software to the company's premises is also a part of purchasing value. Technology

request requires specialized knowledge, hence members of technology teams are considered integral members in the process, and are allowed to consult on the matters of cost. More so, acquisition cost involves necessary preconditions necessary for proper functioning of the new technology, like hardware used for supporting new software platforms.

The fifth cost entails software installation phase. Installation costs include other expense like utilities, labor costs, and other environmental costs. Where the installation cost will result in downtime of the existing system, then corresponding outage costs must be included. The lost end-user time due to the system outage must also be included (Singh et al. 2015). Change management process needs to understand and plan on how to assist the users of new technology during the transition period. Most of the implementation cost lies under capital expense since its highly visible cost of the project, especially when dealing with external consultants (Thomas, 2018).

The sixth cost is that of customizing the application to suit the work environment. Customizing is carried out according to the user requirements and organizational need identified earlier. Customizing cost goes together with training and deploying costs. Training cost involves helping the users get acquainted with the new application by taking them through the system functionalities and the accompanying manuals (Thomas, 2018). Deploying costs refer to the expenses incurred while transitioning the business processes to the application. These costs also include expenditures suffered during the integration of the new software with the existing computing resources and applications

**Indirect Costs:**

Indirect costs, refer to the cost that cannot be directly attached to the application. These costs are fixed, or they can vary with time. Indirect costs arise from the maintenance procedure of the procured application, administrative aspects of the application and license renewals among others. Maintenance practices ensure the continued availability of the application to the user and keeping the system running (Singh et al. 2015). First of these costs is operation management cost, which includes sustaining normal operation of the application, output control, backup, and recovery. Hardware and software maintenance cost are the other indirect costs. These costs include preventative maintenance, corrective maintenance, and general housekeeping costs. Maintenance costs are vital because they ensure that the system is functioning as expected (Thomas, 2018).

Third, is the indirect costs user support and upgrade cost. These costs might seem insignificant, but they are vital in ascertaining the usefulness of a software system. The upgrade cost result from the modification of the functionality of the existing application to suit the dynamicity of business environment. There are other minor indirect costs, which include renewable license fees, and environmental factors like housing and power supply. Licensing fees are applicable annually, and they change with each functional upgrade of the application (Thomas, 2018).

## 3. STEPS INVOLVED IN THE CALCULATION OF TOTAL COST OF OWNERSHIP:

**Evaluation and Selection:**

Different software solutions have various features. Features of an application determine its functionality. In this step, the team planning the procurement has to identify the needs of the organization and the budget at its disposal. It also needs to consider the competitive products available in the market. The organization can choose among an SaaS, a proprietary software, or an open source solution (Thomas, 2018).

**Determining Initial and Annual Recurring Costs:**

Each product comes with its customizing fees, training fees, maintenance fees, upgrading cost and licensing, and license renewal fees. These costs are classified as direct and indirect costs. The team estimating the TCO must factor in each cost associated with the application. The output of this step is the cumulative TCO.

Reviewing and analyzing the Cumulative TCO

After calculating the cumulative TCO, the next step is examining and interpreting the results obtained. The input for this stage is the cumulative TCO. The results from the reviewing and analyzing phase form the input of the decision-making phase.

**Deciding on the Type of Application to Purchase:**

Once the results have been analyzed, then the organization can make the most appropriate decision on the kind of solution it will acquire. The needs of the organization, the resources at its disposal, and the variety of solutions available, form the basis of the decision-making process. The procuring team has to go through all the cost components associated with each option to arrive at a decision.

**Proprietary Software versus Open Source Software:**

A company can opt to choose between a proprietary and an open source application. A proprietary software refers to the software developed for a specific company, and the company owns all the rights to the software. The use of proprietary software is subject to the owning company acquiring a license (Singh et al. 2015). Open source software is a solution developed by a community of developers. The software depends on the developers for updates and future maintenance. The choice of solution impacts the computation of TCO, due to the license factor in the case of proprietary software, and the need for customization to suit your organization's needs in the case of open source software. Customization requires a skilled workforce in conjunction with an internal expert worker, who will guide the customization process based on the organization needs. Another technological solution is cloud computing (Cocco et al. 2016).

**The formula for Calculating TCO:**

The following formula is applied in the calculation of TCO

TCO = P + Current Value of (O + T + R.U + E +…)

Where

P = Procurement costs

O = Operational costs

T = Training costs

R.U = Repairs and Upgrade costs

E = Environment Costs

**Application of Calculation of Total Cost of Ownership:**

Purchasers and managers of the computing system have an interest in TCO. The Information Technology industry is involved in differentiating IT system prices and the system cost. Vendors of IT solutions, sales teams, and the marketing team have also adopted the idea of TCO in digging down into the granular performance metric. An example of the marketers' use of TCO is whereby some competitors of IBM used the Total cost ownership, to show IBM products are expensive, in terms of ownership and operation. Marketers need to carefully examine the goods and services being purchased through TCO to improve performance and activities (Thomas, 2018).

Management relies on TCO in analyzing purchase and making the decision on various assets. Many decisions lie in those assets that require higher maintenance and operating cost. The management centers on TCO when faced with choices for the IT system, laboratory equipment, factory machines, and many more. Before deciding on the best system, the management assesses the ongoing cost of the product to avoid incurring extra costs (Jagroep et al. 2017). Thus, the organization improves competitive advantage.

Procurement managers use TCO to capture the cost related to a particular product over time. TCO is useful in determining the overall lifecycle cost of a product. Today, we are living in a global business environment, whereby the products and services differ. All the cost associated with the product based on usage, maintenance and disposal ought to be determined by the procurement. By considering direct cost, indirect cost, transactional and disposal cost, the procurement professionals get more details concerning financial investments. Additionally, the procurement managers use TCO to compare and contrast variables associated with cost, especially when assessing vendor bid (Thomas, 2018). Various cost of implementation, training, operational and transport cost are put into consideration when giving out bids.

**Challenges Associated with Calculation of Total Cost of Ownership:**

Numerous organizations value TCO as a tool for decision-making due to its cost-conscious nature and the rapid change in modern technology, which outdates most products. The main challenges associated with total cost ownership is finding the balance between the minimum amount to be held and remain conscious of situations like sudden growth. Also, the issue of product fluctuation is a significant challenge since it has a high impact on the cost and the supply-gap management. Second, it is difficult to determine all the cost associated with the maintenance cost, due to variation in the length of operation, the stability of the external environment, and the quality of the original product. Software designed for two years is different from that created to work for 15 (Thomas, 2018).

Third, total cost ownership estimates differ from one organization to another, based on the computing environment, users experience and IT expertise. Also, the system for personal computers has a high indirect cost due to high maintenance and regular updates.

Last, it is difficult to determine the cost area that represents the highest risk that requires full management. Additionally, TCO estimates do not take into account the following benefits: high sales revenue, information access, competitive gains, and high product quality (Thomas, 2018).

## 4. CONCLUSION

In conclusion, the most significant TCO factor for a software solution is the indirect costs, which form the most considerable part of the total cost of ownership. The indirect costs include the ongoing costs of training, maintenance, upgrades, and support. Indirect costs are dependent on the type of software that an organization chooses. Depending on the nature of the application, these costs can range between 50% and 85% of the TCO (Singh et al. 2015). Underestimating these costs can have a detrimental effect on the total cost of ownership value for a given application. Direct costs are integral to owning a new application, and they include researching, designing, purchasing, installation, and customizing costs.

The importance of determining TCO cannot be downplayed, because procuring a new application affects all area of productivity within an organization. Therefore, a lower TCO value is not always ideal because other factors like satisfying the needs of the end user, revenue generation, lowering the expenditures of the organization, solving business needs and aligning with the needs of the IT and operations departments are vital factors require considering. Different parties are interested in the TCO value. Among them is executive management who require the information to decide on the solution to purchase. Vendors and their marketing teams compute the total cost of ownership to ascertain the performance metrics of their software solutions. Lastly, procurement managers use total cost of ownership to capture the expenses attached to the application over time.

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