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Comparison between Software Cost Reduction Techniques

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ABSTRACT

the purpose of the research is to introduce four technique (virtualization, cloud computing, outsourcing and open source) how they work and the effect of using them on costs, their benefits and advantages; the whole process is to analyze these techniques (**virtualization, cloud computing, outsourcing and open source**) and reaching a conclusion on the most effective technique to be used in Jordan. The comparison depends on two criteria infrastructure cost and staff related costs. After explaining each one of these criteria we discuss how every technique affects those criteria. A Company's vision is always focused on maximizing profits and minimizing costs. The chosen criteria that is included in this research gives support to the decision making process which is minimizes the costs.

Key words: cloud computing, outsourcing, software cost reduction, virtualization.

1. INTRODUCTION

Software costs are large and growing fast! Thus; cost savings processes should be applied using all possible techniques. The cost of the process of software development and error repair that appear with updates can cost more than the cost of creating the same software of course that does not apply to all programs. Understanding and controlling software costs can get us better software, not just more software. As our lives and lifestyles continue to depend more and more on software, this factor becomes the most important of all. The criteria that have been adapted for the comparison process are (**infrastructure costs, staff related costs**) the infrastructure is what can be considered essential to apply the chosen technique like **(hardware, maintenance costs, all kinds of bills…etc.**). The infrastructure costs leads us to the other chosen criteria which is staff related costs here we mean that all employees related to the infrastructure and the business process (**supervisors, team leaders, quality assurance, Representatives…etc.**) our opinion is that those type of costs are much more important when analyzing the work environment and are most effective for the decision making process.

2. About Software Cost Reduction

Software cost reduction: at all stages of program design and development the process of reducing the prices of programs must be taken into consideration, and if other solutions can be used to reduce prices, better to be applied. [4]
The med-level companies don't hold that much budget for the software so using the four techniques virtualization, cloud computing, outsourcing and open source help reduce the cost. However, there are hidden costs behind using each of the techniques, which will be explained next.

3. The Techniques

This paper goal is to compare the alternatives of SCR (Software cost reduction) techniques.

3.1 Virtualization

Virtualization Technique is component of cloud computing the overall meaning is a "process of splitting the operating system from the hardware layer so the computing system or component that run in real environment are now running in virtual environment". There is two common steps the first one is making multiple physical resources works as a single logical resource which permit to have better control of the storage and how programs are using it to make perform better, and the second one is making a single physical resource works as multiple logical resources which will save a lot of time and resource by using that physical resource more optimally.[8]

Virtual Machine (VM) Implementation of a machine that executes programs as if it were a real machine, VM is separated into two categories, Process Virtual Machine Runs as a normal application inside an operating system to abstract away the details of the underlying hardware, where the second is System Virtual Machine Allows multiplexing (time sharing) of the underlying hardware between different operating systems. [8]

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There is a main benefit which is Cost Benefit Reduction of physical assets reduces substantial expenses Cost of hardware, Data center footprint, Electricity, and others.

3.1.1 Virtualization and cost reduction

One of the fundamental benefits of virtualization is price discount; on this section I'm able to inform you how virtualization reduces prices. First using virtualization lowers the cost of machines that the groups use such as servers since these servers utilize the hardware more effectively by sharing the resources.

Second is saving the power given that lower number of devices is used to process the same load. That translates to much less cooling. Those cost savings translate in less spending on electricity. VM allow for better use of these rescores which mean better utilization. Additionally this translates to less hardware renovation or "refresh". [8]+ [5]

One main concern to take into account is that virtualization normally requires a substantial amount of memory. Hence, additional costs for memory upgrades must be taken into account.

3.2 Cloud computing

Cloud computing is one of the most famous techniques in the current era, and rightfully so, gien all of the gain cloud can provide us. It is simple to understand why it became one of the most well-known approaches. We can outline cloud computing as:

Cloud computing is the Separatation of packages from the working device from the hardware that runs everything. The software in the cloud is accessed through an internet browser. The main advantage is that no consumer hardware need to be purchased to run software or services. Clouds can be classified as public, personal or hybrid (blend of both) [1]

To rephrases, cloud computing is using the internet as your defacto storage tool, you may get right of entry to your records from anywhere you want. That access requires only that you have a web connection, which is almost a given at each modern agency. As stated previously in the definition cloud can be categorised as public, private or hybrid.

Non-public or private cloud is the only one that must be operated by the enterprise itself. It may be run by using a the agency itself and in this case the costs are larger due to the fact that the agency personal must build and maintantian the infrastructure when compared to the public cloud model. The public cloud offerings is built and maintained by the vendor themselves such Amazon AWS and Google Drive. These offerings can help reduce costs of staffing, but cost more in subscription. A third category which is hyprid offer the flexibility and lowers risk of one of these vendors closing or going out of business is the Hyprid model. This model is a blend of both private and public cloud offerings.[2]+[3]

could computing has a lot of benefits such as availability and accessibility 24/7 which is tough goal to achieve normally. That goal is now easier to achieve with Cloud computing. Cloud computing may be without problems always to be had ,subsequent on in our listing is fee saving whilst you do not have to buy and get the devices for storage or electricity it is going to be obvious how it reduce the fee, I may be writing in detail greater about reduce the fee with distinction, if we preserve going this listing will take definitely long time to list all performance, flexibility and scalability are few are available mind to mention.[2]+[3]

While cloud offers some outstnading advantages there are still some risks in cloud implementations, these risks includes privacy in the cloud. The data may not be saved domistically within the business and even with the same home country of the business. Nonetheless, the business is still liable for any mishapps with any of its data records. [2]+ [3]

Cloud computing offers improvemenets mentioned earlier such as staffing savings and availability to scale. However, moving into the cloud must not mean throwing away virtualization investments. The utilization of the investment can be achieved by hyprid implementations. Using VMs that can live on either environment.[7][6][9]

3.2.1 Cloud computing and cost redction

A number of customers use the cloud as it provide the software they want. That implies they have can save the starter infrastructure investment or scale infrastructure investment. This can be accomplished using pay as you expand. This can be a great deal as you operate a subscription base which is offered for a monthly fee. Additionally cloud implementations save the cost of software improvement since cloud providers are usually responsible for software updates.

Cloud computing can be used as central storage which can further save the company money as they no longer have to pay the upfront cost of the storage devices and the upkeep costs of maintenance.

3.3 Outsourcing

IT outsourcing services: is the use of resource out of the organization structure for a prtion or the whole department of information technology. It organize the use of IT outsourcing to carry out the primary capabilities starts from rent a constructing for the business enterprise, to the growing of software program, maintenance and assist. for instance, the organization might also outsource the management of **IT** due

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to the fact it's miles cheaper to lease a third party to do this than it would be to build your group in-residence IT control. Or the decision is made to outsource all of the needs of the information technology resources due to the fact they do no longer need to own their own information technology gadgets. most big businesses outsource part of the IT function. [10]

3.3.1 ***advantages of outsourcing:***

the primary benefit is that the organisation is able to focus on the primary feature of its present.

keep fees. Are generally corporations that have activities of outsourcings focus on such activities and, consequently, are probable to enjoy economies of scale, each in using equipment or appoint reviews, There can be more cost savings if the outsourcing operation for overseas companies operating in vicinity of the most inexpensive assets of exertions (to the outside). For reaching the goal of keeping the greatest quality. If the outsourcing procedure outsourced to enterprise wherein terms of quality are well defined in the provider contract.

3.3.2 ***disadvantages of outsourcing***:

difficult to reverse. as soon as the organisation outsourcing interest and inner sources it will finally be very difficult to get the IT department back once more. This specifically essential while the agreement renewal: rate comes growth could be better than anticipated, however it could be tough to abandon the supplier.

Defects related to the loss of control of outside sources Operations stems from the motive that external sources administration calls for unique abilities which A combination of people abilities, operations management, contract administration, and authority Negotiation.[12][13]

3.3.3 ***Outsourcing and cost reduction***

The lowering of costs carried out through change work environment to an inexpensive surroundings you're having access to pleasant offerings which are supplied at a far lower cost, the salary of the employees also lower and the infrastructure .

I select the (Aspire Company) as example the company begin in Jordan 2002 with (4) employees, now they have more than 400 employee “the suite of services provided encompasses all phases of SDLC (Software Development Life Cycle) for web and mobile applications, Content Management, Customer Support, Remote Network Support and Data Analysis”.[14]

The company consists of two branches Services Branch and the other InfoTech Aspire services dedicated to Weight Watchers Company the largest benefit of such kind of outsourcing that the customers can find day night service, the differences in time zone where the employees go home outsourcing partner company will complete the tasks and produce to the customers full service so the customer well find 24 hours of customer service.

The gain of outsourcing for organisation along with Aspire corporation in Jordan is decreasing prices like infrastructure, employe expenses (schooling, development), for infrastructure the company can cast off the a whole lot of their infrastructure like buildings and gadget since they do not need it anymore because they are using outsourcing mean the other company will have it, training and development is not needed since the third party company is developing it.

3.4 OPEN SOURCE

Open source software program (OSS) is pc software program with code available with a license that offers the rights for alteration and the distribution of software to any person for whatever purposes. OSS is often placed in the General cooperative manner. The open source software is most significant example of open source development and compared with (knowledge technically) user-generated content or (legally defined) open content movements frequently. [11]

3.4.1 The advantiges of useing open source software program

- It encourages innovative improvement.
- folks who can't tolerate the cost of proprietary software can download OSS at no cost.
- funds made available might be used for purchase different required items.
- The charge (free) makes it easier to exchange the option whilst the software does no longer acquire as much as expectancies.

The **disadvantages** of the usage of open source software program code that have to be understood for the functions of integration with different components of the program parts and drawbacks that could face us, during the use of open source software program code that could need huge adjustment can also cause other issues.

3.4.2 Open Source and Cost Reduction

As we all know the use of open source code software reduce cost because it’s (free license, own the code…etc) so the company or the organization will reduce cost in general, since it is free most of the time even upgrade also is low cost or free, the change of software to another is even better with open source since it is free you are able to change to other software is the first one did not achieved the expecting, but in the hand

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some might say what about the hidden costs training, support, customization and maintenance.

hidden costs can come for a lot of reason like integration code some time is needed that could increases the cost, also testing the system for error and design that could dropdown the performance that test would increases the cost and you test the design because the system could be built without the using of the software engraining steps that could cost problem with the performance and the relationship and complexity if the system.

4. Compares between software reductions techniques

In this phase we are able to compares all of the four preceding strategies (Virtualization, cloud computing, outsourcing and open source), the contrast could be from the ones tow standards (infrastructure charges, workforce related price).

4.1 Infrastructure cost:

As we all know the before starting any kind of business the assets cost must be calculated and the proposed techniques improve the cost reduction we will explain all as bellow:

A. Virtualization: as we mentioned the use of this technique allow us to have multi instance of operating system on the same peace of hardware that leads us to the effective use of the single PC without buying several hardware to run the Operating systems on each of them the virtualization is also is more effective when apply it on severs that will reduce number of severs which require electricity and cooling which cost more on the company.

B. Cloud computing: the good thing is that we can use the infrastructure as a service that will reduce the costs in a massive way and since we use the software as a service which mean that we are not run any code to get the functionality the saving in costs that the developing, maintenance and testing of the software is done by the provider of the software as a service all we need as infrastructure is the devices that allow us to do main function and internet connection to make sure of keeping use the service this may add more costs here to guaranteed the internet connection is always available.

C. Outsourcing: this technique relay on the contact with other company that have to hold the infrastructure costs such (building rent costs, electricity, hardware…etc.) we only receive the function of the outsourced department or the part we want as a service we don't have to consider the costs of it in our infrastructure costs budget.

D. Open source: system that we can get it for free to integrate it with our main system or to use it as it, here the infrastructure we need is the hardware that is going to be the host for the open source systems.

4.2 The staff related costs:

The labor costs is an effective criteria when mentioned the general costs of in the budget of the organizations the mentioned techniques give a great indicator for reducing costs as next:

A. Virtualization: since we reduce the number of the devices that run several operating systems in the mid-level IT companies the whole company hold 50 team that work on developing, maintain and do testing for the software this allow us to evaluate employees and reduce total number of the hired people since the virtualization require experienced employees.

B. Cloud computing: here the cloud give the infrastructure as a service so we no longer need the huge amount of employees like the servers supervisor, the maintenance employees also that will help reduce the staff related cost.

C. Outsourcing: the organization do a hire a third party company that will provide the required functionality and the contracted company will no more hold any costs related to the employees in the outsourced department such(development, training, salaries).

D. Open source: the open source is required an experienced employees because we are not use the systems as standalone system we do integrate them with other system that may cause problems that need good employees to avoid such problems and maintain the system state stable here we can say that the use of open source is not that much effective when mentioned the software cost reduction topic.

5. CONCLUSION

This paper give an indicator about reducing costs for software, from Quality Assurance perspective the mentioned techniques (virtualization, cloud computing, outsourcing, open source) after focus study the virtualization contribute the big way in reducing the costs and the risks of using it are considered low, the cloud computing is the best when only consider the cost reduction topic because we request infrastructure as a service and other services there is huge reduction in costs but when combine the risks with the

decision making process it hard to consider the cloud computing a good choices one of the problem that make the cloud is not that much strong choice is the access problem to the data on the cloud also when reporting the access problem to the service provider the responding needs at least 24 hour that is a big problem. The outsourcing is another good technique since we give the management to the third party company the only thing is hard to revers. The last one is open source, I do consider it a bad choice because of the integration problems that arise as it requires special skills and efforts to solve it, and we have to be careful when dealing with the open source systems.

RECOMMENDATION

The Virtualization and Outsourcing are considered the most effective techniques when we take into account the benefits and risks. Based on selected criteria (infrastructure costs, staff- related costs) I do recommend both

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