Reducing Network Computing by Adopting Intelligent Approach

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Abstract

Large amount of calculations over a server typically needs maximum resources that a server can support, this becomes mandatory when organization needs efficient processing to avoid bottleneck to the server and network resources. The payroll processing is one of the best examples which needs large amount of calculations to prepare salaries of the employees. Payroll processing time is typically at the end of the payroll period, this payroll period can be monthly, semi-monthly and weekly or it may be defined according to organization’s needs. A normal payroll process includes systematically as Payroll Run, Pre Payments, Payments (check writer, Magnetic tape, Cash, External/Manual Payments) costing and transfer to GL. There is a defined sequence of processing when it comes to Payroll Run; therefore if any correction or rollback is required than the rollback process will be in reverse order. As the organizations are growing in size, resulting in increase in assignments, the payroll processing is becoming difficult as it demands high resources and a server with best configuration. In this respect this research is conducted to reduce the server load by processing the overtime of the employees on a separate server which will be responsible for maintaining the attendance and total working hours of individual employees. This database is integrated with the ERP server by defining data link between the two databases.

Keywords: ERP, SMEs, SOP, KPO’s, Pay Value

1. Introduction

ERP system enables a company to reduce human effort and processing time which results in increase of efficiency of the company. This system consists of several modules; each module is integrated with each other to share information across the organization; provided that the users have the rights to see the information. To give access or deny someone for accessibility; the system has its own security profile options. These security levels can also be custom defined and user can also create their own security profiles according to the need of the organization. Since the system is created on international standards; therefore it is globally accepted, but when implemented it need to be customized according to the business processes of the organization. It has the capability to integrate the legacy systems; however the legacy system must be designed by keeping all those factors which are important for the integration. The configuration of ERP system is complex and difficult to implement and it requires long time to go live. The ERP systems need skilled and qualified functional users. Therefore nearly half of the organizations reported that implementations require a lot of budget comprises of consultation fees, licensing fees and infrastructure cost. The network and hardware infrastructure cost very high for setup and maintenance; therefore it returns in failure in implementations. There are several reasons for the failure, sometimes the selection of the ERP also becomes a big challenge for organizations, before implementation it seems suitable for the organization but after implementation it feels that the organization does not need such an expensive setup, we can go through with some alternate solution. There are several solutions available in market and all are running and providing best services to the organizations.

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Beside all its complications, many organizations want to implement the ERP software because of its advantages. Senior management needs reports for making strategies and decisions. The ERP system supports a best MIS system at all levels i.e. for operational management, middle management and for senior management. Other than seeded reports users can create customized reports which can be attached to the application by system administrator responsibility. Not only the reports can be created, a complete applications can be developed with custom designed forms and reports. This returns number of benefits in operational and strategic matters either it is an enterprise or it is SME.

Generally ERP systems were suggested for large organizations but now it is also preferred by SMEs, due to the reason that innovation decision process at individual level is more applicable to SMEs. Most of the failure occurs because the adoption of this system is very difficult for the people who are reluctant to adopt the changes and this depends upon the organization culture and people who are working in it. Their skills set and qualifications are the most important factors which cannot be ignored. Furthermore the training of employees is also very important. Parker and Castleman said that organizational process consist a formal structure, proper Standard Operating Procedure (SOP), proper approver hierarchies and skilled workers; but SMEs don't have such structures as compared to large enterprise. Therefore such structures fails in adoption of IT changes, therefore Parker and Castle mean criticizes Roger’s model. ERP setup needs huge cost regarding network and infrastructure, for small industries it becomes difficult to meet the hardware and hosting expenses, reducing network and hardware cost may benefit the SME's. The cost includes the following considerations.

1.1 Servers
The server must be of best configuration in order to guarantee smooth functioning of processes.

1.2 Workstations and Laptops
ERP software has several modules and all are integrated with each other, for this workstations and laptops are needed in the organization in several departments.

1.3 Network Hardware
ERP implementation normally changes the business process and data patterns; for this purpose several hardware and network equipment are needed to support system needs.

1.4 Application Specific Hardware
Specific software sometime needs specific hardware devices, like scanners, cash registers etc. ERP module also needs dedicated devices which you need to purchase, and hence increasing cost budget.

1.5 Mobile Devices
Mobile devices, Smartphone's and laptops can contribute to project cost and increase efficiency.

![Figure 1. Simplified network structure.](image-url)
1.6 Hosting
Cloud is an option for ERP, dedicated services charge ongoing cost, which contributes in increasing cost (Figure 1).

2. ERP System and Organization Growth
It is discussed earlier that organizations adopt ERP systems for number of reasons therefore it is considered as an important requirement for the companies to obtain their benefits by making the process smooth and error free by standardizing the process to enhance the performance. Many research were conducted to list out the benefits that a firm gets by implementing the ERP systems, in this continuity Hitt et.al. found that whoever adopted this system take an advantage of performance and productivity, resource utilization, employees profit margin, inventory turnover etc. On the basis of his study, those firms who implemented ERP are 4.2% higher in productivity. He also correlates between firms performance and user productivity with the reason that the user who works on ERP are more likely to be more extensive users of information technology. Some ERP implementations does not get strong benefits from the system particularly the usage of ERP, therefore the reflection of advantages are not up to the level where it should be. One of the important reason is related with the employees who are reluctant to adopt changes or unwilling to accept ERP, because everyone has to complete his task on time otherwise log is maintain for user activity regarding when he started work and how long it takes to finish or left incomplete in between. Therefore the corruption rate may also decreases as they are now accountable to give answers in front of management, if they fail to justify themselves than their annual performance rating will decrease. A study was conducted by Kositanurit et.al. regarding usage of ERP; he pointed an important factor affecting individuals work performance from system usage. Similarly a study was conducted by Amaoko-Gyampah and Nah et.al. they concluded that ERP users are more concerned that ERP system helps them performing their daily job routines rather than with the system capabilities to integrate the data. So to take the maximum benefit from the automated system, a good understanding of user’s acceptance of ERP systems is essential for maximum user productivity. The application needs to be connected by its centralized database irrespective of the location of end user where he is working. The application has the capability to handle issues of data integration even it supports different legislation including different currency in a single application. This is possible by setting up more than one Business Groups and these business groups can be treated as different companies with the advantage that they can share their information with the option of “Cross Business Group”. According to Zhu and Kraemer, business characteristics are changed and therefore today’s most important business characteristic is the usage of internet that connects by several public networks and broad connectivity of Information Technology.

3. Key Performance Indicators (KPI)
Performance measurement analysis needs some tools like metrics and measures to evaluate the performance of the system, for this purpose the process may be categorizes using following parameters as KPI’s.

3.1 Staff Productivity
After implementation this is very important to access that how much output is produced by each individual.

3.2 Cost Effectiveness
This is the major factor which needs to be considered before implementation of the system. This gives information about the process and shows how the process operating costs are managed.

3.3 Cycle Time
This measures that how much time is required to complete a specific task. These tasks can be measured in units like hours, days, or months.

3.4 Process Efficiency
These measures show (Table 1) how well procedures and systems support the operation.

4. Current Business Process
Employees record their overtime daily on a sheet of paper formally designed for recording their actual overtime hours as this normally happens in most of the orga-
Reducing Network Computing by Adopting Intelligent Approach

Organizations, employees have to take approval from their supervisors before submission of Overtime sheet to KPO’s. KPO’s upload this data on their application using custom designed form as shown in Figure 2.

When all the overtime data is uploaded on the system, Errors are identified by the script in Figure 3 these errors may include duplicate records, overlapping time period and human errors etc.

At the end of payroll cycle, payroll process calculates the overtime amount as per their rate. This amount is calculated in the field of Pay Value (Pay value is the amount which is paid to employees) (Figure 4).

4.1 Disadvantages of the Existing System

First of all man power is required to punch the overtime data into application for which custom form is designed according to the organization requirement as shown in Figure 2. This overtime punching exercise is carried out throughout the month depending on data size. If the strength of employees is in thousands than thousands of sheets will be approved by their supervisor regarding overtime, thousands of papers need to be printed and signed. Errors may occur during punching of data due to which human effort increase to find and rectify those errors by using Figure 3.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost</th>
<th>% Cost over runs</th>
<th>Duration</th>
<th>% Duration overruns</th>
<th>% Receiving 50% or less benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>$3.80</td>
<td>57%</td>
<td>21.1 Months</td>
<td>57%</td>
<td>46%</td>
</tr>
<tr>
<td>2014</td>
<td>$4.50</td>
<td>55%</td>
<td>14.3 Months</td>
<td>75%</td>
<td>41%</td>
</tr>
<tr>
<td>2013</td>
<td>$2.80</td>
<td>54%</td>
<td>16.3 Months</td>
<td>72%</td>
<td>66%</td>
</tr>
<tr>
<td>2012</td>
<td>$7.10</td>
<td>53%</td>
<td>17.8 Months</td>
<td>61%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Other than this following are the key points need to be considered.

- Dedicated man power is required for punching data all the day.
- Overtime sheets signed by manager (i.e. paper wastage).
- Each key punch operator requires dedicated machine for doing his job.
- Each user accesses the database using Remote login if needed.
- Network traffic and server load increases.
- Payroll process may not be processed until all punching is completed and data is validated.

All the above factors increases overall cost in terms of Man power, electricity (power consumption), papers, maintenance of hardware used by key punch operators, network traffic etc.

![Figure 5. Proposed model architecture.](image)

### 5. Methodology

The Use of biometric machine for attendance helps in recording “from time” and “to time” for the calculation of overtime. An additional table is created in attendance server containing the Basic Salary of all the employees. The data in this table is updated runtime, whenever the basic salary of the employee is updated in Human Resources system a trigger is fired which updates the salary data in attendance server. To automate the updating of salary table a job is created and scheduled according to the need. This job contains insert/update or deletes statement. According to the formula for calculating the overtime; the overtime amount is calculated and saved in a table. Now at the end of payroll period this amount is added into the salary of all employees using API in Human Resource system. The approval of the overtime sheets is done through the self-service functionality by the line manager (Figure 5).

### 6. Experimental Results and Advantages

The experimental results shows that the computation load is reduced on ERP server because all the processing regarding overtime is processed on a biometric server machine, and the results are send back to ERP server, the processed data will be used at the end of the payroll processing period. Not only the load is balanced for overtime calculation, it also releases all the resources which were being used to complete entire exercise. key punch operators were used to access the ERP application and starts punching the data all the day 30 days of the months, this not only increase number of application users, but also reserves resources on ERP application which overheads the network traffic and increases human effort. Now by this approach no key punch operator is required.

### Table 2. Manual work load - per month assignment / task

<table>
<thead>
<tr>
<th>Performance Measure Attributes</th>
<th>Count</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>No's of Key Punch Operators(KPO's)</td>
<td>3</td>
<td>No's</td>
</tr>
<tr>
<td>No's of Company's Employees (who claim overtime)</td>
<td>1000</td>
<td>No's</td>
</tr>
<tr>
<td>Total Hours of KPO's(Per Month)</td>
<td>176</td>
<td>Hours</td>
</tr>
<tr>
<td>Total Working Days of KPO's (Payroll Cycle)</td>
<td>30</td>
<td>Days</td>
</tr>
<tr>
<td>Overtime Staff(KPO's) to Complete above Assignment (Per Head O.T =76 Hours per Month)</td>
<td>228</td>
<td>Hours, Overtime</td>
</tr>
<tr>
<td>Accuracy in %</td>
<td>90%</td>
<td></td>
</tr>
</tbody>
</table>

This methodology also reduces human effort in terms of cost, time and money and it also saves a lot of papers on which overtime was recorded. This methodology also increases accuracy by eliminating manual interaction;
Reducing Network Computing by Adopting Intelligent Approach

the system is now shifted from manual to automatic. All this may only happen with the condition that organization is willing to adopt the changes and they are willing to re-engineer their procedures. The scenario considered for this study is tabulated in Table 2 and 3. By analyzing below tables we can clearly see that workload is reduced and task can be completed in less than 1 day, and the accuracy increases at its maximum.

**Table 3.** After automation - per month assignment / task

<table>
<thead>
<tr>
<th>No's of  Company's Employees (who claim overtime)</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Day Required to Complete Task</td>
<td>Less Than 1 Day</td>
</tr>
<tr>
<td>Total Hours</td>
<td>Less Than 1 Hour</td>
</tr>
<tr>
<td>Accuracy in %</td>
<td>100%</td>
</tr>
</tbody>
</table>

The business benefits which are achieved by adopting proposed approach can be measured by following parameters.

6.1 User Productivity
This methodology will make the managers or approvers more efficient and productive because they do not have to approve thousands of overtime sheets. This approach will save time of line managers; this saved time can be utilized in other tasks.

6.2 Improved Time Admin Process
Since overtime sheets will be approved online using self-service functionality, this will enable line manager to view total amount regarding the employees overtime just after the submission of overtime sheets, as the system will now get closer to the real time processing.

6.3 Reduced Cycle Time
Managers would get sufficient time before cutoff date because no manual data punching and approving is now in practice, this will also improve system performance as the number of concurrent users are reduced during real time.

7. Conclusion
The aim of this study was to reduce the workload of ERP server by processing one of the important tasks on separate machine which was just maintaining the “time in” and “time out” of the employees. This study also identified the pros and cons of the ERP system for any organization. There are several ERP solutions available in the market; the best choice will benefit the organization because these systems need high cost and employees skills to achieve the maximum from these costly solutions. This research provides a useful instrument to increase efficiency. All the factors including complexity, compatibility, Efficiency, best practice, training and empowerment are also very important for maximum productivity. Findings of this research can help practitioners to identify those process which can independently executed on separate machines, the results of these machines are finally processed on ERP payroll server. Several methodologies can be applied in future to reduce workload of a server which will increase the efficiency of the system. In addition to this research a mechanism of continuous calculation may also be used, which spreads the processing across the whole payment period. This will be more beneficial when dealing with large number of assignments.

8. Acknowledgments
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9. References