

# THE ANALYSIS OF PERFORMANCE BEFORE AND AFTER ERP IMPLEMENTATION: A CASE OF A MANUFACTURING COMPANY

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## Abstract:

Machines and technology have been known for saving the efforts and so the time of the human race. Thus in the gravity of consideration to this point, companies are required to innovate their process and practices to improve productivity. The present research was conducted at ABC manufacturing company having three departments i.e. A, B, and C. The significant impact after ERP implementation in terms of time-saving has been reflected in the present research. The nature of working and nature of manufacturing is different in all the departments; that's why each department has its business development team. The case company has implemented an industrial and financial system (IFS) in 2020 and the whole process is properly followed in IFS. In this study, the process flow of documents and time consumption on each step of obtaining approvals from various authorities is covered, and saved time after the implementation of IFS is also revealed in detail. Results indicated that, after the implementation of IFS, the company has saved 48272.5 hours in 2021 by carrying out the whole process on IFS instead of a manual approach. None of the research highlights the magnitude and percentage of saved time after the implementation of an IFS in the manufacturing industry; The present research can be the basis of motivation for any manufacturing to implement IFS.

**Keywords:** enterprise resource planning; industrial and financial system; computer technology; time-saving.

**Cite as:** Kalwar, M.A., Khan, M.A., Phul, Z., Wadho, M.H., Shahzad, M.F., Marri, H.B. (2022). The analysis of performance before and after ERP implementation: a case of a manufacturing company. *J Appl Res Eng Technol & Engineering*, 3(2), 115-121. <https://doi.org/10.4995/jarte.2022.17789>

## 1. Introduction

Too small capacity of the computers and programming language or organizations content to manage narrow functional lines along with themselves, the vision of the 1970s single integrated information system for the enterprise remained a mirage for the majority of computer-using organizations (Markus & Tanis, 2000, p. 174). Enterprise resource planning (ERP) and widespread innovations are the major points in the world of Information Technology (IT) and improvement (Ullah et al., 2017). ERP systems are adopted by Organizations continuously. This is a way to increase efficiency and gain advantages over competitors. Commonly, decision, selection, planning, and implementation phases were the focus of the ERP systems lifecycle (Amado & Belfo, 2021). Enterprise resources are planned to implement by many organizations seeking a system to integrate various business processes across various functions (Saide & Mahendrawathi, 2015). The rate of adoption varies in different years In 2012 the rate was around 22%, rising to 26% in 2013, 31% in 2014, and 36% in 2015 respectively (Amado & Belfo, 2021) the richness given to enterprise

systems in terms of different functionality and potential benefits adopted by organizations, shouldn't be surprised that companies are adopting these systems for many different reasons (Markus & Tanis, 2000, p. 179).

The various activities are carried out by organizations which are made easier by modern information technology methods. The change in the flow of information, enabling multiple people to access and share information could be done by information technology which eliminates delays in decision making and also could be included the replacement of sequential steps with tasks that can be done simultaneously (Meiryani et al., 2021). According to Donovan (2001), the delivery of ERP implementation failed, this was usually because management hasn't taken the time to structure the organization to take advantage of such systems (Donovan, 2001).

In the present research, the increased performance of ABC manufacturing company after the implementation of ERP has been reflected in terms of time. The working

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hours which were required to complete the task manually and via ERP: the difference in required time in both scenarios has been projected in detail in the present research.

## 2. Literature Review

Today's markets are required to be more vibrant, and enterprises ask for more new business opportunities and ideas to enhance their agility and competitiveness. Enterprises even focused on improving their business agility by enhancing in responding time to consumers, material or product quality, production efficiency, and services (Hoseini, 2012, p. 1). This is the reason, they need to introduce their latest innovation to the market regarding new technology (Kalwar et al., 2020; Chaudhry et al., 2021; Khan et al., 2021). In recent Fourth Industrial Revolution, also known as Industry 4.0, has manifested that is the effects on the economy and hence corporate governance. The main primary objective of it is long-term growth and maximization of market share for all businesses (Pohludka et al., 2018). The operational performance opportunity for business improvement is provided by ERP (Sammon & Adam, 2007). Even It could save time, too. Throw local government's new ERP software, cities like Pasadena, California say their financial documents and accounting that took up to ten days each month to process, print, and mail take only a day to post online with that software (Kocakulah & Willett, 2003). Even Reports shared by IBM's Storage Systems division state that their ERP system helped re-price all their products in five minutes versus the five days required for the same job before the enterprise system began operation (Kocakulah & Willett, 2003). Sanja (2013) indicated that the ERP usage in health services is quite effective as it reduces the waiting time of patients at Emergency Department and service Work stations and provides better value for purchases at pharmacies by implementing ERP the organization improves the performance in existing business processes, reduces receivable days, credit returns and also improves the back end efficiency (Sanja, 2013). Enterprise IT automation services are useful as they provide the ability to fix problems immediately, when they occur, and reduce the mean time to respond to problems (MTTR) from days and hours to minutes. Such a function prevents severity 3 and 4 events from becoming severity 1 events (Antonoaie et al., 2017). The use of information benefits each organization (see Figure 1) in

terms of organizational performance; whether it is used properly or not but the benefits can be enjoyed in every situation but their magnitude of impact would be different depending on the situation.

Meiryani et al. (2021) for the improvement of the company's financial performance the implementation of the Enterprise Resource Planning (ERP) system aimed to be determined. The company's financial performance is mainly measured based on certain factors like financial ratios, namely Labor Productivity and Net Profit Margin. Before and after the implementation of the ERP system the data was analyzed by comparing various ratios over 3 years. The results indicated that there was an increase in productivity but an increase in profitability was not proved after the company implemented the ERP system. Therefore, further research can be directed at the level of ERP system implementation, because companies may have no background in implementing an ERP system (Meiryani et al., 2021). Chiawah (2019) in ERP implementation whether social and technical elements increase use and productivity was examined. The research questions addressed the relationship made between the ERP and organizational efficiency, cross-functional communication, information sharing, ease of ERP use, and ERP usefulness. For the study on a theoretical basis, the sociotechnical systems theory is provided. Data was collected throw the online surveys completed by 61 ERP users and analyzed using Wilcoxon matched pairs statistics and Spearman's correlation coefficient. Findings indicated a positive significant relationship between different segments like ERP and information sharing, ERP system quality and ease of ERP use, and ERP system quality and organizational productivity. Findings may be useful for local government leaders, technology managers, and chief information officers to ensure increased productivity and ERP sustainability (Chiawah, 2019). It was indicated by Ahmad (2012) that the planning solution and enterprise resources could be useful as accounting information systems in all organizational scales from large, medium, to small. The concern of this paper problem of Just-in-time work on ordering organizations and companies. And this paper includes the Jordan market in the study area. Moreover, ERP is quite effective to be applied in Just-in-Time applications like if programming, intelligence, and information technology issued fixed, or specifically adapted. Where the adaptation that is made on the ERP in every new feature order represents a high cost on

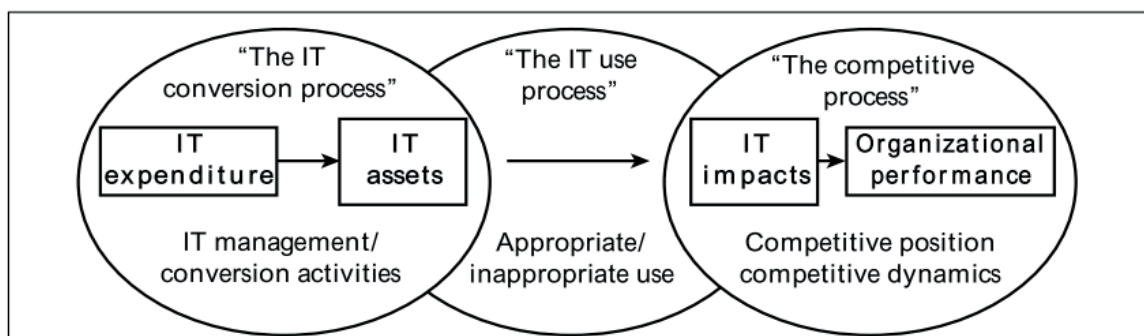


Figure 1: Soh and Markus's (1995) Model as cited by (Markus & Tanis, 2000, p. 189).

the budget. So, cost minimization is main issue in using such systems in such areas. The enterprise resources solutions and accounting information systems vendors needs to plan more dynamic, flexible solution to solve this problem, and they have to go cheaper (Ahmad & Jordan, 2012).

### 3. Research Methodology

The present research was conducted at ABC manufacturing company of Karachi, Pakistan having three departments i.e. A, B, and C. The nature of working and nature of manufacturing is different in all the departments. At the very first, the process flow was understood so that it could be split into parts for precise comprehension. The process flowchart was made in Microsoft Excel 2016. Since the ERP is being implemented in the company that's why the time of each of the value-added steps present in the flowchart was collected two times. The time of each step was collected as per its manual execution and via ERP; so that the benefit of ERP implementation could be highlighted. Moreover, the frequency of each stepper year in each of the departments was collected. The data was then put into Microsoft Excel for calculations. Total time saved on each step was calculated and compared with the manual time. Graphs were plotted in Origin 2019b. The data are given in tables along with carried-out calculations.

### 4. Results and Discussions

The increase in cost savings, streamlined business operations, and improved business productivity was guaranteed (Otieno, 2010), and organizations worldwide have taken initiatives to launch the integrated ERP systems into their existing business environments (Otieno, 2010, p.1). ERP implementation is considered a complex process, lengthy, and expensive, usually in millions of dollars (Saide & Mahendrawathi, 2015). The process starts with the initial inquiry which can be put by the customer via telephone or email; sometimes, the business development team of the company looks for

the orders in newspapers (in the form of tenders), on the website of the Pakistan procurement regulatory authority (PPRA). After the initial inquiry, the business development department puts it forward to material stores and the production planning department to ensure the availability of materials and time to be incurred on the new project. When the availability of material and time is confirmed, registration of the prospect customer master file starts, and development of the contract file starts. Contract development includes the estimation of required material, time, and cost. The tender is supposed to be submitted thereafter and if the company wins the contract, project file is supposed to be created (see Figure 1); and in case of losing contract, the file is closed as per standard operating procedure (SOP) of the company.

Manufacturing order follows the creation of the project, the order is developed from the estimations already made during the contract development. The production planning department executes the plan to meet the deadlines. After the manufacturing has been started, the inspections conducted by the company itself and the customer as well are the parts of step in the process flowchart i.e. work progress (see Figure 2). With the progress of the project, the company enquires amount from the customer as per the written contract and when it is completed, the file of the project is closed as per the SOP of the company as indicated by Figure 2. There are thirteen steps in the process of the company with the help of with it plans and executes its manufacturing projects. Since the making, circulation, and approval of files manually is a time-consuming job; therefore, the company decided to implement Industrial and financial systems (IFS). In this regard, a comparative analysis has been conducted to see the difference in productivity between manual work and the work which has been conducted on IFS. By 1998 approximately 40% of companies implemented ERP systems with annual revenue of more than \$1 billion (Caldwell & Stein, 1998). ERP vendors mostly began aggressively targeting smaller firms because they represented a much larger market. In aggregate, the ERP marketplace is quite huge (Markus & Tanis, 2000, p. 175).

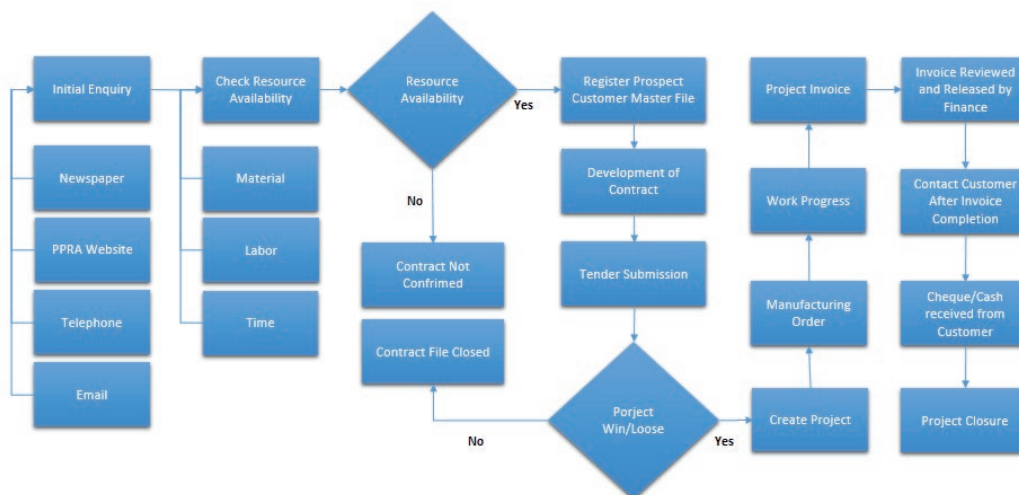


Figure 2: Process flow at all the departments of the case company.

**Table 1:** Descriptive of time required to complete work manually and via ERP.

Symbol	Reports	Manual Working (Hours)	Total Time Incurred via IFS (Hours)	Saved Working Hours	Saved Working Hours (%)
A	Initial Enquiry	24	1.00	23.00	95.83%
B	Check Resource Availability	32	2.00	30.00	93.75%
C	Register Prospect Customer Master File	16	0.33	15.67	97.92%
D	Development of Contract	24	0.50	23.50	97.92%
E	Tender Submission	8	0.17	7.83	97.92%
F	Contract Win/Loose	8	0.08	7.92	98.96%
G	Create Project	24	0.67	23.33	97.22%
H	Manufacturing Order	24	0.33	23.67	98.61%
I	Work Progress	16	0.33	15.67	97.92%
J	Project Invoice	16	0.17	15.83	98.96%
K	Invoice Reviewed and Released by Finance	16	0.50	15.50	96.88%
L	Contact Customer After Invoice Completion	16	0.17	15.83	98.96%
M	Cheque/Cash Received From Customer	8	0.25	7.75	96.88%
	Total	232	6.50	225.50	97.20%

In the past few years, a lot of organizations have implemented ERP across the globe: the improvement in organizational performance is the motivational factor behind these investments (Wickramasinghe & Karunasekara, 2012, p. 3). Table 1 indicates the working time of steps carried out manually and via IFS; it can be seen that the whole process consumes 232 hours manually and 6.50 hours via IFS. 225.50 hours are saved per project which is equal to 97.20% of the manual working time on the project as indicated in Table 1. The KM concept started gaining the attention of companies in the maximization of information and knowledge at the various levels of management to improve organizational performance (Saide & Mahendrawathi, 2015).

In department A, 52 inquiries were received in 2021 (see Table 2); 22 were not confirmed and 30 were active in the year.

The total estimated time to be incurred on the manual process of documentation was calculated to be 7952 hours but with IFS it was made possible in 253.50 hours; which means, 96.81% (7698.50 hours) time was saved

at department A with the application of IFS; the details regarding each step are indicated in Figure 4.

The difference between the time of manual work and the time on IFS at each step at department A can be seen in Figure 4; Moreover, the magnitude of saved time through IFS is given in Figure 3. 65 inquiries were received in 2021 (see Table 3) at department B; the corresponding department won the contracts. The total estimated time to be incurred on the manual process of documentation on 65 projects was calculated to be 14560 hours but with IFS it was done in 406.25 hours; which demonstrates that 97.21% (14153.75 hours) time was saved at department B after the implementation of IFS in a year.

The difference between the time of manual work and the time of same work on IFS at each step at department B can be seen in Figure 5; Moreover, the magnitude of saved time via IFS along with the percentage is indicated in Figure 6.

**Table 2:** Frequency distribution of inquiries and orders received at department A of the case company.

Symbol	Frequency in Department A/Year	Manual Working (Hours)	Total Time Incurred via ERP (Hours)	Saved Working Hours	Saved Working Hours (%)
A	52	1248	52.00	1196.00	95.83%
B	52	1664	104.00	1560.00	93.75%
C	30	480	10.00	470.00	97.92%
D	30	720	15.00	705.00	97.92%
E	30	240	5.00	235.00	97.92%
F	30	240	2.50	237.50	98.96%
G	30	720	20.00	700.00	97.22%
H	30	720	10.00	710.00	98.61%
I	30	480	10.00	470.00	97.92%
J	30	480	5.00	475.00	98.96%
K	30	480	15.00	465.00	96.88%
L	30	480	5.00	475.00	98.96%
M	30	240	7.50	232.50	96.88%
Total		7952	253.50	7698.50	96.81%

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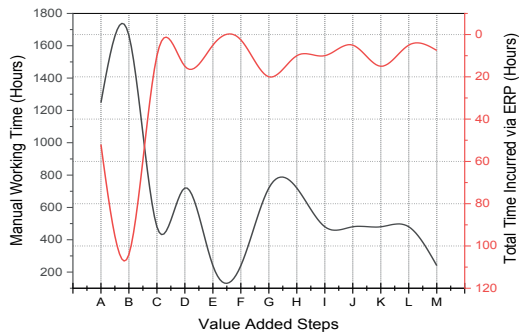


Figure 3: Graphical representation of the time of the value-added tasks carried out manually and on ERP at department A.

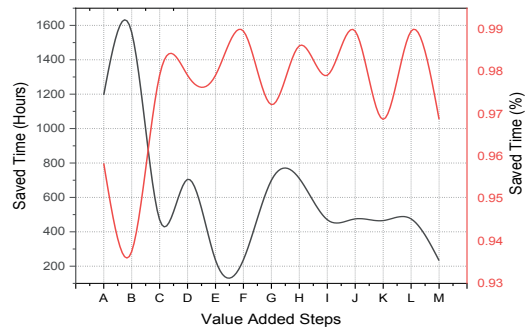


Figure 4: Graphical representation of time-saving by using ERP at department A.

Table 3: Frequency distribution of inquiries and orders received at department B of the case company.

Symbol	Frequency in Department B/Year	Manual Working (Hours)	Total Time to be Incurred via ERP (Hours)	Saved Working Hours	Saved Working Hours (%)
A	65	1560	65.00	1495.00	95.83%
B	65	2080	130.00	1950.00	93.75%
C	65	1040	21.67	1018.33	97.92%
D	65	1560	32.50	1527.50	97.92%
E	65	520	10.83	509.17	97.92%
F	65	520	5.42	514.58	98.96%
G	65	1560	43.33	1516.67	97.22%
H	65	1560	21.67	1538.33	98.61%
I	65	1040	21.67	1018.33	97.92%
J	65	1040	10.83	1029.17	98.96%
K	65	1040	32.50	1007.50	96.88%
L	65	1040	10.83	1029.17	98.96%
M	65	520	16.25	503.75	96.88%
Total		14560	406.25	14153.75	97.21%

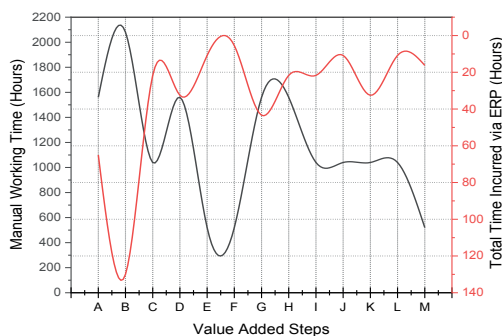


Figure 5: Graphical representation of the time of the value-added tasks carried out manually and on ERP at department B.

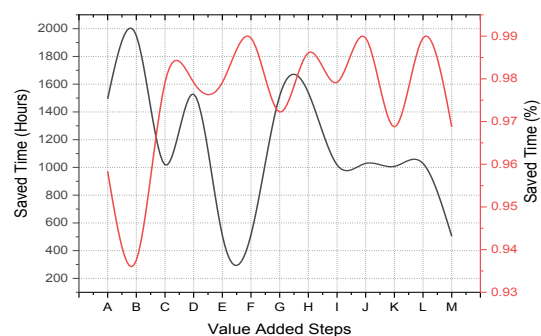


Figure 6: Graphical representation of time-saving by using ERP at department B.

By focusing on the functionalities and advantages of these systems, a lot of companies are getting these systems implemented to improve their efficiency and effectiveness in day-to-day affairs (Ullah et al., 2017).

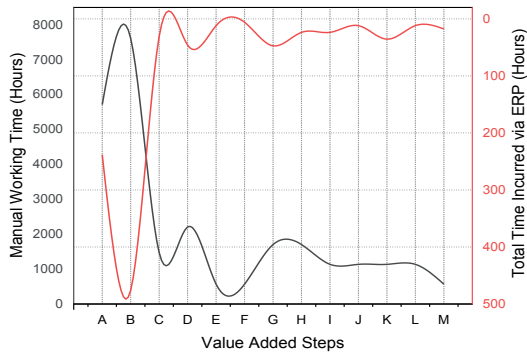
In 2021, a total of 238 inquiries were received (see Table 4) by the business development team of department C; 92 were confirmed and 71 were active in the year. The total estimated time to be incurred on the manual process of documentation was computed as 26096 hours but it was done in 962.25 hours by using IFS; which resulted in a time saving of 96.81% (7698.50 hours) at department C.

Since computerized work and technology save a lot of human efforts and time. In the present study, the difference between the time of manual work and the time on IFS at each step at department C can be seen in Figure 7; Moreover, the magnitude of saved time via IFS along with the percentage is indicated by Figure 8.

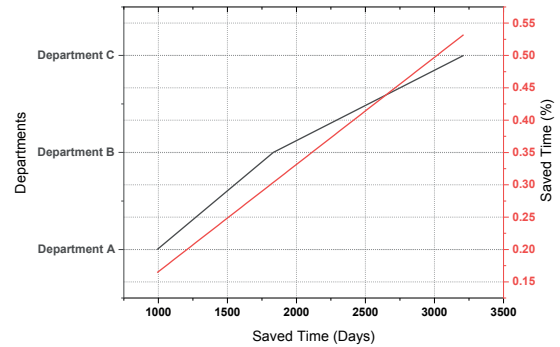
There is the requirement of good connectivity of the internet so that it can function well; however, with the improvement in technology, these systems might work offline (Callejas & Terzi, 2012, p. 16).

**Table 4:** Frequency distribution of inquiries and orders received at department C of the case company.

Symbol	Frequency in Department C/Year	Manual Working (Hours)	Total Time to be Incurred via ERP (Hours)	Saved Working Hours	Saved Working Hours (%)
A	238	5712	238.00	5474.00	95.83%
B	238	7616	476.00	7140.00	93.75%
C	92	1472	30.67	1441.33	97.92%
D	92	2208	46.00	2162.00	97.92%
E	71	568	11.83	556.17	97.92%
F	71	568	5.92	562.08	98.96%
G	71	1704	47.33	1656.67	97.22%
H	71	1704	23.67	1680.33	98.61%
I	71	1136	23.67	1112.33	97.92%
J	71	1136	11.83	1124.17	98.96%
K	71	1136	35.50	1100.50	96.88%
L	71	1136	11.83	1124.17	98.96%
M	71	568	17.75	550.25	96.88%
Total		26096	962.25	25133.75	96.31%



**Figure 7:** Graphical representation of the time of the value-added tasks carried out manually and on ERP at department C.



**Figure 8:** Graphical representation of days saved by carrying out the documentation on IFS.

### 5. Conclusion

Machines and technology have been known for saving the efforts and so the time of the human race. Thus in the gravity of consideration to this point, companies are required to innovate their process and practices to improve productivity. The present research was conducted to reveal the magnitude of the difference in time-saving in the documentation process by using IFS. Results indicated that a total of 48272.5 office working hours (6034.0625 days) were saved in 2021.

Figure 8 indicates that the department A saved 7931 hours (991.375 days, 16.43% of total saved time), department B saved 14657.5 hours (1832.1875 days, 30.36% of total saved time), and department C saved 25684 hours (3210.5 days, 53.21% of total saved time).

### 6. Future Implications

Initial inquiry still consumes one hour, which can be reduced to some extent in future research. Moreover, in the present research, generally conclusive steps are considered to be carried out in any project at the case company; in future research, each of the steps can be

split into sub steps so that the time-consuming areas in the documentation process can be highlighted.

### 7. Acknowledgment

The authors of the present research paper would like to thank the staff of the company for sparing their time in providing the data which was required in the present research. The name of the company cannot be disclosed due to confidentiality reasons.

### 8. Conflict of Interest

There was no conflict of interest among the authors of the present research.

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