
Impact of ERP Implementation on the Refineries of Assam

6.1 Introduction

Refineries need to maintain all regulatory standards of operational performance as well as keep cost performance a top priority and focus on generating a healthy cash flow. The structural changes in the business climate are also dictating a change in the view and role of refining and petrochemical plants. It is in this context that ERP is being adopted by refineries. ERP implementation is a very complicated task right from planning to roll out. There are additional complexities if ERP systems have to replace legacy systems as is the case with the refineries in Assam that are being studied.

ERP is usually a business led initiative. Businesses use ERP to make sure their resources are deployed effectively. An ERP will effect the whole organization. That means that its users will have a wider range of experience of IT, expectations about IT and ways of valuing of IT. User involvement consists of

fitting the system into the organization (or fitting the organization into the system perhaps). There may be a double learning curve for the users at this stage if business processes are changing in addition to the need to learn just what the software is capable of achieving (Milford and Stewart, 2000). The implementation of an ERP is likely to produce widespread organizational changes because of the scope of such solutions. An organization's existing culture is therefore likely to have profound effects on the planning process, the implementation process and in the operation of the completed project. The areas that commonly cause problems are related to user empowerment and user responsibility (Stewart, Milford, Jewels, T. Hunter, and B. Hunter, 2000).

SAP is the most dominate ERP in the oil and refining industry. All the refineries under study have adopted SAP. Table 6.1 gives a picture of the different SAP modules being used in the refineries of Assam. Numaligarh Refinery being a standalone refinery, SAP administration is done in the refinery itself. That is the reason why it uses ABAP, Basis and IS Oil & Gas. For the other refineries, they are constituent refineries of Indian Oil Corporation and all SAP administration is done at the corporate level and not in the refineries.

Table 6.1: SAP Profiles of the Refineries

Name of the Refinery	Year in which SAP Installation Started	Year in which SAP Installation Completed	SAP Modules /Components Used
Bongaigaon Refinery	2005	2005	FICO, HR, MM, PM, PP, PS, QM, SD
Digboi Refinery	2003	2003	FICO, HR, MM, PM, PS, QM, SD
Guwahati Refinery	2003	2005	FICO, HR, MM, PJ, PM, PP, QM, SD
Numaligarh Refinery	2005	2005	ABAP, Basis, FICO, HR, IS Oil & Gas, MM, PM, PS, SD

Data Source: IS/IIS Department of the respective Refineries

Table 6.2 gives the information about the frequency of use of SAP by the respondents. It is revealed that 84.52 percent of the respondents use SAP for more than 40% of their work time. The figures are 90.20, 74.07, 90.39 and 89.09 percent respectively for Bongaigaon, Digboi, Guwahati and Numaligarh refineries respectively. It is seen that SAP is an integral part of the work life of most respondents.

Table 6.2: Usage of SAP by Respondents

Time Spent	Bongaigaon Refinery	Digboi Refinery	Guwahati Refinery	Numaligarh Refinery	Total
Less than 20% of my work time	2	11	0	3	16
Between 20% - 40% of my work time	3	10	5	3	21
Between 40% - 60% of my work time	17	22	18	20	77
Between 60% - 80% of my work time	15	26	21	16	78
More than 80% of my work time	14	12	8	13	47
Total	51	81	52	55	239

Data Source: Concerned Refineries

6.2 Comparative Analysis of the Impact of ERP on the Refineries of Assam

The operational definition of Enterprise Productivity for this study emphasizes on seven separate dimensions: Cost Control (CC), Increase in User Satisfaction (IUS), Process Improvement (PI), Better Management (BM), Knowledge Enhancement (KE), Collaboration (CO) and Innovation (IN). The questions asked to the users of SAP in the refineries of Assam to gauge their opinion regarding Enterprise Productivity because of the use of ERP (SAP) belongs to these dimensions along with their associated codes as given below:

Cost Control (CC):

- CC01: Operational costs through shared services
- CC02: Operational costs by bringing in end-to-end process transformation
- CC03: Operational costs by integrating operations
- CC04: Explicit opportunity costs
- CC05: Implicit opportunity costs
- CC06: Infrastructure costs
- CC07: External coordination costs
- CC08: Internal coordination costs
- CC09: Direct bargaining costs
- CC10: Indirect bargaining costs
- CC11: Prevention costs
- CC12: Appraisal costs
- CC13: Internal failure costs
- CC14: External failure costs
- CC15: Reducing the number of errors I make on my job

Increase in User Satisfaction (IUS):

- IUS01: Creating a productive workplace culture
- IUS02: Helping in organizing the work
- IUS03: Improving business performance inside the organization
- IUS04: Saving time in doing my job

Process Improvement (PI):

PI01: Improving process efficiency

PI02: Leading to process improvements

PI03: Reducing Inventory

PI04: Creating reports

PI05: Reducing the number of tasks needed to finish my work

Better Management (BM):

BM01: Improving effectiveness

BM02: Enhancing decision making

BM03: Improving relations with customers/vendors

BM04: Maintaining records

Knowledge Enhancement (KE):

KE01: Helping in better collaboration

KE02: Collecting information

KE03: Providing more knowledge concerning the company and business
processes

Collaboration (CO):

CO01: Improving communications

CO02: Improving organizational responsiveness

CO03: Integrating with other departments and teams

CO04: Communicating with peers

CO05: Communicating with superiors

Innovation (IN):

IN01: Decreasing control / formalities

IN02: Automating more business processes

IN03: Reducing the time needed to deliver products or services

As is seen, significant emphasis has been put to understand the dimension of cost control by specifically asking about the various kinds of costs that are usually seen in running the operations of an organization. All the costs that have been mentioned in the questionnaire have been defined in section 2.3.

Table 6.3 shows that the respondents are not giving consistent responses on whether ERP (SAP) is reducing the various types of costs. As is seen, as many as 74.90 percent of the respondents believe that “Internal coordination costs” is being reduced while only 28.03 percent of the respondents believe that “Implicit opportunity costs” is being reduced. The percentage of respondents who believe that the other costs are being reduced lies between these two extremes.

The illustrations from 6.1 to 6.4 show the status of responses in the individual refineries. It is seen that in all the refineries, wherever the percentage of respondents saying “yes” is low, the percentage of respondents saying “can’t say” is high. This reflects that the respondents’ knowledge about the various types of costs that ERP (SAP) is supposed to reduce is not sufficient.

Table 6.3: Affirmative View of Respondents Regarding Reduction in Various Costs

Cost	Bongaigaon Refinery	Digboi Refinery	Guwahati Refinery	Numaligarh Refinery	Total
CC01	38	58	39	43	178
CC02	36	45	36	44	161
CC03	39	56	36	46	177
CC04	13	26	21	18	78
CC05	10	17	22	18	67
CC06	28	40	28	31	127
CC07	34	39	29	35	137
CC08	43	52	37	47	179
CC09	17	26	19	11	73
CC10	17	28	19	13	77
CC11	35	42	29	18	124
CC12	31	40	24	15	110
CC13	26	23	29	24	102
CC14	15	17	20	16	68

Data Source: Concerned Refineries

Illustration 6.1: Responses regarding Reducing Costs at Bongaigoan Refinery (in percentage)

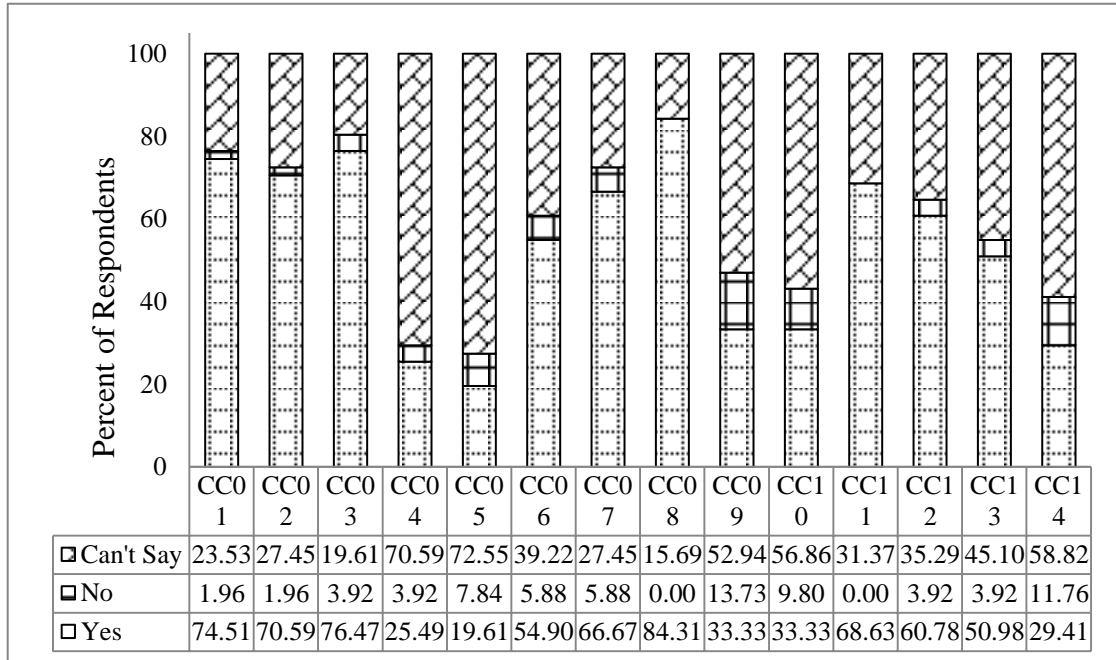


Illustration 6.2: Responses regarding Reducing Costs at Digboi Refinery (in percentage)

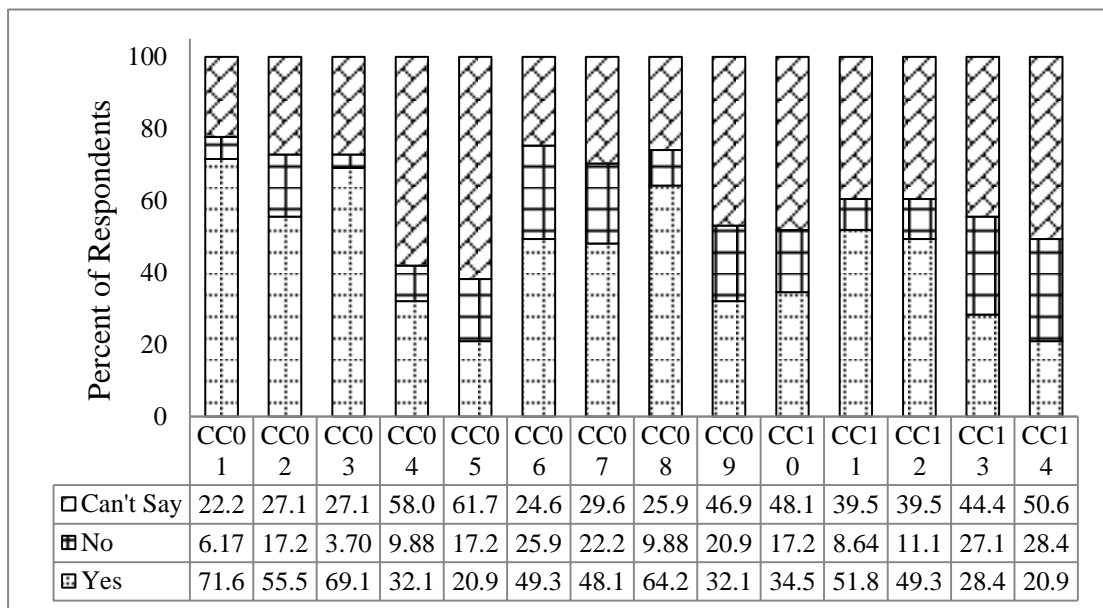


Illustration 6.3: Responses regarding Reducing Costs at Guwahati Refinery (in percentage)

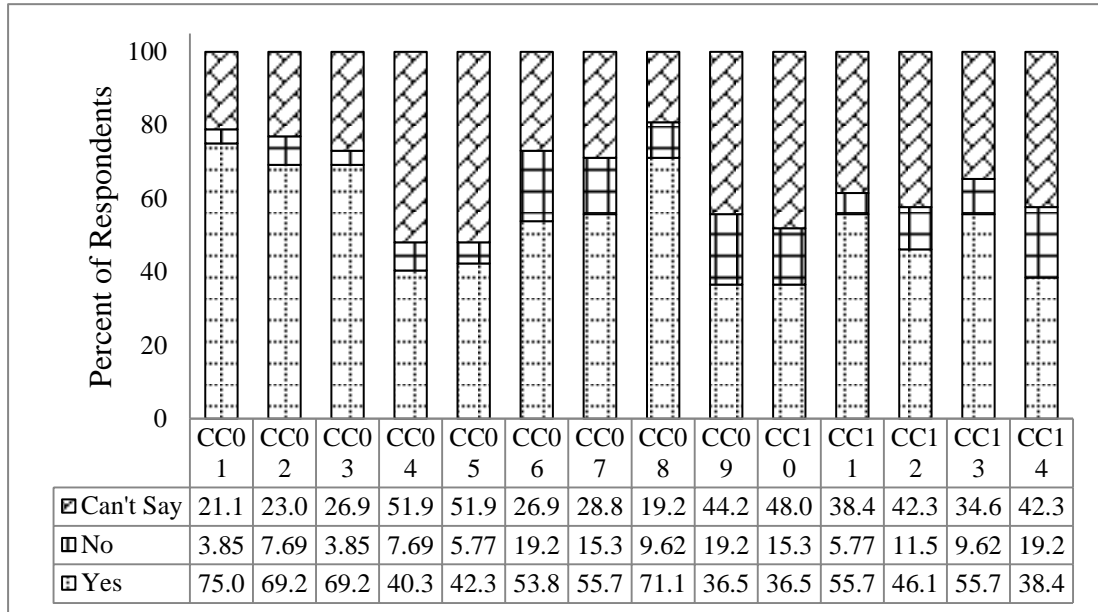


Illustration 6.4: Responses regarding Reducing Costs at Numaligarh Refinery (in percentage)

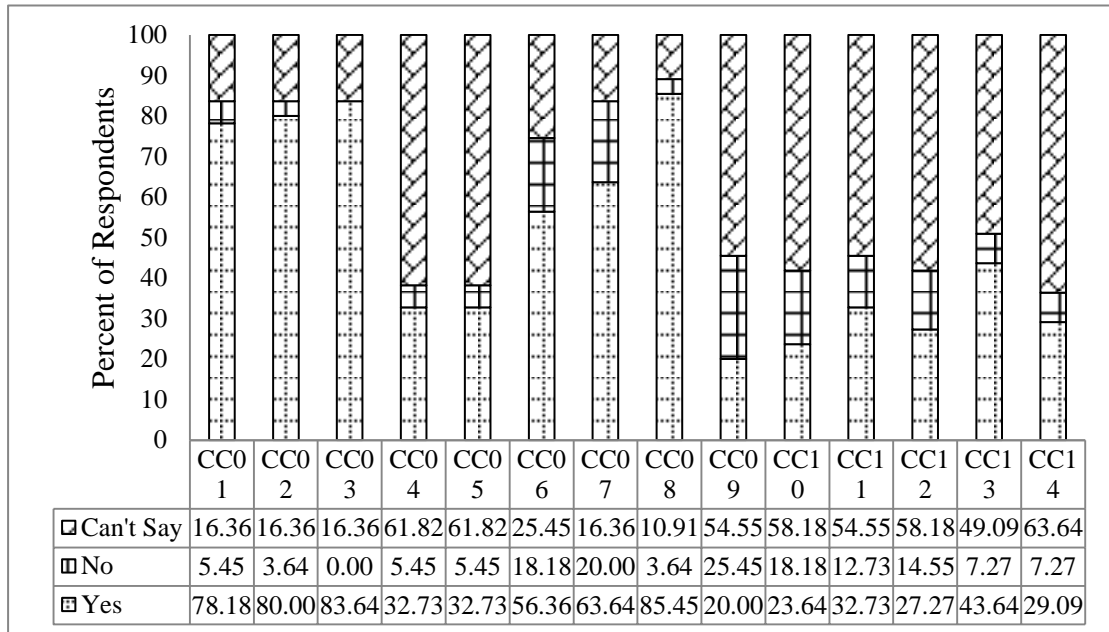


Table 6.4: Affirmative View of Respondents Regarding Increase in Enterprise Productivity because of the introduction of ERP (SAP)

Statement	Bongaigaon Refinery	Digboi Refinery	Guwahati Refinery	Numaligarh Refinery	Total
IUS01	48	68	36	40	192
IUS02	50	73	44	50	161
KE01	39	63	42	40	184
BM01	49	69	44	49	211
CO01	47	62	36	48	193
BM02	39	49	31	39	158
CO02	39	59	38	44	180
IUS03	35	56	30	40	161
IN01	30	30	24	21	105
PI01	42	56	37	48	183
PI02	40	55	31	44	170
IN02	34	52	35	49	170
PI03	40	50	33	33	156

Data Source: Concerned Refineries

Table 6.4 reveals that a clear majority of the SAP users in the refineries of Assam believe that the introduction of ERP (SAP) has increased productivity as for all the statements except one, the percentage of affirmative response is more than 65 percent. Only when it comes to “Decreasing control / formalities (IN01)”, the SAP users are not convinced regarding the role of ERP as only 43.93 percent of the respondents have given an affirmative answer.

For the individual refineries, the results are similar. But a trend which is again disturbing is that there are a considerable percentage of respondents who have responded as “can’t say”. This reflects that a sizeable number of respondents in the refineries of Assam are not aware about the capabilities of ERP (SAP).

Illustration 6.5: Responses regarding Increasing Enterprise Productivity at Bongaigaon Refinery (in percentage)

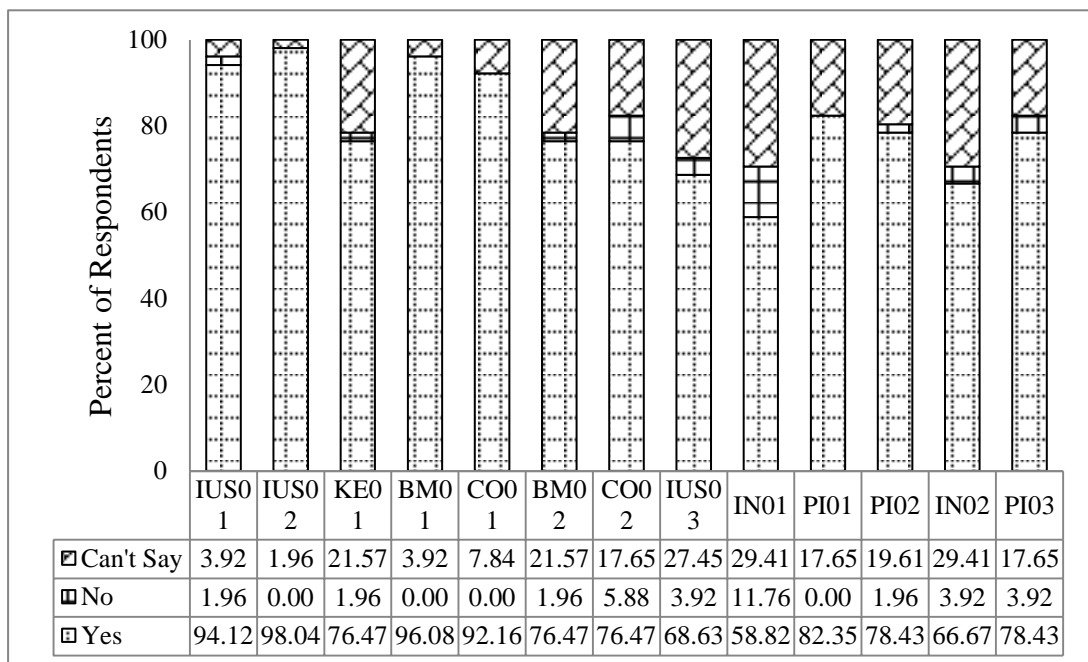


Illustration 6.6: Responses regarding Increasing Enterprise Productivity at Digboi Refinery (in percentage)

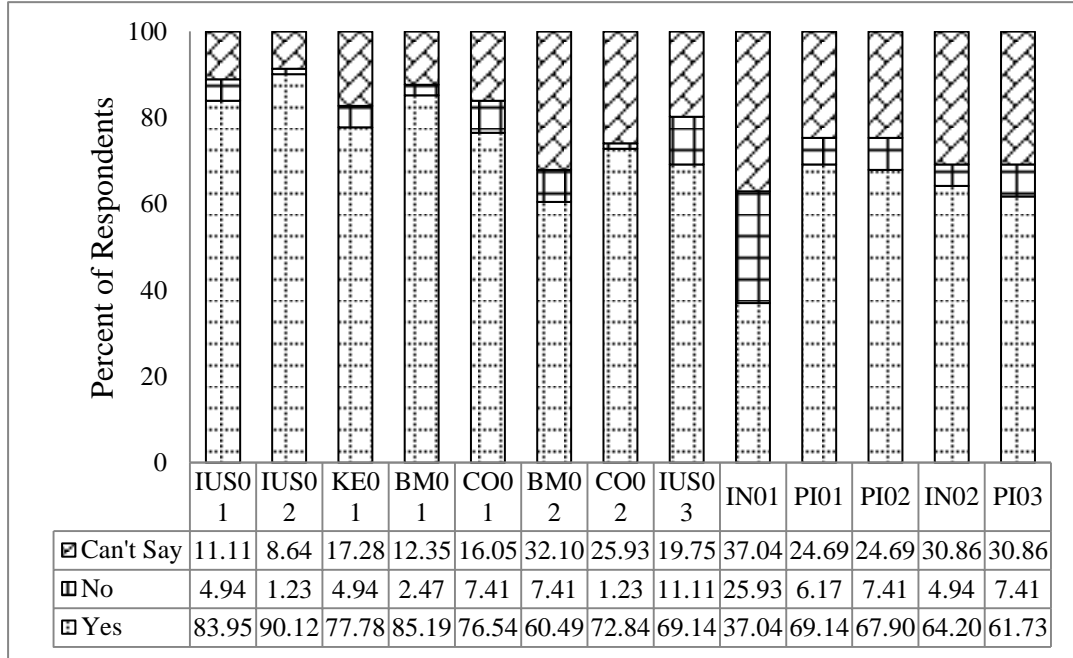


Illustration 6.7: Responses regarding Increasing Enterprise Productivity at Guwahati Refinery (in percentage)

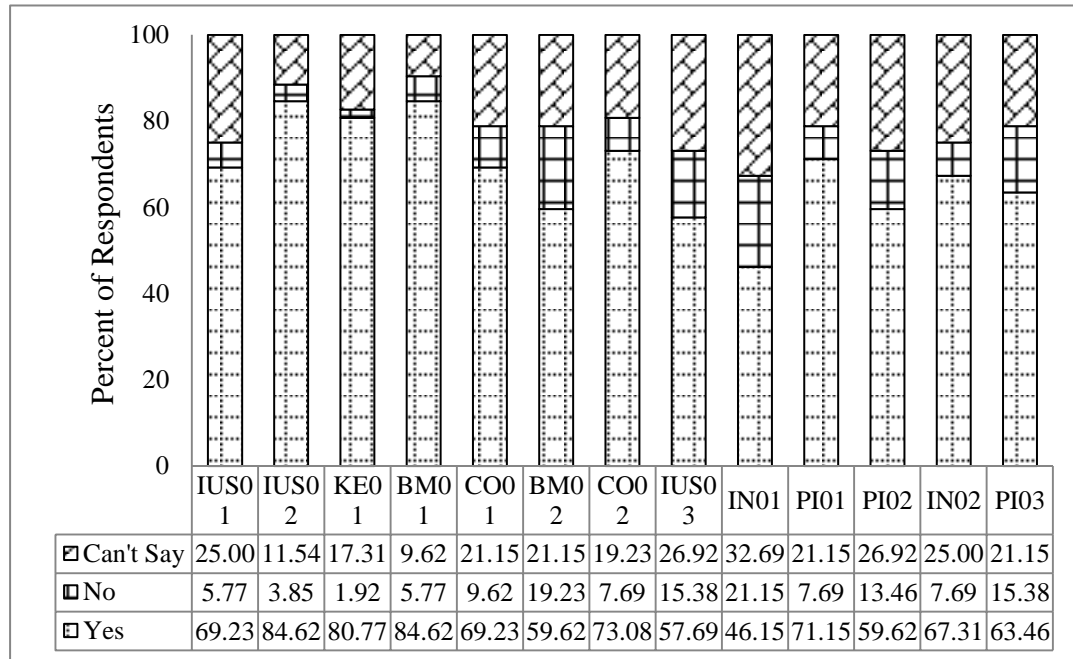
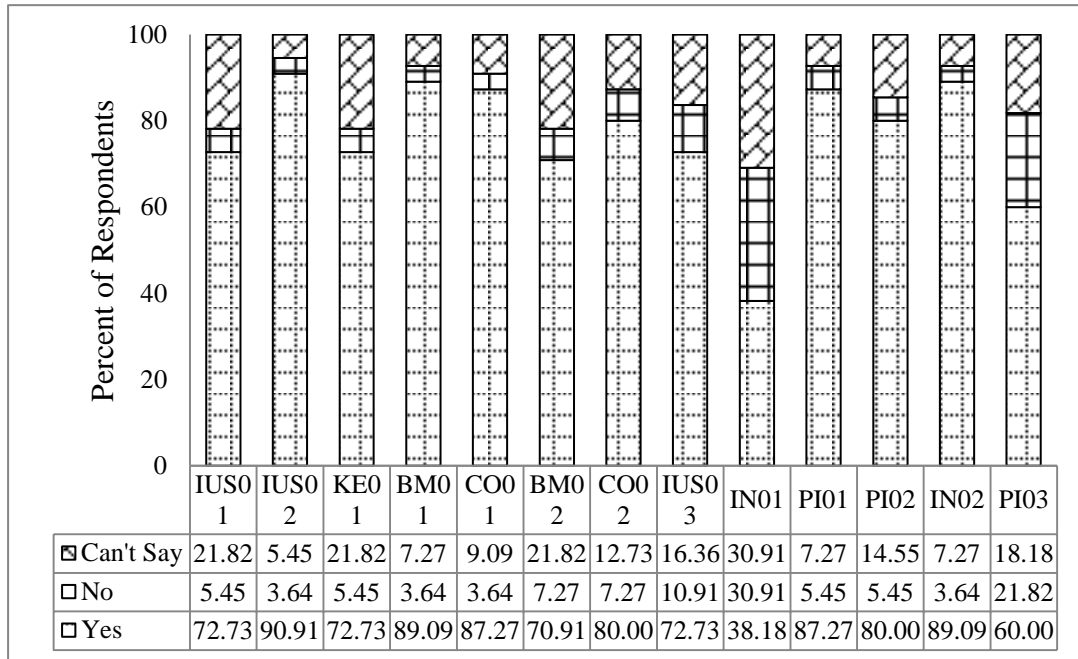


Illustration 6.8: Responses regarding Increasing Enterprise Productivity at Numaligarh Refinery (in percentage)



Average weighted score has been used to study the importance of SAP by respondents on some key parameters. Five-point Likert Scale has been selected to measure the extent of agreement, importance or degree of satisfaction. The range of scale is 5 (Very Important), 4 (Important), 3 (Neutral), 2 (Not Important), and 1 (Not at all Important). On the basis of frequency of ratings for each attribute, average weighted scores have been calculated with the help of following formula:

$$W = \left[\frac{\sum w_i f_i}{\sum f_i} \right]$$

W = Average weighted score

w_i = weight for a particular score

f_i = frequency

Table 6.5: Average Ratings of Respondents Regarding the Importance of SAP

Statement	Bongaigaon Refinery	Digboi Refinery	Guwahati Refinery	Numaligarh Refinery	Average
KE02	4.784	4.593	4.596	4.727	4.675
BM04	4.765	4.568	4.769	4.855	4.739
PI04	4.627	4.469	4.346	4.782	4.556
IUS03	4.451	4.235	4.385	4.436	4.377
KE03	4.353	4.395	4.173	4.109	4.258
CO03	4.608	4.420	4.192	4.400	4.405
CO04	4.000	3.963	3.596	3.691	3.813
CO05	4.137	4.025	3.731	3.600	3.873
IUS04	4.608	4.272	4.423	4.473	4.444
PI05	4.314	4.062	4.135	4.436	4.237
CC15	4.392	4.198	4.173	4.418	4.295
IN03	4.353	4.148	4.212	4.455	4.292
Total	4.449	4.279	4.228	4.365	4.33

Data Source: Concerned Refineries

Table 6.5 shows that the respondents considering all the refineries together believe to a significantly high degree that SAP is important across various parameters as the scores range between 3.813 and 4.739 out of a maximum possible score of 5. The maximum score of 4.739 is given to the parameter “Maintaining records” while the least score of 3.813 is given to “Communicating with peers”.

Looking at the individual refineries, the top and the bottom two parameters as far as the importance of SAP is concerned is same for all the refineries though the order is not same. The topped ranked parameters are “Collecting Information” and “Maintaining Records”. The least important parameters are “Communicating with peers” and “Communicating with superiors”. It is thus clear that SAP’s utility is linked most with availability of information and least with communication.

Table 6.6: Importance of SAP at each of the Refineries

Name of the Refinery	Total Score
Bongaigaon Refinery	4.449
Digboi Refinery	4.279
Guwahati Refinery	4.228
Numaligarh Refinery	4.365

Data Source: Concerned Refineries

Table 6.6 gives an overall score of the importance of SAP at each of the refineries in Assam. It is the average score calculated from the average ratings obtained for each of the statements given in table 6.5 for the individual refineries. The total scores obtained are very close to each other. Still for the sake of comparison, it is seen that the SAP users of Bongaigaon Refinery give the maximum importance to SAP. The least importance is given by Guwahati Refinery.

6.3 Conclusion

This chapter looked at the fourth objective of the present study, “To make a comparative analysis of the impact of Enterprise Resource Planning (ERP) implementation on Enterprise Productivity from ERP user’s perspective in the refineries of Assam”.

The usage patterns of SAP by the respondents reveal that the implementation of ERP (SAP) has had a considerable impact on the refineries of Assam with respect to the day to day operations. There is not much to compare amongst the individual refineries on the usage aspect. Only in Digboi Refinery, SAP usage is comparatively on the lower side. As time progresses, the usage of SAP will increase further.

ERP (SAP) implementation has had a positive impact on the refineries of Assam. The SAP users believe that various costs have come down because of the use of SAP. Different types of productivity have also increased as a result of the use of SAP which has given rise to Enterprise Productivity. If we make a comparison amongst the four refineries, there is again not much to compare on the impact and importance of SAP. Responses and ratings on various parameters are seen to be quite consistent across the refineries.