

# A Decision-Making Framework for IT Outsourcing using the Analytic Hierarchy Process

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**Abstract** Information Technology Outsourcing (ITO) has generated considerable research interest since the historic Eastman Kodak deals of 1989. In this paper, a model has been developed for making the ITO decision based on the Analytic Hierarchy Process (AHP). Two hierarchies have been developed - one for making a choice of activities to outsource and another to choose the appropriate outsourcing methodology. The model has been tested by applying it to an outsourcing decision made by a leading locomotive company of India. **Keywords** Outsourcing activity; Outsourcing methodology; AHP technique.

## 1 INTRODUCTION

Since the Eastman Kodak deals of 1989, Information Technology Outsourcing (ITO) has received considerable attention from the researchers. In the 1980s and early 1990s, the companies, lacking in-house IT expertise and technology, usually outsourced their IT activities. However of late, the companies with strong IT capabilities, such as IBM, Microsoft and SUN, are also outsourcing some of their IT functions. As a result, they are able to focus on their core-activities. IT outsourcing resulted in *cost-reduction* owing apparently to the *economies-of-scale*. Lately, outsourcing is being done for business impact and for commercial exploitation [3, 7].

An outsourcing decision making process starts by an assessment of the in-house IT capabilities. Analytic hierarchy process has been applied for determining key capabilities of a firm [6]. Based on this assessment, the management has to decide what activities to outsource out of all the activities that can potentially be outsourced.

Once the choice of activities to be outsourced has been made, the next step is to select an appropriate methodology for outsourcing them. The issues involved in deciding the outsourcing strategy of a company are two-fold.

- Selecting the appropriate vendor

- Framing the appropriate contract

There are certain distinctive characteristics of IT that set it apart from most other business processes [7]. Consequently, the issues of vendor selection and contract management also take on new dimensions in the context of IT.

A generic model based on AHP [8] for making the ITO decision has been proposed [9] consisting of three levels. The Analytic Hierarchy Process (AHP) enables the decision maker to express his qualitative judgments in a quantitative format.

In this paper, we present a new model based on AHP for making the ITO decision. The model consists of two parts - one to decide the activities, which a company should outsource, and the other to decide the outsourcing methodology (vendors and contracts) to adopt. The model has been validated through its application to the outsourcing decision of a leading locomotive company of India.

We present our model in the next section followed by its verification in the section 3. The conclusions are presented in section 4.

## 2 THE DECISION MAKING MODEL

### 2.1 Deciding the activities to be outsourced

We suggest a set of three factors for selecting activities for outsourcing from a group. These factors are *criticality*, *stability* and *simplicity*. These three factors cover every aspect of IT outsourcing. The criticality captures importance of an activity to business positioning and importance of an activity to business process. In other words, criticality includes strategic importance of an activity as well as its importance to the business processes in general. The complexity takes care of the capabilities of the firm. Simplicity (or complexity) is a relative term and depending on the capabilities of a firm, an activity gets rated on a scale of 1 (simple) to 9 (complex). We use a scale of 1 to 9 in this paper that was originally proposed

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in [7]. However, in most cases, a scale of 1 to 3 or 1 to 5 would be sufficient and allow people to be more consistent. The stability factor captures the IT related issues such as volatility of an activity. This is an external factor influencing the choice of activities to be outsourced due to rapid changes in IT [1, 2].

The decision-hierarchy is shown in Figure 1.

In the decision hierarchy, at level one, we have the focus which is to outsource an activity. At level two, we have *criticality*, *stability* and *simplicity*. At level three, we have shown four activities to choose from to outsource. In practice, a company may have any number of activities at this level. A pairwise comparison matrix as shown in Table 1 is filled up by participants during the decision-making process. The three aspects of an activity are compared pairwise. The decision makers answer questions like *given our present business position and strength of our IT department, which attribute of an activity is more important to us in deciding whether we want to outsource it or not?*

Then, the decision makers are required to compare each IT activity pair on the criteria of criticality, stability and simplicity. Here, the decision maker is answering questions like *Is activity A more complex than activity B?* or *Is activity A more stable than activity B?* We will get three matrices, one for each criticality, stability and simplicity. The matrix is shown in Table 2. After obtaining data for these three matrices along with level one matrix, the final priority vector is calculated. The final priority vector reveals how suitable or how necessary it is to keep the activity in-house. Consequently, the activities with lower values of priority are more suitable for outsourcing. In next section, we will show the effectiveness of our model through a practical example. Let us now discuss our model for deciding the outsourcing methodology.

## 2.2 Deciding the outsourcing methodology

In this section, we present a four level decision-making hierarchy for deciding the outsourcing methodology (Figure 2).

The first step is to decide the priorities of the business. The overall focus, or goal, has been fixed - *extract business-value from ITO*. The fixed focus results in no loss in generality of the model. The company has complete flexibility in deciding the criteria for achieving the goal. Depending on the view of the goal, decision makers may assign values to the options available at the next level. The ways in which a company can extract business-value out of IT Outsourcing have been divided into the following three classes.

1. Use IT Outsourcing to help solve the immediate business problems.

2. Use IT Outsourcing to improve the business.

3. Use IT Outsourcing to transform the business.

These three classes constitute level 2 of the hierarchy.

At next step, one has to decide the action that are more relevant for achieving a particular objective. These options constitute level 3 of our AHP. Our basis for deciding these options are the well researched list of 14 drivers [5]. However, we have modified the list to eliminate some of the *too specific* and *too general* drivers. The final list of drivers is shown in Figure [?] which constitute Level 3 our hierarchy .

At Level 4, there are several alternative contracts through which the activity may be outsourced. The contracts can be classified into the following general categories.

- Insourcing : The Company lets its own IT department take the responsibility.
- Value-added outsourcing: The Company should enter into a close and strategic alliance with the supplier.
- Short-term outsourcing: The activity should be outsourced for a short period.
- Long-term outsourcing: The activity should be outsourced to a vendor for a long period.

Identifying a contract as belonging to one of the above categories allows the company to identify some advantages/disadvantages of the particular contract. These contracts are then compared against each other pairwise on each of the criteria listed in Table 2. The priority vector for the various outsourcing alternatives is obtained. Then *Expert Choice* [4], or any other AHP software, is used for analyzing the responses. The alternative with the highest priority is selected as the methodology for outsourcing.

## 3 RESULTS

We verified our AHP hierarchy by conducting a survey in which 20 people participated from a leading automobile manufacturing company. The internal IT department of the company had been performing all the IT activities. In the late 90s, the company decided to spin-off their IT division into a separate entity.

The IT unit of the company has been delivering high quality IT services to the company and has developed a large and diverse third-party clientele as well. The company decided to get a website of its own. The activity was outsourced to an outside company. The focal point of our survey was to analyze this decision of the company, from within the decision making model proposed in the present work. It is noteworthy that the decision had already been taken and the hence the analysis was post-facto.

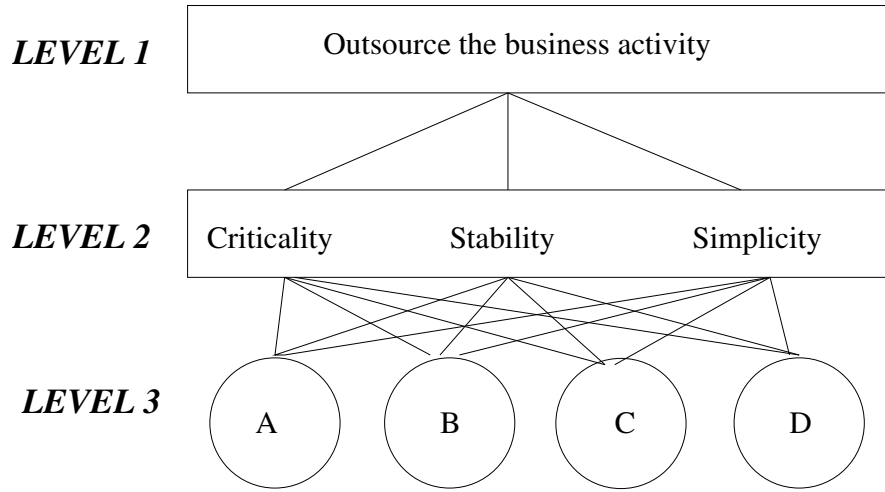


Figure 1: Decision hierarchy for selecting activities to outsource.

	Criticality	Stability	Simplicity
Criticality			
Stability			
Simplicity			

Table 1: Pairwise comparison matrix for criteria in deciding the activities to outsource.

Criticality	Stability	Simplicity
0.656	0.225	0.119

Table 3: Obtained priority vector for choosing an activity to outsource.

The hierarchical distribution of the eighteen participants was as follows: Managers - 3, Assistant Managers - 12, Deputy Managers - 2, and Engineer - 1.

The respondents were asked to compare the relative importance of criticality, stability and simplicity of an activity while making the decision to outsource it. The aggregate responses to this question is shown in Table 3.

The criticality of an activity was the most important criteria in deciding whether to outsource it or not. The four potential activities for outsourcing were

- Materials Requirement Planning (MRP)
- Finance
- Human Resource Management such as payroll, benefits etc (HRM).
- Website development and maintenance (WDM)

	Criticality	Stability	Simplicity
WDM	0.082	0.056	0.449
MRP	0.593	0.319	0.061
Finance	0.218	0.338	0.161
HR	0.107	0.387	0.329

Table 4: Relative positions of the activities at level 3 with respect to level 2; WDM is web site development and maintenance, MRP is Materials Requirement Planning, and HR is Human Resource Management.

The respondents were asked to make pairwise comparisons among the four activities on the criteria of criticality, stability and simplicity. The aggregated responses are shown in Table 4.

From the above results, it is clear that MRP is perceived to be the most critical and most complex activity. However, MRP is regarded as a moderately stable activity i.e. software and technologies related to this activity do not become obsolete in the short-term.

Finance is not as critical as MRP for company's business in the aggregate judgment of the respondents. Finance is the most stable function of the organization due to the routine nature of the issues involved. Its simplicity, how-

	Activity 1	Activity 2	...	Activity n
Activity 1				
Activity 2				
...				
Activity n				

Table 2: Pairwise comparison matrix for IT activities based on a criterion.

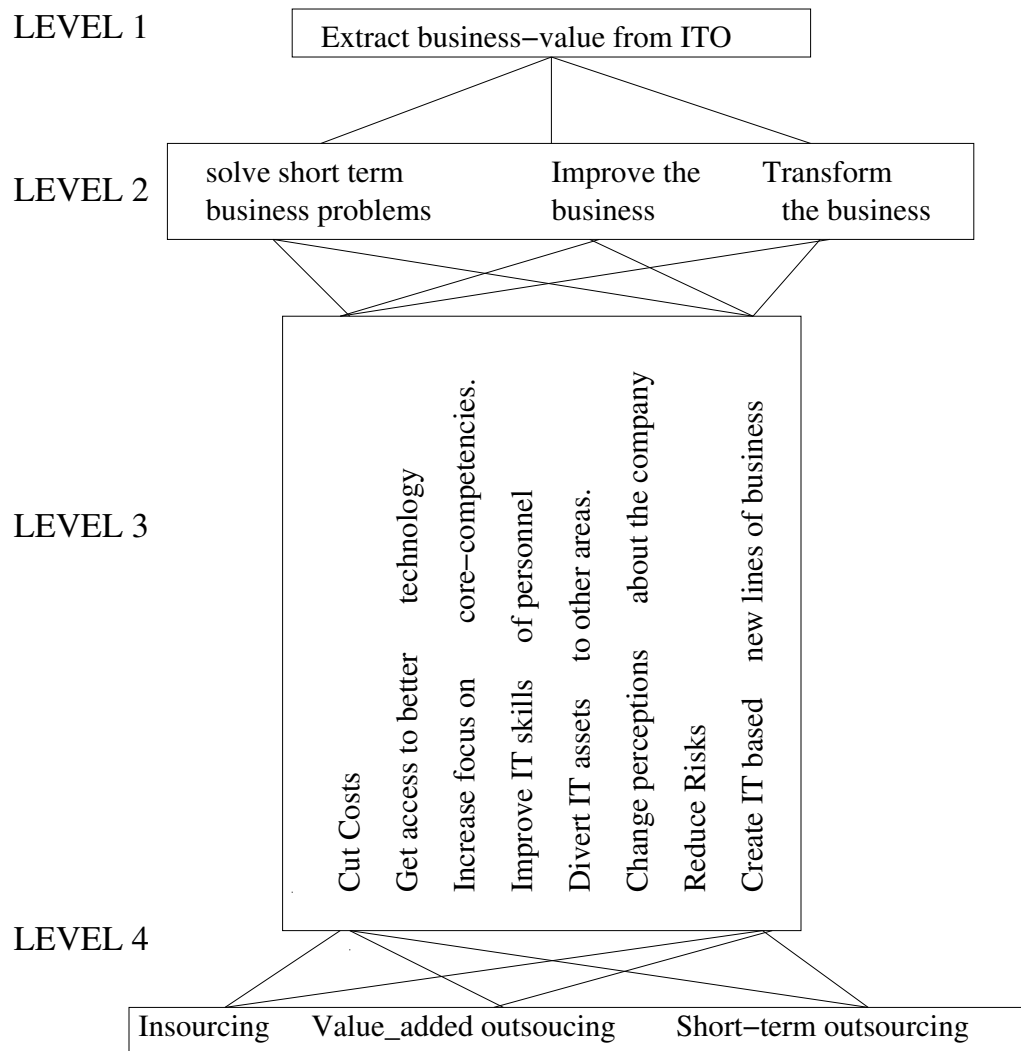


Figure 2: Decision-hierarchy for deciding the outsourcing methodology; Level 1 is focus, level 2 is objective, level 3 is activity and level 4 is outsourcing methodology.

WDM	MRP	Finance	HR
0.121	0.434	.250	.195

Table 5: Priority vector for activity choice.

Solve Short term business problem	Improve the business	Transform the business
0.243	0.640	0.117

Table 6: Priority vector for business objectives with respect to deriving business value from ITO.

ever, is next only to MRP according to the respondents. WDM is the least critical, and rightly so for an automobile firm operating in a traditional market. Moreover, WDM is seen to be the least stable activity. This number is an indicator of low-level of maturity of the website industry where new tools, methods and designs emerge on a regular basis. This function, however, is not considered very complex. On the criteria of simplicity it gets the highest score i.e. 0.446. Thus, WDM is perceived as the most simple, but most unstable and non-critical activity. In the final analysis, WDM emerges as the most suitable activity for outsourcing due the lowest priority of 0.121 in the priority vector, as shown in Table 5.

For the second part of the decision i.e. choosing the right methodology for outsourcing, WDM is chosen as the base-activity for making all the comparisons. The respondents were first asked to pairwise-compare the business objectives behind ITO i.e. what benefits the company expected to draw from outsourcing its IT functions. The aggregate response is shown in Table 6.

It is clear from the values in Table 6 that the company was interested in improving the business while outsourcing its IT activities.

After this, the respondents were asked to pairwise-compare the various courses of action open to them with respect to short-term problems, long-term improvement and complete transformation in the business. The results obtained are shown in Table 7. We dropped *the divert IT assets to other areas* action from the list of options at level 3 for this experiment. The company management was sure that the outsourcing activity was not being done to liquefy assets.

The respondents feel that business can be improved by increasing focus on core competency, getting access to better technology, enhancing customer satisfaction, improving skills of IT personnel and by improving service-

delivery levels, in that order. The short-term advantages it would like to draw are: reduction in cost and increased customer satisfaction level. For transforming the business, the main thrust is on diversification. The responses show that an established and traditional firm cannot think about radically different business paradigm. The last decision level was of comparing the various outsourcing options against the amount of contribution each can make towards a particular benefit such as cost-reduction etc. The responses are summarized in Table 8.

Outsourcing WDM to an outside company on long term basis such that it also provides the infrastructure for the website give maximum advantage to the automobile company in terms of focusing on its core-competency.

In terms of cutting costs, outsourcing on short term basis to a local provider was the clear choice. The local provider was also perceived as the most risk-free option, while a new service provider was seen as the most risky option. For improving the skills of its IT personnel, outsourcing on long term basis lagged behind value added outsourcing. Similarly, for getting access to better technology, value added outsourcing was perceived to be a better option.

After processing the data obtained by the respondents above, the priority vector obtained for the four outsourcing options is shown in Table 9.

This vector clearly shows that long term contract is the most suitable option for outsourcing the website function. It should be noted that this choice was the result of high priority of the company in improving its business rather than solving its short-term business problems.

## 4 CONCLUSION

In this work, a decision making model for Information Technology Outsourcing (ITO) was developed using the Analytic Hierarchy Process (AHP). Although AHP is a widely used method, its application in the field of ITO is rarely found in literature. The model developed was verified against an actual outsourcing decision made at a leading automobile company of India.

We would like to add that a company may hire a consultant for making a decision. Market trends may also be taken into consideration. If a similar situation is documented and the decision criteria as well as final decision is known, a company may use this information to its benefit. However, all these methods are subjective to a great extent.

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	Solve Short term business problem	Improve the business	Transform the business
-Mitigate Risks	0.060	0.055	0.151
-Enhance Customer Relations by improving service quality	0.213	0.180	0.079
-Diversify	0.085	0.027	0.264
-Improve IT skills of personnel	0.123	0.193	0.196
-Increase focus of core competencies	0.107	0.235	0.070
-Get access to better technology	0.153	0.212	0.164
-Cut costs	0.260	0.098	0.076

Table 7: Priority vectors for importance of potential benefits with respect to desired objectives.

	Insource	Value added outsourcing	Short term contract	Long term contract
-Mitigate risk	.21	.18	.48	.12
-Enhance Customer Relations by improving service quality	.28	.11	.18	.43
-Diversify	.17	.31	.29	.25
-Improve IT skills of personnel	.5	.4	.2	.38
-Increase focus on core competencies	.5	.12	.3	.52
-Get access to better technology	.4	.42	.18	.37
-Cut cost	.2	.1	.42	.27

Table 8: Relative priority of various outsourcing options with respect to potential benefits of ITO.

Insourcing	Value added outsourcing	Short term contract	Long term contract
0.142	0.242	0.264	0.370

Table 9: Final priority vector for the four outsourcing options of the company

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