Cost Estimation of Transition Projects in Application Outsourcing
An Empirical Model

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Abstract— Application outsourcing is a major IT business, with an estimated global market size of € 49 billion for 2014. In a transition project the involved parties in an application outsourcing contract need to move from a current situation to a target situation. Generally the proprietor asks the IT service provider to provide a (fixed) quotation for the application services including the transition project, without supplying extensive details about the application portfolio. In this paper the authors present a model for cost estimation of transition projects in application outsourcing.

Keywords— application outsourcing, transition, cost estimation

I. Introduction
Application outsourcing is a major IT business, with an estimated global market size of € 49 billion for 2014 [1]. In this paper application outsourcing or application services is defined as an IT service package providing (legacy) systems maintenance, application management and support, enhancement and new development for an application portfolio. This service is regularly delivered by an IT service provider to the owner of the application portfolio.

In a transition project the involved parties in an application outsourcing contract need to move from a current situation to a target situation. Before the transition project the current situation is that delivery of the application services is performed by the owner of the application portfolio herself or some other IT service provider. The target situation is that the services are provided by a new IT service provider (i.e. supplier). Generally the proprietor asks the IT service provider to provide a (fixed) quotation for the application services including the transition project, without extensive details about the application portfolio.

Each year Ordina manages the transition of dozens of application portfolios from proprietors or other service providers to an Ordina target situation. This paper proposes an empirical model for cost estimation of transition projects in application outsourcing. The model is based on the experience of Ordina project and service managers, however it is not yet validated quantitatively at this moment.

II. Outline of the proposed model
In general, a transition project contains the following work packages:
1. Defining and organizing work processes
2. Application transitioning
3. Supporting proprietor’s organisational change
4. Installation and delivery of environments
5. Installation and delivery of software licences
6. Project management

Some transition projects also include data migration or the transfer of employees from the proprietor to the IT service provider. However, these work packages are currently not included in this model.

III. Estimation parameters
According to experienced project and service managers from Ordina, three estimation parameters are key to the estimation of a transition project: size, organisational change support and experience of the transition team. Additionally, the model includes a number of parameters which are taken as input for the model.

A. Size (S)
At the bidding stage the size of the application portfolio is usually not known in detail. Since it is a critical parameter in the total estimation we developed a size measure that can be determined relatively easy, without knowing much detail, the functional module. The idea is derived from the world of packaged application development, where the number of modules to be implemented or maintained is the main driver for effort [2]. Our approach builds on one of the concepts behind the E&QFP approach, designed to establish a size range in function points in an early stage of a software realization project [3]. We used this concept because a measure that can be related to a function point size can be verified with a variety of data that may be available about the portfolio. For our size measure we used the concept of the 4th aggregation level of the...
The E&QFP approach, which is the Macro Process. At this highest level of aggregation, functional areas are identified. In practice these areas amount to a large system segment, a sub-system or even an entire small scale application. These functional areas can be identified even with very little information about the software portfolio. In the table below we give an indication of the relationship between the number of functional modules and function points. In reverse, the following table can also be used to establish the number of functional modules in the application portfolio (S), if the function point size is known.

### Table I. Application Portfolio Size

<table>
<thead>
<tr>
<th>Number of functional modules</th>
<th>Application Complexity grade</th>
<th>Function Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L</td>
<td>0 - 500</td>
</tr>
<tr>
<td>2</td>
<td>L</td>
<td>501 - 1000</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>1001 - 1500</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>1501 - 2000</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>2001 - 2500</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>2501 - 3000</td>
</tr>
<tr>
<td>7</td>
<td>H</td>
<td>3001 - 3500</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>3501 - 4000</td>
</tr>
<tr>
<td>9</td>
<td>H</td>
<td>4001 - 4500</td>
</tr>
</tbody>
</table>

In case the number of functional modules needs to be estimated based on available size information expressed in Lines of Code (LOC), then technology dependent translation tables need to be used (e.g. [4]).

**B. Organisational change support (T)**

In all transition projects there is an organisational change. This can be minimal if the transition is from an outsourcing service provider to another, but can be substantial if the transition is from the proprietor to an outsourcing services provider or vice versa. The relative amount of effort needed for organisational change at the proprietor’s side that will be carried out by the IT service provider lies in a range of 0% to 100%.

**C. Experience of the transition team (E)**

This is a combination of the degree in which the individual members of the transition team from the IT service provider has experience with this type of projects and the degree in which this experience was gained with this specific team. With COCOMO this factor can be predicted for each situation [5]. In practice this can be reduced to three possible values:

0.7 = the team has shared experience in a similar project

1.0 = the individual team members have experience in a similar project

1.5 = the team members have no experience in similar projects

Additional to the three key parameters, the model uses nine additional parameters that are taken as input for this model. For most of these additional parameters specific calculation models exist or experience data is available. Some may be situation or organization specific, others may have generally applicable ranges.

All parameters are shown in the table below:

### Table II. Model Parameters

<table>
<thead>
<tr>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
</tr>
<tr>
<td>C_p</td>
</tr>
<tr>
<td>C_a</td>
</tr>
<tr>
<td>C_c</td>
</tr>
<tr>
<td>C_e</td>
</tr>
<tr>
<td>C_i</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>C_pmu</td>
</tr>
<tr>
<td>N_t</td>
</tr>
<tr>
<td>N_s</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>T</td>
</tr>
</tbody>
</table>

### IV. Modelling the work packages

**A. Defining and organizing the work processes**

The costs of defining and organizing the work processes are strongly dependent on the experience of the project team (E), therefore:

\[ C_1 = C_p E^2 \]  \hspace{1cm} (1)

Also:

\[ 0.7 = E_{\text{min}} \leq E \leq 1.5 \]  \hspace{1cm} (2)
The strong relation between experience and costs is explained by the fact that re-use of work processes and document formats is more likely and more efficient in a team that has previously worked on a similar project. Re-use will lower the amount of work in drawing up work processes and document formats, explaining these to each other and getting agreement within the team about the way of working.

B. Application transitioning

This work package mainly depends on the size of the application portfolio (S). Furthermore, there is a complex relation with project team experience (E). An unexperienced team will perform less efficiently early in the project, but the difference with an experienced team will grow smaller when the project progresses. This means the impact of project team experience (E) decreases with an increasing application portfolio size (S). Therefore:

\[ C_2 = C_{a2}E_sS \]  

(3) with an efficiency factor \( E_s \) and with a given application portfolio size \( S \):

\[ E_s = E_{\text{min}} + \frac{E - E_{\text{min}}}{\sqrt{S}} \]  

(4) With \( E_{\text{min}} = 0.7 \).

Fig. 1. Efficiency factor given application portfolio size

This model assumes that the cost for this work package does not depend on the difference between tailor-made software and (commercial) off the shelf software (COTS).

C. Supporting proprietor’s organisational change

The proprietor’s organisation needs to be able to work according to new processes for interfacing with the IT service provider, e.g. placing support calls or planning new software releases. This organisational change is ideally carried out by the proprietor itself. When the IT service provider is asked to support the proprietor in executing this part of the transition project, however, the extent to which the IT service provider executes organisational change should be established. The costs of this supporting role are dependent on the experience of the project team (E) and the extent to which the IT service provider needs to carry out the proprietor’s internal change project.

\[ C_3 = C_{a3}TE \]  

(5) The extent to which the IT service provider needs to carry out the proprietor’s internal change project is expressed as a value \( T \) between 0 (no support needed) and 1 (IT service provider supports / carries out every aspect of the proprietor’s organisational change).

\[ 0 \% \leq T \leq 100\% \]  

(6) D. Installation and delivery of the environments

The cost for installation and delivery of the environments for development, test, acceptance and production (DTAP) are determined by the number of technologies used in the application portfolio and the number of servers needed in the production environment.

\[ C_5 = C_{a5}(N_t + N_s) \]  

(7) where \( N_t \) is the number of technologies used in the application portfolio and \( N_s \) is the number of servers on which the application portfolio is running. This paper does not provide a model for these estimating these parameters; these should be provided by IT infrastructure consultants.

E. Installation and delivery of the licences

The costs of the delivery of the software licenses are completely determined by the purchasing costs of these licences by the IT service provider. Installation of the licences requires some effort that depends on the number of technologies used in the application portfolio.

\[ C_8 = C_{a8}N_t + L \]  

(8) \( \text{L should be determined by using the actual price lists of the software supplier.} \)

F. Total cost of the transition project and project management

The total direct costs of the transition project are therefore:

\[ C_{dt} = \sum_{i=1}^{5} C_i \]  

(9) For project management a percentage of the direct costs of the transition project is estimated. More advanced models for project management effort are available (e.g. [7]), however this is not the main focus of this paper. Therefore the total cost of a transition project is estimated with:

\[ C_{\text{total}} = C_{dt}(1 + C_{pm}) \]  

(10)
V. Discussion

In this paper a model is presented for estimating the cost of a transition project for application outsourcing. Both IT service providers and the proprietors of software portfolios could greatly benefit from such a model to make transition project costs more predictable and transparent. However, this model needs to be developed further. The constant parameters need to be fitted on sufficient data from transition projects from various application outsourcing providers to determine a generally accepted quantitative range for each of the parameters. We have not yet been able to quantitatively validate the model, due to a statistically insignificant number of measurements.

Also, adding a model for cost estimating of data migration and employee transfer would be beneficial in making this model the basis for making transition project cost comparable, predictable and transparent.

Note that this paper does not provide a model for estimating the application outsourcing itself, but only the transition from one party (either the proprietor or an external IT service provider) to another IT service provider [6]. It has not been tested in retransition projects. It could possibly be used as well in a situation where application maintenance and related services are moved from one team to another within the same organization, although Ordina does not have experience with such transitions.

In our observations non-functional requirements do not play a role in this model. This is probably due to the fact that the effort needed for a transition is mainly about knowledge transfer. The amount of knowledge that needs to be transferred appears to be predominantly dependent on the functional size of the application portfolio and appears to be independent from various non-functional requirements.

About Ordina

Ordina is the largest independent services provider in the field of consulting, solutions and IT in the Benelux region. We focus on companies and organisation in financial services, the public sector, healthcare and industry.

As the designers, builders and managers of a better digital world, Ordina has the expertise to improve corporate processes and IT in a sustainable fashion. And this is what we and our 2,900 employees work to achieve on a daily basis. Our strength lies in our ability to translate strategy and policy into our clients' operating processes, thanks to our knowledge of their organisations, markets and local regulations and legislation. We want to realise sustainable innovation in partnership with our clients.

References

[4] QSM, Function Point Languages Table, version 5.0 www.qsm.com/resources/function-point-languages-table
Appendix 1: Example

Without data this model appears to be very abstract. As stated in the main article our quantitative data is statistically insignificant. Therefore we did not include quantitative ranges to the parameters in the article. To illustrate the working of the model we have added an example with fictitious numbers.

An IT service provider receives a Request for Proposal for application outsourcing. The proprietor currently carries out its software maintenance, support and user herself. In the RfQ document is stated that the application portfolio consists of 80 applications, of which 40% of low complexity, 50% of medium complexity and 10% of a high complexity. The proprietor expects full assistance of the IT service provider in the organizational transformation of 2 out of 6 internal processes that are involved in this application outsourcing deal.

Based on the situation and additional information received from the proprietor the nine additional parameters are estimated to have the following values:

<table>
<thead>
<tr>
<th>Parm</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_p$</td>
<td>€ 12,000</td>
</tr>
<tr>
<td>$C_a$</td>
<td>€ 4,500</td>
</tr>
<tr>
<td>$C_e$</td>
<td>€ 9,500</td>
</tr>
<tr>
<td>$C_c$</td>
<td>€ 9,500</td>
</tr>
<tr>
<td>$C_l$</td>
<td>245</td>
</tr>
<tr>
<td>$C_{pm}$</td>
<td>0,17</td>
</tr>
<tr>
<td>$N_t$</td>
<td>4</td>
</tr>
<tr>
<td>$N_s$</td>
<td>175</td>
</tr>
<tr>
<td>$L$</td>
<td>€ 250,000</td>
</tr>
</tbody>
</table>

The main parameters for this transition project are also determined:

**Size:**
- 40% * 80 applications * 2 modules (L) = 64 modules
- 50% * 80 applications * 5 modules (M) = 200 modules
- 10% * 80 applications * 8 modules (H) = 64 modules

$S = 64 + 200 + 64 = 328$ modules

**Organisational change support:**
- 2 out of 6 processes need full support $T = 0.33$

**Experience of the transition team:**
- One of the most experienced transition teams is fully available for this transition $E = 0.7$

**Transition cost**

With all the parameters known the transition cost can now be determined.

- $C_1 = 12,000 * 0,7^2 = € 5,880,=\quad \
- C_2 = 4,500 * 0,7 * 328 = € 1,033,200,=\quad \
- C_3 = 57,000 * 0,33 * 0,7 = € 13,167,=\quad \
- C_4 = 980 * 4 + 980 * 175 = € 175,420,=\quad \
- C_5 = 245 * 4 + 250,000 = € 250,980,=\quad \
- C_6 = € 1,478,647=\quad \
- C_{\text{total}} = 1,478,647 * (1 + 0,17) = € 1,730,014,=\quad \

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