THE "RIGHT-SOURCING" OR THE CORRECT BALANCE BETWEEN IN-HOUSE ACTIVITY AND THE PURCHASE OF EXTERNAL SERVICES*

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Abstract

During the last few years, and more particularly to face the LHC construction, the development of several large scale control systems have been externalized at CERN. This concerns various domains such as application software development, system maintenance as well as turn-key control systems.

Among other motivations, this tactical approach was seen as a way to cope with the staff reduction. The outsourcing success of IT activities resides in the mastering of a complex process that includes amongst other specification, purchasing, negotiation, contract management skills on top of advanced technical knowledge. The perception of the success of outsourcing differs also from one stakeholder to another.

From this experience and the survey of current practice in industry, this paper analyses various parameters that should be considered to find the correct balance between in-house activity and the purchase of external services.

INTRODUCTION

Information Technology (IT) outsourcing is usually defined [1] as: "the practice of transferring IT assets, leases, staff and management responsibility for delivery of services from internal IT functions to third-party vendors." At the beginning of the 1990s, outsourcing service providers were advertising outsourcing as a way to reduce IT costs. Early studies however showed that cost saving was not always achievable [2]. A subsequence study even demonstrates that similar cost saving could be achieved by in-house staff providing they are given the same possibilities to impose working practices on their users [3].

The benefits and problems of outsourcing and insourcing have been studied extensively during the last 10 years with somehow contradicting results. The real motivation has been questioned. A key study investigating in details 61 IT outsourcing decisions has been published in the MIS Quarterly [4]. The results of the study are summarized in Table 1 and Table 2.

Table 1: IT outsourcing benefits

Benefits
Cost reduction
Refocus of in-house staff
Improved IT flexibility
Improve quality
Access to scarce IT skills
Improved business flexibility
Better management control
Access to new IT
Assist cash flow problems.

According to the statistics provided in [4], the expected cost savings were actually achieved in only 40% of the cases. Other studies have shown that the 'perception' of success can indeed be quite different form one stakeholder to the other.

Table 2: IT outsourcing problems

	Problems
Strategic	lack of business understanding
Cost	cost escalation
Management	loss of control, poor staffing
Operational	poor SLA, deteriorating service
Technical	failure to upgrade IT

STUDY AT CERN

CERN has now more than 10 years of experience in IT outsourcing. Current contracts cover the maintenance and the development of control systems in areas such as cryogenic control, safety alarm monitoring, radiation monitoring, power distribution, cooling and ventilation and interlock systems.

In this study, we have investigated eight outsourcing initiatives in the area of control system development and maintenance. The list of outsourcing deals is provided in Table 3 together with an estimate of their cost. The projects and contracts are at a different stage of their development and are related to the global CERN technical infrastructure, the SPS or the LHC.

Table 3: List of the outsourcing deals

Project Description	Cost (MCHF)
CERN Safety Alarm Monitoring	5
SPS/LHC cooling & ventilation Controls	5
Software Support for Industrial Controls	5
Electrical Network Supervisor	5
SPS Power Converter Control Interlock	0.75
SPS Software Interlock System	0.25
LHC cryogenic Control System	10
LHC Radiation Monitoring System	6

Using a standard questionnaire, we have conducted interviews with representatives of CERN management, project leaders, in-house developers and contractors.

The interview aimed at identifying the motivations of the people involved in the outsourcing exercise as well as the perceived motivations of other stakeholders. The outcome of the outsourcing contracts was also assessed in terms of problems, perceived costs and benefits. In addition, people were asked to compare the expected benefits with the realized benefits. The time constraints did not allow us to interview every important stakeholder for each project or contract. We believe however that the

results are truly representative of the reality.

RESULTS

The evaluated motivations for outsourcing are summarized in Table 4. There is a clear consensus that the lack of human resource was the main determinant. Other motivations are directly related to the interests of the stakeholders: resource usage for managers, interesting technical and managerial experience for project leaders and the possibility to concentrate on interesting activities for in-house developers, by delegating maintenance to the service supplier. The opportunities to bring in ideas and expertise were also attractive to managers and project managers. The contractors' opinion on CERN's outsourcing motivation is somewhat simplified. They interpret outsourcing as a means for CERN to obtain documented projects on time, within budget and with clear roles and responsibilities.

Table 4: Motivation of the various stakeholders

	Motivation
Management	Cope with the lack of human resources Personnel budget constraints Bring in new ideas
Project leaders	Cope with the lack of human resources Gain experience in the design of professional contracts and specifications Gain experience in contract management Learn from industry practices Brake contractor monopoly
In-house developers	Reduce maintenance work and concentrate on new developments Cope with the lack of human resources
Contractors	Transfer responsibility to obtain specified results Transfer risk Access to technical skills Cope with the lack of human resources

The summary of the identified problems is provided in Table 5. The difference between the culture of the contractor, perceived by CERN as profit-oriented, and the culture of CERN, perceived by the contractor as non-realistic in terms of real costs, was mentioned as a significant problem. The project leaders were more satisfied with the experience than the in-house developers. Project leaders have, however, been sometime disappointed by a lower than expected professionalism from the contractors. In one case, the contract pricing mechanisms were found to be unsuitable and therefore became a major source of problems.

In-house developers complained more about the lack of flexibility and sometimes the inadequacy of the contract to their needs. The lack of experience and internal support for the elaboration of the specifications and the contract strategy has been mentioned by both the project managers and the in-house developers.

The motivation of the contractor's personnel for maintenance has been mentioned as a problem by both the contractors and the in-house developers. As opposed to many organizations heavily relying on outsourcing and retaining little in-house technical competence in the outsourced area, CERN continues to have much in-house expertise leading sometimes to "technical competition" between CERN staff and the contractors' staff.

Table 5: Problems experienced by the stakeholders

	Problems
Project leaders	Lack of initiative of the contractor Technical skills lower than expected Unsuitable pricing model Profit orientation of the contractor Poor documentation
In-house developers	Too much paper work Lack of reactivity Lack of in-house training for contract specification and management Little flexibility to change requirements Lack of interest by the contractor's staff for maintenance work Contract not suitable for small work Profit orientation of the contractor
Contractors	Incomplete, unstable specifications Technical choices imposed by CERN Problems between consortium members Non-profit CERN culture Technical competition Fear from CERN staff to loose technical, financial control & knowledge Lack of understanding by CERN staff of the real cost (indirect costs, investment) Difficulties to motivate their personnel for maintenance tasks (only)

The outsourcing efficiency is usually assessed in terms of costs. These costs are not limited to the price of the contract, they also include the so-called "transaction costs" that is the cost of specification, tendering and the costs of managing and controlling the contract. The general cost distribution, as assessed by the interviewees is presented in Table 6. The ratios transaction costs / development costs can be excessive for small projects, when major problems are experienced, or when the contract is elaborated by non-experienced staff.

Table 6: Estimated cost structure

Transaction costs (%)		
Specification & tender	Contract management, development follow-up	Development (%)
10 – 30	10 - 20	60 – 80

The perceived cost compared to in-house solutions is much more controversial. Cost evaluations made by the stakeholders are clearly highly subjective. The contractors management admits that cost was not the main issue.

On the other hand, the in-house developers are convinced that the outsourced solutions are much more

expensive whereas most of the project managers believed that their projects were (highly) cost-effective. It must however be noted, that the interviewed persons were not evaluating the same projects. The benefits expected at the outset of the various outsourcing deals are presented in Table 7. The realized benefits are documented in Table 8.

Table 7: Expected benefits

	Expected benefits
Management	Quality Predictable costs & delays
Project leaders	Quality Predictable costs & delays Benefit from industrial experience Transfer responsibility for result Documentation Knowledge transfer to CERN staff Highly reliable software
In-house developers	Documentation Concentrate on developments
Contractors	Predictable costs & delays Documentation Single responsible (in case of problem)

Documentation and quality were the mains benefits put forward by most of the stakeholders. The management and the project managers were clearly concerned by the possibility to have predictable results. This was understood by the contractors. The acquired industrial skills were also one of the main benefits expected by the projects leaders. These benefits have globally been obtained. One project however experienced major problems and delays.

Table 8: Realized benefits

Realized benefits (Estimation in % of the cases)	
Documentation	60%
Quality	60%
Predictable costs	80%
Predictable delays	80%
Benefit from industrial experience	80%
Transfer responsibility for result	80%
Concentrate on development	100%
Knowledge transfer to CERN	100%
Highly reliable product	100%

Better results are achieved when the specifications are clear and stable and when interesting developments are transferred to the contractors. Outsourcing solutions are inherently less flexible and potentially expensive when the requirements are not stable. Outsourcing the maintenance is more delicate. Table 9 summarizes the sourcing parameters that have been discussed in this paper.

Finally, it is worth noting that outsourcing has developed at CERN without really developing the specific skills required.

Table 9: Sourcing parameters

	IN	**OUT**
Project characteristics	High level of in-house expertise Maintenance	Well specified Market exist Development
Flexibility	High	Low
Size	Small	Medium, Large

CONCLUSIONS

The lack of human resource has been the main outsourcing determinant for CERN outsourcing. Unlike many organizations, CERN does not transfer its personnel to the contractor and cash infusion (by transferring asset to the contractor) is not an objective. Exactly as other organizations, CERN has experienced many problems in contracting out projects and maintenance and we were not able demonstrate clear cost savings. This study also clearly shows that the motivation and the perceived outcome of outsourcing vary with the stakeholders.

In-house developments have clear advantages mainly in terms of flexibility, reactivity and motivation of CERN staff. There are also real benefits for outsourcing. CERN has experienced some very successful projects. Such projects are interesting and challenging for the project leaders. The coexistence of outsourced and in-house projects can be beneficial even if (or because) it creates though "competition" between CERN staff and the contractors' staff.

Outsourcing requires specific knowledge and expertise in various areas such as: purchasing, negotiation skills, ability to elaborate contract strategies and to specify a system or a service as well as a good technical background. It also requires effective collaboration with IT specialists, purchasing officers and managers. This calls for specific support and the sharing of experiences.

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