Index

North Sea FLOW Measurement Workshop

Paper 5.1

Allocation Computer Systems – Considerations for Vendors and Customers

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1 INTRODUCTION

Hydrocarbon allocation is a crucial activity for all operators and owners of oil and gas fields and production facilities. Allocation computer systems are used to automate the process and make it more accurate, timely and efficient. As the North Sea has matured, the demands placed on allocation systems have increased, firstly because shared infrastructure projects have become more common, necessitating commercial allocation of commingled fluids, and secondly because the emphasis on improving recovery requires accurate and timely reporting of production.

The authors have been developing and supporting allocation systems in the North Sea for the past ten years, and in that time have encountered certain common themes: that quantifying and achieving real business value is an elusive goal, that implementation projects are particularly prone to go awry, and that outcomes often vary significantly from what was anticipated.

However, while these appear to be common themes, analysis of the underlying causes is often based on subjective assessments and anecdotal evidence. There is a tendency to make general assumptions based on isolated experiences. When these assumptions and conclusions feed back into planning and procurement decisions for new projects, there is a risk that such decisions will be influenced too much by supposition and too little by hard facts.

Furthermore, the outcomes of allocation system projects are often not studied in detail. In advance of a project, here is a powerful incentive for both the customer and the vendor to define the expected benefits. Once a project is complete, however, the incentive to reflect on and quantify the *actual* benefits is much weaker. Yet that is exactly when the lessons can be learnt.

In an attempt to make an objective assessment of the success of allocation system projects, the authors conducted a study of recently completed projects. The study aimed to find answers to two key questions:

- How successfully do allocation systems achieve their objectives?
- What are the main factors that influence the success of such projects?

The definition and measurement of success in relation to IT systems is a subject of some debate in the academic literature (DeLone and McLean, 2003 [3]). Our approach was a simple qualitiative assessment of whether the business objectives, as stated in the business case or project sanction, were achieved.

1.1 Information Value-Chain

The context of allocation systems and their relationship to flow measurement can be understood in terms of an information value-chain, as represented in figure 1.

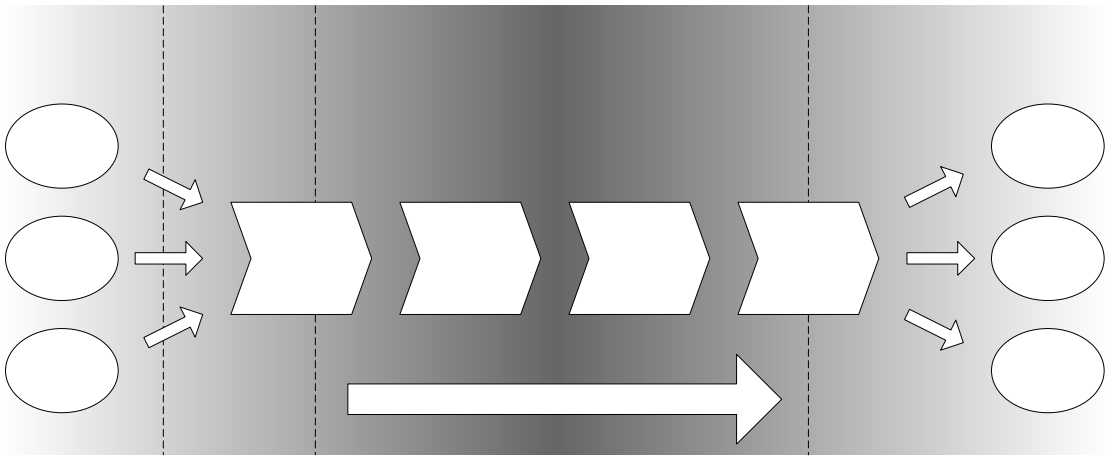

Fig. 1 – Information Value-Chain

In this model, information from flow metering systems feeds in at the start of the chain, and value is added incrementally as the information is processed in stages. At the end of the chain, high-value information is delivered to end users. For a typical allocation system, the processes in the chain include:

- Gathering data from multiple sources into a single database;
- Verifying data for completeness and correctness;
- Controlling changes to data due to mismeasurements and errors;
- Carrying out calculations to allocate measured flows to wells and fields (physical allocation);
- Applying commercial rules to attribute flows and stocks to owners, buyers and other parties (commercial allocation or attribution);
- Aggregating data for multiple assets and time periods;
- Presenting information to end-users and to other systems in the value-chain.

The information produced by this value-chain is used to generate reports for government (e.g. PPRS returns), allocation statements for joint venture partners, tariffs and invoices for shared-infrastructure users, and reserves statements.

Through consideration of this model, allocation systems can be defined as systems that convert flow measurements into definitive statements of production.

2 METHOD

In order to address the key questions posed above, a survey was made of recently completed allocation system projects. The survey focused on medium and large scale projects completed in the last three years which implemented new systems for North Sea assets. This type of project was of most interest because it involves significant choice in terms of product selection and implementation approach, and also carries significant risk. Data was gathered through questionnaires and structured interviews with project managers, sponsors and other personnel involved in implementing the projects. Participants gave information on the understanding that individuals, companies and projects would not be identified in this paper.

Data was gathered on the following aspects of the projects:

- Categorisation of project according to size, functional and asset coverage, type of solution and implementation method;
- Assessment of project performance against budget and timescales;
- Identification of details of the business case;

- Assessment of outcomes against the business case;
- Assessment of the impact of project management issues;
- Assessment of the impact of IT issues.

The sample included 16 projects, with an average budget of £820k. All the projects implemented solutions supplied by external software vendors (no in-house developments were included in the study). In all cases, there was a significant element of bespoke configuration, customisation and development to meet the customer's requirements.

Categorisation of projects by functional area is shown in figure 2, and by asset type in figure 3. These show the number of projects that implemented functionality in each category and for each type of asset. In all cases, a single project covered multiple functional areas and multiple asset types.

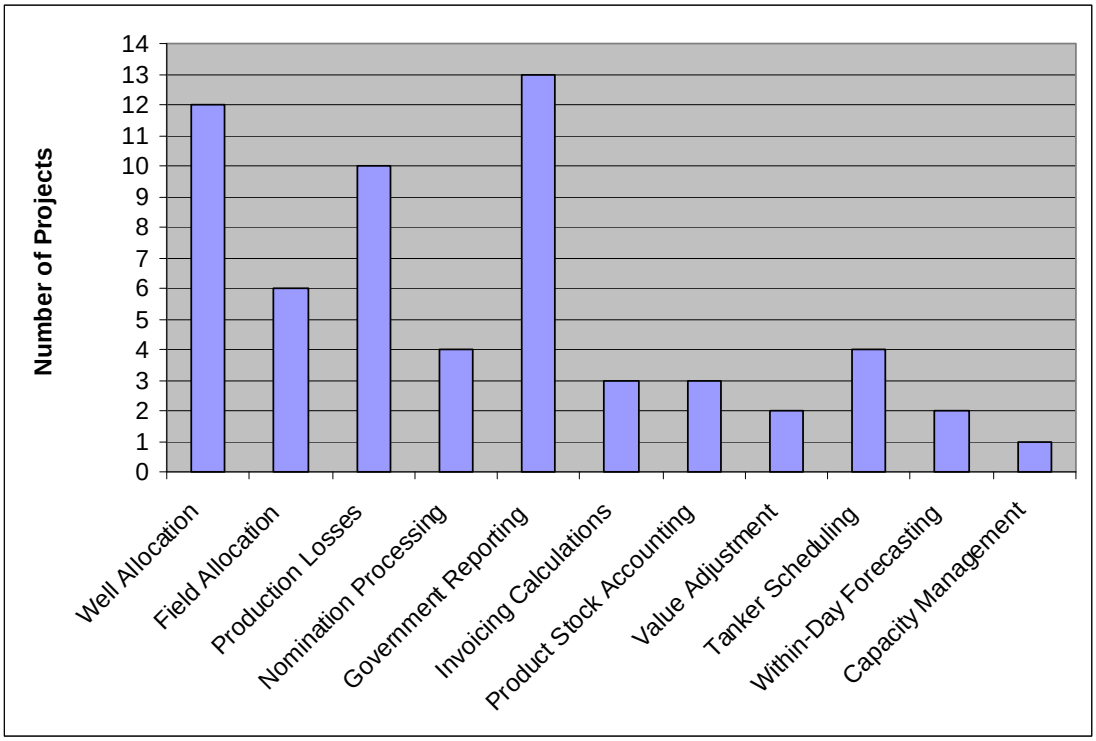

Fig. 2 – Categorisation of Projects by Functional Area

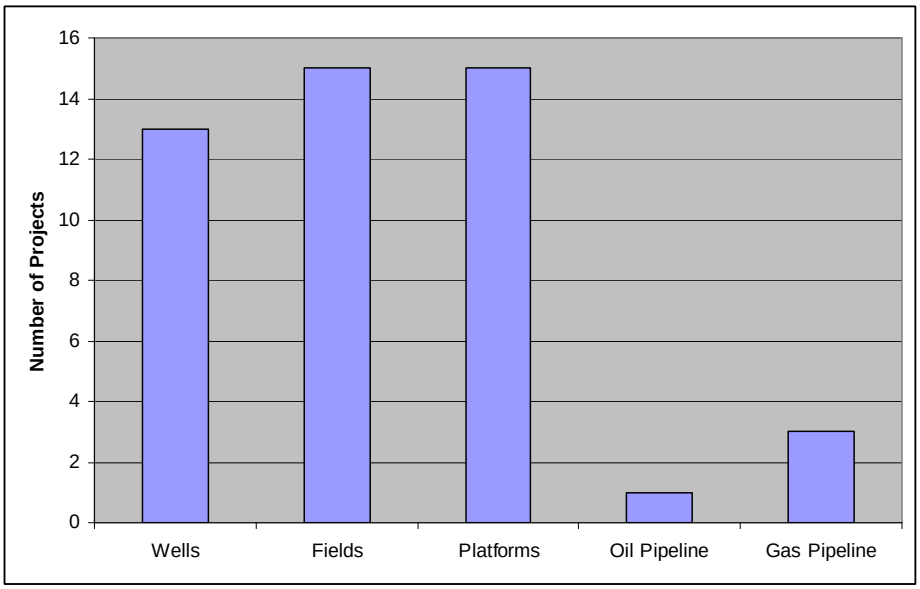

Fig. 3 – Categorisation of Projects by Asset Type

Analysis of the results was largely qualitative, as the sample was too small and varied for detailed statistical analysis. Quantitative analysis was performed where the availability of consistent numerical results made it possible.

3 ANALYSIS AND RESULTS

3.1 Achievement of Business Objectives

Business objectives were identified through reference to the business case, or where there was no documented business case available, the project sanction as understood by the study participant. We rationalised these into seven generic objectives (see table 1). We applied a grading of high, medium and low to the level of success for each objective, which combined the participants' assessment for each project with the number of projects for which that objective was achieved.

Overall, participants reported a high level of achievement of objectives. Few business case objectives were perceived not to be satisfactorily achieved. This observation should be considered in light of the fact that – almost exclusively – those surveyed had management responsibility for the projects in question.

Table 1 contains a summary of these results.

Table 1 – Summary of Achievement of Business Objectives

Objective	High	Medium	Low
Act as the definitive source of finalised production data	●		
Enforce standard business processes		●	
Control changes to data and provide traceability		●	
Implement well-defined and repeatable calculations	●		
Reduce/minimise cost of business process			●
Enable flexibility in the process		●	
Reduce exposure to business and financial risk		●	

The objectives with the highest level of success related to establishing the system as the definitive source of finalised production data, and implementing well-defined and repeatable calculations.

Those objectives rated as medium were generally achieved satisfactorily, but were assessed as less successful.

The objective that was least commonly achieved was cost reduction/minimisation. Relatively few projects included this objective in the business case. In those that did none succeeded in achieving the desired savings.

A significant issue concerning the business cases in the survey was the paucity of quantitative analysis. There was very little financial detail in any of the objectives, and very little attempt to quantify benefits in any rigorous way. Justification for projects was often based on necessity, or on vaguely defined business benefits.

3.2 Performance against Budget and Schedule

Participants were questioned on actual spend versus budget and actual duration versus schedule. Table 2 contains a summary of the performance of the projects against budget, and table 3 contains a summary of the performance against schedule.

Table 2 – Summary of Performance against Budget

Metric	
Number of projects surveyed	16
Number of projects under budget	1
Number of projects on budget	2
Number of projects over budget	13
Average (mean) budget	£820k
Average (mean) actual spend	£948k
Average (mean) percentage overspend	19%
Number with > 50% overspend	2

Table 3 – Summary of Performance against Schedule

Metric	
Number of projects surveyed	16
Number of projects under schedule	0
Number of projects on schedule	5
Number of projects over schedule	11
Average (mean) planned duration	8 months
Average (mean) actual duration	12 months
Average (mean) percentage overrun	35%
Number with > 50% overrun	3

The following factors were observed:

- A high proportion of projects overspent (81%) and overran (69%), while only one project reported an underspend and no projects were finished ahead of schedule.

- However, in most cases the overspend/overrun was relatively minor. Only two projects overspent by more than 50%, and three overran by more than this.
- The performance against schedule was, on average, worse than the performance against budget. There were two reasons for this: firstly there were a number of projects where progress slowed due to lack of available resource or rescheduling of work; secondly some fixed-price projects overran, but the increased costs to the vendor were not fully passed on.

3.3 Key Issues

The key issues affecting project outcome were identified through open questioning of the study participants, and assessed according to the participants' judgement. Project management and IT software issues were assessed separately. Across all the projects studied, the most commonly identified key issues were:

- Availability of suitable resources. Specifically: the lack of available staff among the project team who had sufficient business area knowledge; and the loss of staff with specialist knowledge part-way through a project. There was a very strong correlation between the overall success of the project and the reporting of resource availability as a key issue.

  This result is in line with previous studies into the factors affecting IT development projects generally, in which people issues have been shown to have more impact than any other factor, and productivity of individuals with similar levels of experience has been shown to vary by a ratio of at least 10 to 1 (McConnell p12 [2]).

- Implementation of project management processes. This issue is widely recognised as being important in preventing budget and schedule overrun and balancing the schedule/cost/scope trade-off. The worst performing projects in the study reported lack of good project management as a key issue.

- Contractual framework. This was an issue for fixed price projects that experienced cost and schedule overruns. In these cases, the contractual framework gave rise to a number of project management issues, including: a disincentive to consider any changes to requirements, even where they would bring clear business benefit; and an excessive amount of management time and effort spent on dealing with scope and contract issues, to the detriment of other aspects of the project. In the worst cases, these issues dominated management time.

One noteworthy finding was the fact that software product issues were not identified as key to project outcome in a negative sense for any project. Some relatively minor issues were reported, such as difficulties in integrating different software systems, and poor ease-of-use of certain products. However, fit between product functionality and business requirements was only reported in a positive light, as was the capacity to configure and customise products to match requirements. Where difficulties were experienced in delivering functionality, the ability of project staff to understand business requirements was a much more important factor contributing to the problem than the capabilities of the software.

4 CONCLUSIONS

The study described in this paper was a small, qualitative study focused on a highly specific area. There are limitations on the range and accuracy of conclusions that can be drawn from this type of study. However, as described in the previous section, a number of clear results emerged. In view of these results, what are the main considerations for vendors and customers involved in allocation system projects?

Firstly, while most projects overspend their budget and overrun their schedule, few get out of control. This would indicate that the view that this type of project is especially prone to becoming a disaster is an exaggeration.

Secondly, most business objectives are reported as being successfully achieved. However, it is apparent that certain objectives are more likely to be achieved than others. Establishing the allocation system as the definitive source of finalised production data, and implementing well-defined and repeatable calculations, are objectives with a relatively high chance of success. Achieving cost reductions through implementation of an allocation system is less likely. Also, most business objectives are not defined quantitatively, and therefore the level of success in achieving them cannot be assessed accurately.

Generally there is a lack of rigour in identifying benefits, and a lack of emphasis on achieving value from the investment. A common justification for projects is a simple one of necessity: the system is necessary for the business to function. The budget is then made up according to the cost of the preferred solution, and justified as being small in relation to the value of the business it enables. More rigorous analysis of value is often not carried out for this type of project.

Strong project sponsorship is key to successfully achieving business benefits. It can be of enormous assistance in driving standardisation and controlling complexity. A good project sponsor provides a high-level view which separates the important issues from the nice-to-haves. This can help to keep things simple and keep issues such as failures during acceptance testing in perspective. Without that kind of commitment, a project has to perform at a very high (perhaps unrealistically high) standard to build confidence.

Thirdly, the choice of contractual framework should be carefully considered, as it can have a powerful effect on the project outcome. A fixed price contract places a heavy burden on the requirements specification and on the vendor's estimates and project management practices. If the scope changes significantly, or if the contractor has difficulty in delivering against estimates, the management of the contract may become a major issue, often to the general detriment of the project. To the customer, the commonly accepted advantage of a fixed price contract is that it places the risk on the supplier. Theoretically, this makes the supplier less likely to take technical risks, and should prevent cost escalation. This orthodoxy presupposes certain behaviours on the part of the vendor and the customer. Vendors, for example, should track productivity, re-estimate frequently, and manage scope carefully. Customers should accept that they are ceding a degree of control over project resourcing, task prioritisation and eventual functionality. On both the vendor and the customer side, that presupposal is not always borne out and, consequently, this contractual model does not always provide the desired effect.

Finally, resource issues are a highly important factor in project success. The work required to implement an allocation system, and the nature of allocation itself, require specialist skills. The availability of resources with these skills is likely to determine the quality of the solution that is implemented.

Often, product selection is seen as the most important factor when initiating an allocation system project. It is common to spend many months and even years considering the suitability of available products and matching features to requirements in order to select the most appropriate software. In comparison, relatively little effort may be spent on selecting appropriate resources to carry out the implementation work. The fact that resource issues were identified, after project completion, as an important factor in project success indicates that these priorities should be carefully considered.

Problems with lack of suitable resources may not be immediately apparent on a project. An individual who lacks the capability to carry out a role effectively may still be self-confident and may spend a considerable time on the project before problems with productivity or quality are brought to the attention of management. Effective quality controls and decisive management are required to deal with such a situation.

The factors influencing success in IT projects have been widely considered and documented, for example by McConnell [2], Kuang et al [3], and in the Capability Maturity Model [1]. However, these refer to IT projects generally. Allocation systems differ from a typical IT application in the following ways, and therefore require special consideration.

- There can be a wide variation in requirements between different allocation systems, even for different assets within the same organisation. This is due to the widely differing configuration of assets and supporting systems, and particularly the detail of commercial agreements. Despite some efforts to standardise these areas, variation remains and has a major effect on the amount of bespoke configuration and customisation required to implement allocation systems. All the solutions in our study required a significant amount of work by system specialists to enable them to implement the business requirements.
- The esoteric nature of hydrocarbon allocation means there is a relatively small pool of IT resources with detailed knowledge of the area. Compared with business areas such as HR or logistics, allocation is more specialised and much less widely understood. The relatively small number of allocation system projects taking place, combined with the long time period required for IT resources to gain a good understanding of the business area, mean that this pool remains small.
- Allocation systems themselves tend to be complex, being based on large numbers of data points that can be difficult to distinguish between, and often involving extensive and complex calculations. This makes the software development and testing phases particularly prone to error

The successful implementation of an allocation system is undoubtedly a challenge. As with all IT projects, there is a risk of overrun and failure to achieve business objectives. The unique features of allocation systems call for careful consideration of the issues by both vendors and customers.

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