

PROBLEMS AND NEEDS OF PROJECT MANAGEMENT IN THE PROCESS AND OTHER INDUSTRIES

R. HUSSAIN¹ and S. WEARNE^{2,*}

¹Siemens AG, Power, Transmission and Distribution Department, Erlangen, Germany

²Centre for Research into the Management of Projects, University of Manchester, UK

This paper reviews the greatest problems of project management as stated by people employed in the process and other industries in Western Europe. Their statements indicate that the greatest problems are in organization, time and resourcing projects. By contrast, risk, quality and safety are not stated to be major problems. There are only relatively small differences in these results between the process industries and other industries, and between different types of employer. There are also only small differences in the greatest problems of large compared to small projects, and the problems do not appear to change over time. The data indicates that many of the problems could be reduced or eradicated. The data also confirms what should be the core topics for the assessment and training of project managers.

Keywords: project management; problems; size of project; sector of industry; type of employer.

INTRODUCTION

Over the past fifty years the process industries together with construction and defence have been leaders in developing practice in project management (Cooke-Davies and Arzymanow, 2003). The driving forces have been the growth in the scale, complexity and financial risks of capital projects, problems of delivery, quality and cost, and greater competition and regulation. As a result, companies have defined procedures for managing projects, and many books, journals, standards, case studies, courses and professional associations now offer guidance on how projects should be managed (APM, 2004), as indeed also on corporate planning, marketing and management in general.

Despite this, projects of all sorts continue to suffer problems of achieving their promised delivery, quality and cost (Cooke-Davies, 2002; Flyvbjerg *et al.*, 2003; Standish Group, 2004). These problems lead to several questions of practical importance:

- (1) What are the greatest problems and thus the priorities for actions to improve project management?
- (2) Are the problems different between industries or between types of employers?
- (3) Do the problems change over time?

Answers to these three questions are now explored using data from people employed in the process industries, manufacturing, construction, services and utilities.

*Correspondence to: Professor S. Wearne.
E-mail: stephen.wearne@manchester.ac.uk

DATA COLLECTION

The data was obtained by questioning individual 'delegates' who were registered to attend continuing professional development and post-graduate project management programmes run by various training and university organizations between 1991 and 2004. In a short questionnaire sent to them in advance of a course each individual was asked to write down what he or she considered was the greatest problem of project management, and also what is the cause of the problem and whether the problem is common to projects large and small. A total of 1063 answered the questionnaire. The objective of asking them to state what they considered were the greatest problems of project management was to guide the course leaders and speakers on adapting their programmes for each course to the interests of the delegates attending it. Their responses to these questions over the 14 years have provided the opportunity to review the statements of the problems, look for trends in these over time and for differences between the responses of those in the process industries and those from other sectors. The delegates were in employment by project owners, suppliers, contractors, consultants and other advisory organisations in Western Europe. They were mature people, not inexperienced students. Their job titles varied greatly, and though titles are an unreliable guide, they indicate that most worked in technical, commercial and middle management roles for projects.

The delegates were not a random sample of people in these roles. They had been given time and other support by their employers to attend courses. They are therefore likely to represent their able and more promising

employees and so be knowledgeable and constructive guides to the problems in their work. Nevertheless, in management research it is recognized that the information that people provide through questionnaires or interviews may be consciously or subconsciously affected by self-interest in their employment and by their assumptions about a researcher's motives. The delegates were providing information solely to help course leaders make the best use of their own time. We therefore expected valid and reliable information from them, but as in all such research the methods used to obtain information should be borne in mind when studying the results.

THE STATEMENTS OF THE GREATEST PROBLEM OF PROJECT MANAGEMENT

The delegates' statements covered a wide range of 'problems'. These included for instance delay and over-spending which are often discussed as potential causes of criticism, embarrassment, disputes and the possible failure of projects, but they also included broader issues of communications, organization and project definition. The delegates were free to use their own words in stating the greatest problem. Classification of their statements was therefore needed to be able to analyse them and to look for changes over time and differences between industries and between sectors of employment. For this purpose, a set of categories was chosen which met two criteria:

- Use the words which were most frequently used by the delegates in stating the greatest problem, for instance cost, resources, time.
- Cover the topics stated in papers in leading journals as important in practice, for instance quality, risk, safety (Themistocleous and Wearne, 2000).

On that basis 11 categories were used to classify the delegates' statements of the greatest problem:

<i>Project Definition</i>	including business objectives, customer's need, project scope
<i>Resources</i>	including personal time, priorities, project strategy, management support
<i>Organization</i>	including roles, communications, leadership, supervision, teamwork, trust
<i>Time</i>	including planning, scheduling, delays, time over-runs
<i>Cost</i>	including estimating, budgeting, earned value, cost over-runs
<i>Quality</i>	including standards
<i>Safety</i>	including health, environment
<i>Risk</i>	including uncertainty, risk allocation and risk management
<i>Contracts</i>	buying or selling hardware, software or services, including subcontracts
<i>Change</i>	to scope or priorities
<i>Inexperience</i>	including lack of knowledge

To be brief, the 11 categories are referred to in the rest of this paper by just the first words in the above list.

THE DATA ON THE GREATEST PROBLEM OF PROJECT MANAGEMENT

Table 1 shows the totals of the delegates' statements of the greatest problem in each of the 11 categories.

Some of the statements of the greatest problem fell into more than one category. Allocation of these was guided by the answers given to the supplementary question on the cause of the problem.

The data in Table 1 shows that together the three categories *Organization*, *Time* and *Resources* embrace 65% of all the statements of what is the greatest problem. *Project Definition*, *Cost*, *Contracts* and *Change* account for a further 28% of the greatest problems. The dominance of some of these categories of problems is illustrated in Figure 1.

Views that some project management topics are in practice more important than others have been reported from surveys in the UK and the US run to determine which topics should be known and understood for competence in project management (Morris *et al*, 2000; Smith, 2003). In those surveys the respondents were asked to give views on what should be known and understood, rather than state the problems experienced, and they were asked to answer on the basis of lists of topics presented to them rather than choose openly. Also they were not required to select one topic, and as a result 35 topics out of a total of 44 scored over 50%. Those results are therefore not directly comparable with the data presented in this paper but they do confirm as we would expect that some of the problems are more common than others.

UK professional engineers questioned in 2002 stated that some managerial skills were more important than others in their work (Dudman and Wearne, 2003). The whole sample of UK engineers and also the set of Chemical Engineers amongst them indicated that *Leadership* skills were most needed in their work, relative to other business skills and techniques. In that survey the respondents were asked to answer on the basis of a list of topics presented to them rather than choose openly. They were not required to select one topic, and as a result most topics scored over 50%. Again, those results are therefore not directly comparable with the data presented in this paper, but they are consistent in that their top topic *Leadership* corresponds with our highest ranked *Organization* category of problem shown in Figure 1.

Table 1. Numbers in each category of greatest problem of project management.

Category of greatest problem	N	%
<i>Project Definition</i>	92	9
<i>Resources</i>	196	18
<i>Organization</i>	276	26
<i>Time</i>	215	20
<i>Cost</i>	80	8
<i>Quality</i>	13	1
<i>Safety</i>	2	>1
<i>Risk</i>	31	3
<i>Contracts</i>	68	6
<i>Change</i>	59	6
<i>Inexperience</i>	31	3
Total	1063	

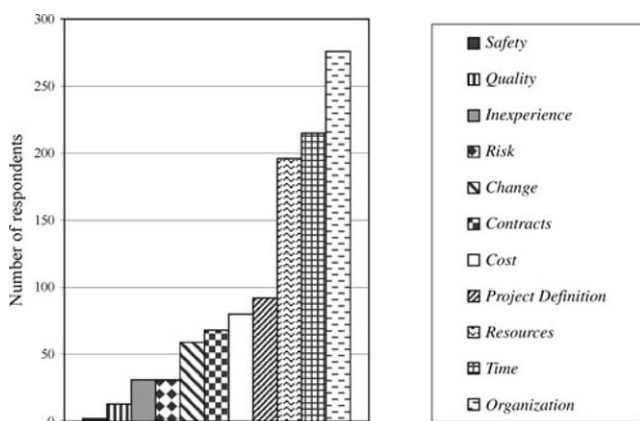


Figure 1. Number of greatest problems in each category (1991–2004).

Organization, Time and Resources together with *Project Definition, Cost, Contracts and Change* are the topics given the most attention in leading journals and textbooks (Cleland, 1994; Meredith and Mantel, 2000; Morris, 1994; Turner, 1999), and they correspond with the factors defined as the main threats to successful project management (Clarke, 1999; Munns and Bjermi, 1996; Pinto, 1998; Yeo, 2002). It is therefore not surprising that they are dominant in this data on the greatest problems of project management.

More surprising was the small reporting of some other categories, particularly *Risk, Quality and Safety*. Only 3% of delegates stated *Risk* as the greatest category of problems. The word 'risk' also appeared in other delegates' statements of the *causes* of problems of *Organization, Time, Project Definition, Cost, Contracts, Change and Safety*, and poor quality was mentioned in stating the *causes* of problems of *Organization and Contracts*. As said earlier, *Risk, Quality and Safety* were included as separate categories of problem because the practical value of their concepts and techniques has been increasingly emphasized in papers and reports. It may be that the emphasis on them in papers and reports has stimulated the development of effective risk, quality and safety strategies in companies to the point of preventing most or all the potential problems (Dobbins, 2003). The low reporting in the *Quality and Safety* categories may also be because to people employed on projects these are seen as constraints rather than variables in project decisions, and the problems are thus expressed in terms of poor organization or project definition and consequent impact on time, resources and cost. The practical result is that *Risk, Quality and Safety* are not themselves seen as great problems.

Change was also not stated by delegates to be a major category of problems. 6% of their answers fell into this category, and the word 'change' appeared in only a few other delegates' statements of the *causes* of problems of *Organization, Project Definition, Time, Resources, Cost, Contracts and Risk*. Changes are not necessarily negative in impact or 'tragic', as pointed out by Terwiesch and Loch (1999) in a study of change orders in an engineering organization. Changes are part of the process of development of a project and coping with uncertainty. They can be

opportunities for real improvements to help achieve project objectives, but they can greatly affect the planned use of resources, budgets and schedules. Some experienced authors consider that controlling changes is therefore a major task in managing projects (Hass, 2003; Meredith and Mantel, 2000; Turner, 1999). Mantel (2003) asked over 500 US project managers what was the most important single problem faced in their day to day work as a project manager. Coping with change was not only the most frequent response. It was an absolute majority response. Guidance to them defined 'importance' in terms of 'the amount of trouble the problem causes you as a manager, rather than in terms of potential or actual economic impact on the project'.

Those US project managers were questioned during the late 1980s and early 1990s, overlapping with the start to collecting data from the 1063 European delegates, so economic or market fluctuations over time seems unlikely to explain the apparent difference between their statements. Mantel (2003) suggests that the difference may be due to the wording of the questions asked. The US project managers were asked for the issue causing them the greatest *managerial* problem in their role. The 1063 European delegates were asked what is the greatest problem of project management, not the same question, and responded more in terms of the consequences of problems of *Organization and Project Definition* and their impact on *Time, Resources, Cost, Contracts and Risk*. Mantel reports similarly that amongst the US project managers the problem of coping with change was often described in terms of failure to communicate. When the costs or delay due to changes are considered to be a problem, analysis should therefore start with attention to the effectiveness of communications and the quality of project definition.

SIZE OF PROJECT

Size of project might be expected to affect what are the greatest managerial problems, as well as the scale of the managerial tasks. Some textbooks support this with qualitative comments that the needs of small projects are different to those of large (Lawson *et al.*, 1998; Loftus, 1999; Morris and Hough, 1987), but no reported studies provide quantitative data. A recent study of the maturity level of project management in some US companies found no difference with size (Pennypacker and Grant, 2003), but the extent of a company's development of its systems of management could be independent of the extent of their problems. We could therefore only draw on experience and logic to predict which problems might be more prominent on large or on small projects. On that basis we expected that *Organization* problems would be greater on large projects, because of greater numbers of people employed, and *Time* problems would be greater because size requires more activities in parallel and therefore more time interdependence. On the other hand we expected that *Resources* problems would be greater on small projects because, as in the authors' and others' experience, small projects command less attention in companies, and so have to 'fight' the larger ones for resources (Loftus, 1999).

In answering the questionnaire, 64% of the delegates stated that the greatest problem they had defined was

common to projects large and small. A minority thus stated that the problems differed with size of project. Of this minority, 75% stated that the problem they had defined was more a problem of large projects, and 25% more of small projects.

Figure 2 shows the ranking of the 11 categories of greatest problems by them and by the delegates who stated the problems as common to projects large and small.

The data displayed in Figure 2 shows that the ranking of the 11 categories of problem does not vary greatly with size of project. *Time* was stated by some delegates to be more a problem of large projects, and *Resources* more a problem of small projects, as expected. *Organization* is shown to be less of a problem for the smaller projects, also as expected, but these differences are small compared with the differences between this and the other ten categories of problem. The *Organization*, *Time* and *Resources* categories of problem were dominant for all sizes of project, followed by *Project Definition*, *Cost*, *Contracts* and *Change*.

The number of delegates is indicated at the foot of the histograms. Not all the delegates answered the question whether the greatest problem they had stated was common to projects large and small, so the total of these responses is less than shown in Table 1.

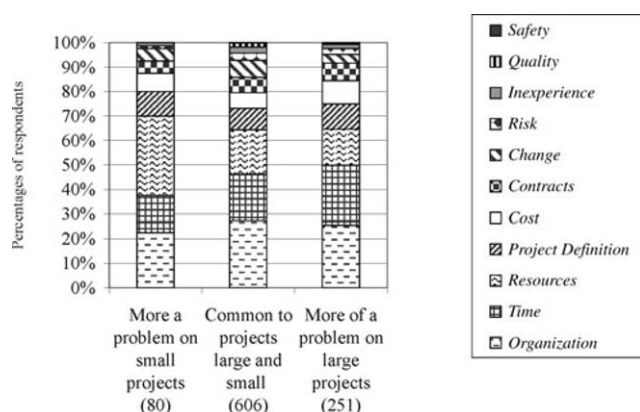


Figure 2. Differences with size of project (1991–2004).

PROCESS INDUSTRY COMPARED WITH OTHER SECTORS

The delegates were employed in Construction, Manufacturing, Process Industries, Services and Utilities. Figure 3 shows how the statements of the greatest problem of project management differed between those in the Process Industries and those in the other sectors.

Figure 3 shows that the *Time*, *Resources* and *Project Definition* categories rank relatively higher in the Process Industries, and in the smaller categories *Change* and *Inexperience*. *Organization* and *Contracts* rank relatively lower, but the differences between sectors of industry are again small compared with the differences between the categories of problem. The higher ranking of *Project Definition* is to be expected in the Process Industries as this is the most capital-intensive sector, and the higher ranking of *Time* because of the size of projects and the financial importance of obtaining a return on capital investment. We expected

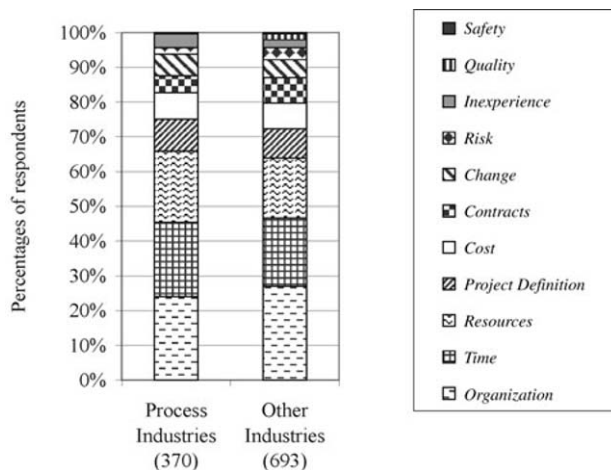


Figure 3. Process industry compared to other industries (1991–2004).

a lower ranking of *Organization* and of *Resources* as a result of downsizing. The rather higher ranking of *Resources* is logical if the result of downsizing is problems of dependence upon contractors' manpower. The lower ranking of *Contracts* compared to other sectors may be due to the employment of mostly known contractors and vendors. The relative differences from sector to sector are therefore logical, and in both sets of data the *Organization*, *Time* and *Resources* categories are dominant as the greatest problems.

DIFFERENCES WITH TYPE OF EMPLOYER

To look for possible differences between different organizations contributing to projects the delegates' employers were classified into three categories:

- Customers* including project sponsors, promoters, owners and users
- Suppliers* including manufacturers, contractors, subcontractors
- Advisers* including consultants, inspectorates, research and development departments

Figure 4 shows how the statements of the greatest problem differed between these three categories of employer.

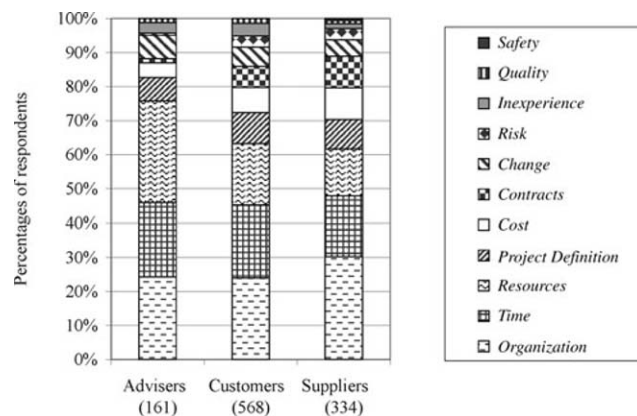


Figure 4. Comparison between types of employer (1991–2004).

The data shows that the three categories of *Organization*, *Time* and *Resources* were dominant for all three types of employer, though with some differences between them.

The Advisers group stated *Resources* as their largest problem, compared to the Customers and Suppliers. This was to be expected because the Advisers are the smaller organizations and may therefore have greater problems in switching manpower to meet changes in the demands for their services. *Organization* was the largest category of problem for the Suppliers. This may be because they employ more people on projects than do their Customers or the Advisers, and they have to move them from contract to contract. The Suppliers stated problems of *Cost* and *Contracts* higher than do the Advisers and the Customers, as might be expected from contract-based businesses. As in the comparisons by size of project and by sector of industry, the differences were relatively small and they were what might be expected.

Amongst the other smaller categories of problems, *Risk* was stated more by Customers and Suppliers than by Advisers, logical if it is these who bear the time and cost effects of most risks. The small category of *Quality* was stated most by the Advisers, logical if reputation is important to their obtaining further work. The small category *Inexperience* was stated most by the Customers, and this is logical because for Customers projects are only a means to an end and one reason for employing contractors and consultants is to draw on their project experience.

TRENDS OVER TIME

The same categories of problem were dominant over the 14 years of data and there was no trend for any of the categories to become more or less dominant. Year by year the relative importance of the categories fluctuated, as found by Hussain (2001) in analysing the data available up to 2001. This was likely, as the data shows that the problems varied from individual to individual and so would vary from year to year according to the mix of delegates.

The result that over the 14 years there is no trend for any of the categories to become more or less dominant suggests that the same problems tend to recur and may be characteristic of project work. Reviews of earlier similar courses run between 1973 and 1980 support this conclusion (Wearne, 1980). Those older reviews listed the problems then stated by the delegates. The most frequent were: lack of agreed or defined objectives; coordination and control; motivation of specialists; unrealistic budgets and programmes; commitment of departments to programmes; poorly prepared contracts; lack of resources; lack of authority; and lack of managerial willpower. Though classified differently, these correspond with the *Organization*, *Resources*, *Time*, *Project Definition*, *Cost* and *Contracts* categories of problems as stated from 1991 to 2004.

THE GREATEST PROBLEMS—ORGANIZATION

As *Organization* was the largest category of problems, we looked into whether it really consisted of two or more distinct categories which could have been considered separately. Structure, processes and leadership are the three headings commonly used in the management

literature on organizations, but with emphasis that these are interdependent (Handy, 1999). We found that few of the delegates statements of *Organization* problems could be classified as relating only to structure, processes or leadership, or other possible subgroups. The word communication appears more than any other, but used mainly as an alternative word to 'organization' to embrace a variety of problems related to structure, relationships, resources, time, deliverables and other issues, rather than as a distinct subcategory. There seemed therefore to be no practical value in considering subdivisions of this category of problems.

What we did observe was that in stating problems of *Organization*, delegates referred to structure and to leadership rather more than to processes. This indicates that lack of attention to processes may be an underlying cause of problems, as reported elsewhere as a weakness in engineering and other industries (Parnaby *et al.*, 2003; Wearne, 1993). Structure, processes and leadership all need attention. Defects in any one of these are not compensated by the others. In other words, all organizations need some structure of authority and responsibilities, processes for information flow and decisions, and personal skills in relationships between individuals and groups. Only the relative importance of structure, processes and leadership varies with the uncertainties of the work and the size and autonomy of an organization. The data obtained indicates that what is called 'organization design' should be the priority for action on the problems, a circular process starting with analysing the business processes required, designing the form and extent of structure accordingly, and then leading everyone into understanding, operating, reviewing and improving the processes and structure.

ARE THE PROBLEMS INHERENT IN PROJECT MANAGEMENT?

Table 2 shows a sample of delegates' statements of the causes of the greatest problem of project management, covering in this table the *Organization* and other categories of problems.

These stated causes of the problems range widely, but they can be considered in two categories: Some appear to be due to the nature of projects and therefore *inherent* in undertaking projects, for instance 'number of people involved and complexity of project'. But most of the causes of problems listed in Table 2 appear to be due to how companies manage their projects, and therefore may be *avoidable* by them, for instance 'lack of in-house control systems'. Classification of the causes of problems in this way is shown in the last column in Table 2. Question marks show where this classification cannot be certain from the delegates' words used to state the causes of problems.

We have similarly classified all the delegates' statements of the causes of the greatest problems. Allowing for the uncertainty about the meaning of some words used, the results indicate that more than 80% of all the problems are due to practice within organizations. If so, many of the problems of project management could be avoided or at least reduced by greater attention to their causes.

Table 2. Statements of causes of the greatest problems of project management.

Cause of problems	Inherent or avoidable?
Transient nature of projects	I
Lack of information, communication	A
Too many responsibilities	A
International cultures	I
Poorly defined boundaries/scope and methods of review/communications	A
Retention of data	A
Limited knowledge, lack of confidence	A?
Poor planning and communication	A
Not enough experience of project management	A?
Control freaks in management	A
Production, suppliers late, short on stock	A
People wishing to control themselves	I
Many projects rushed, scope delayed, changed	A?
Lack of delegation/understanding	A
Changes in scope	I?
Too many people on the problem, expanding scope	A
Not having breadth of knowledge of company issues	A
Distance, and other projects	I
People not being able to deliver	A?
Need for project management to be clear on aims/drivers/deliverables	A
Many relations within the project, our cost is their income	I
We often allow individuals to act as individuals to a great extent	A?
Needs a lot of work and attention	I
Organizing philosophy, European regulations	A?
The accounting system—takes too long	A
Not all disciplines located in the same office	A?
Company structure of many groups, departments and so on, involved in each project	I
Unwillingness of parties to adhere to guidelines, inflexibility	A
Lack of experience generally	I?
Lack of communication, unknown deadlines	A
Those resources may have other conflicting priorities	A
Complex interaction and competition of many factors	I
Operators do not always know their plants. People not honest	A
Identifying separate areas of concern and links between them	I
Varying 'beliefs', lack of 'ownership'	A
Lack of experience	A?
Failure to understand the importance of information	A
Information from other functions not available on time	A
Ill-defined priorities, line management, design change	A
People usually—misunderstanding their objectives, budget overrun	A
Endemic in the system	A?
Lack of planning. Short term view of projects	A

CONCLUSIONS

The data shows that people employed on projects in the process and other industries see the greatest problems are in organization, time and resources, and to a lesser extent project definition, cost, contracts and changes. The problems and their causes overlap, but asking what is the greatest problem has established that managers should first give priority of attention to the broad range of *Organization* topics. The delegates' statements confirm the authors' experience that most people in organizations become aware of structures and problems of relationships. Action on the greatest problems stated demands more. It requires the attention of managers with understanding of choices in structure,

techniques for analyzing business processes and skills in leadership.

Comparing the data from the different sectors of industry, the differences were small compared to the differences in the ranking of the 11 categories of problems. There were also relatively small differences in the ranking of the problems between types of employer represented and with size of project. For all, the greatest problems are in organization, time and resources, and project definition, cost and contracts. The relative differences between sectors of industry, size of project and type of employer corresponded with what might be expected. This gives confidence in the data as a guide to what are the greatest problems.

Analysis of the data found no trend for change over time. So far as represented in the data, the greatest problems thus appear to be characteristic of project work, at least in Western industrial cultures. The growth in industrial and professional attention to the needs of projects indicates much more awareness of the potential problems and how to manage them. All this should have reduced the impact of the problems and increased confidence in controlling them, but these same categories of problem appear to remain a definition of the main tasks of project management. The word 'unique' is used in some definitions of what is a project, but also many writers observe that the lifecycles of all types of projects are similar. So therefore may be the categories of problems which need anticipation and control through any project.

For individual companies and other organizations the data provides a benchmark for reviewing their needs and problems in managing projects. Some of what were stated to be the problems could be said to be inherent in undertaking a project, and therefore need to be anticipated and managed, for instance complexity in temporary relationships between large numbers of people on a large project, or the risk of extra costs and delay due to changes during a project caused by competitors' actions or by new legislation. Most of the problems were stated in terms that indicated that they could be eradicated or avoided, given attention to their causes, for instance lack of internal control systems. They indicated that much of the time delegates are engaged in what is often called 'fire fighting', i.e., resolving problems which might have been reduced or avoided by earlier attention. Many managers may be well aware of this. That the problems recur indicates that more rigour and energy may be needed to apply the lessons to be learned from completed projects.

The data is based upon what delegates stated at the time. Statements of current problems do not necessarily represent future needs, and the problems of projects as stated by employees do not necessarily correspond with what their employers recognize as important for their business (Morris, 1998). But the delegates do or they direct the work which influences the success of their companies' investment in projects. If what the delegates said is right, corporate actions are needed to reduce the costs of the problems. If what they said is wrong, corporate systems need to learn why they are wrong. The quality, safety, delivery and cost of new products, processes and services depend greatly on employees such as represented by the 1063 delegates. Corporate actions which don't appear to address the greatest problems as seen by them could fail for lack of their support.

The US Project Management Institute, the UK Association for Project Management and others internationally have published *Project Management Bodies of Knowledge* ('BoKs') which list topics for assessing competence in project management (PMI, 2000; APM, 2000; IPMA, 1999). Our data provides confirmation that in practice some of these topics are more important than others listed in the BoKs and should therefore be given weight when establishing methods for assessing competence and planning training for project management. As for the lower ranked categories, the data that these are not the greatest problems comes straight from people employed on projects. The promoters of training programmes, meetings, courses and company procedures should therefore note that people employed on projects might not recognize the potential value to their work of acquiring expertise in these topics.

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