BENCHMARKING THE MANAGEMENT OF PROJECTS

By

ELIZABETH BARBER
University College,
University of New South Wales
ADFA
CANBERRA. ACT.
e.barber@adfa.edu.au

ABSTRACT

Benchmarking is used as an evaluative tool to assess the level of management skills of project managers. Distinction is made between project and program managers. It is argued that different organisational structures of projects require different management skills. Therefore when benchmarking the work of project managers the underlying variable of the project's organisational structure should be included in the evaluation. Research has shown vast differences in the performance between leading companies and average companies in performing particular activities. By benchmarking leading companies, many firms have experienced significant success in upgrading their organisational capabilities. (Grant, 2000). It is inferred that as benchmarking can significantly improve the performance of managing companies, similar evaluations can lead to similar improvements in the performance of managing projects.

Key Words: Benchmarking, Project Management, Management, Evaluation

1. INTRODUCTION

Benchmarking can make a very significant improvement to performance
(Lock, 2001.)
The concept of project management has changed from the traditional notion of an engineering firm being tasked to build a hospital, office block or bridge to numerous, senior and middle managers in all sorts of organisations being tasked to consider their role as one of a project manager. A key advantage of considering a work task as a formal project is that it directs the focus of the job onto the planned outcome. Projects are variously defined but the key element is that it is a one off unique task that has a definite and finite completion. Otherwise the task is termed a program. As a result of this change in management practices there are a huge variety of project managers in both the public and private sector who are managing projects that can range across the organisational spectrum.

Research has shown vast differences in the performance between leading companies and average companies in performing particular activities. By benchmarking leading companies, many firms have experienced significant success in upgrading their organisational capabilities. (Grant, 2000). It is inferred that as benchmarking can significantly improve the performance of managing companies a similar improvement in the performance of managing projects is also likely. The effectiveness of a project management process will determine whether or not those projects play a role in providing a source of competitive advantage for an organisation. Those organisations that are the most resourceful in seeking out best practice and making those aspects work for them will be the most successful. (Maylor, 1999, p.3)

This paper discusses some aspects of benchmarking managerial performance of projects within different project team formations. There are three major types of project team formation, namely, the pure project structure, the functional project structure and the matrix structure. Different types of benchmarking processes should be applied to different team structures. The skills and competencies of project managers are arguably benchmarked according to different perceptions of project manager's roles. These roles change to some degree depending on the project team structure. Some of the problems facing benchmarking of this ellusive subject matter is also discussed. The general pupose of benchmarking as an evaluative tool to provide continuous learning for both the project manager and the project organisation are seen as challenges that need to be addressed more widely in the project management discipline. The paper concludes by recommending the adoption of benchmarking as an evaluative tool that stimulates continual improvement in project management skills.

Benchmarking can be a continuous event which is used to compare and measure the management of one project to the managerial processes of a leading project manager. It is essential of find the information or date that will guide the specific project manager towards improvement. (Andersen and Pettersen, 1996) This paper asserts that different projects and the different structures within those projects require different information and data to provide guidance to the specific benchmarking being undertaken.

2.TYPES OF BENCHMARKING

Types of benchmarking reflect 'what is compared' and 'whom it is compared against'. (Anderson and Pettersen, 1996). The former involves performance, process and strategic benchmarking, whilst the latter involves internal, competitive, functional and generic. (Evans, 1994) Kasilingam expands Evans grouping of 'whom it is compared against' to include industry and national best in class. (see Figure One)

Figure 1. Types of Benchmarking: The Analysis Pyramid
(Kasilingam, 1995)

Dorf (1999) explains performance benchmarking as a broad measure such as sales per employee or some other quantifiable output form. Process benchmarking is explained as a comparison of yields and through put such as manufacturing yield rates, through put times on assembly lines and direct labour productivity. Strategic benchmarking is comparing a competitor's strategy to one's own in the same market and product benchmarking compares the features and performance of actual products. Gattorna and Walters (1996) argue that unless the strategic direction of the targeted benchmark company is understood, it is unlikely that the comparative exercise will prove successful, especially in the management strategies of projects. Management performance falls under performance benchmarking but is influenced by the company's strategies. Benchmarking project management is a sub set within the managerial performance indicators.

Grant (2000) lists five stages involved in external benchmarking. External benchmarking is sometimes referred to as industry or competitive benchmarking and takes place when a business compares itself with other organisations which demonstrate best practice in the way they produce similar services.

Internal benchmarking occurs when one sub-division of an organisation compares itself with another subdivision with the intention of finding and applying best practice. Performance of similar management processes or functions within projects can vary widely and once compared (benchmarked) the best processes can be applied.

Applying internal benchmarking to management processes of projects occurs when higher level management identifies a particular functional or divisional area or project manager, or project team of the organisation that has a proven record of accomplishment in managing projects within its area of responsibility. The projects it has completed can be examined and the organisation can identify the practices they conduct well and how they conduct them, which enables them to outperform other areas of the firm.

Internal benchmarking has a number of advantages over external benchmarking. First, the organisation using internal benchmarking can easily obtain access to detailed information about different projects it has conducted. Second, internal benchmarking reduces the likelihood of cultural and definition problems which can often affect the validity of benchmarking. There is no benefit in comparing 'apples with oranges'.

However, multi-national organisations conducting internal benchmarking need to be aware that definitional and cultural problems may still arise if the organisation has acquired firms in different countries. For example, a German firm benchmarked the performance of a British subsidiary and the assessment determined that the British firm was performing well below standard. However, there were considerable differences in how the two organisations defined particular terms. These definitional differences resulted in a flawed benchmarking assessment.(Maylor 2000, p.271)

Internal benchmarking has its shortcomings. Often management styles, values, thought process and culture, permeate throughout the organisation. This may create perceptual limitations on how to improve the management of projects, leading to a tendency to conduct activities which only conform to management and approved cultural norms.

Benchmarking outside the organisation can lead to the discovery of radically different approaches to the same problems. The advantages of external benchmarking are: that it prevents the company from being internally focused, it reduces incremental process change and minimises low management commitment. With external benchmarking, a company can develop a concrete understanding of competition, utilizes new ideas of proven practices and technology, and generates a higher level of commitment. (Camp 1989 p.30)

The Australian Institute of Project Management (AIPM) concurs with Camp's assessment of the benefits of benchmarking. It identifies leading practices such as: how to best develop and deploy project management processes; provides comparisons of project management data with other organisations; provides confirmation of good practices and challenges to accepted practices; and improves learning for both project managers and the organisation.

Watson (1993) continued Camp's understanding of the continuous improvement process and viewed benchmarking as a process that should evolve as a business process.

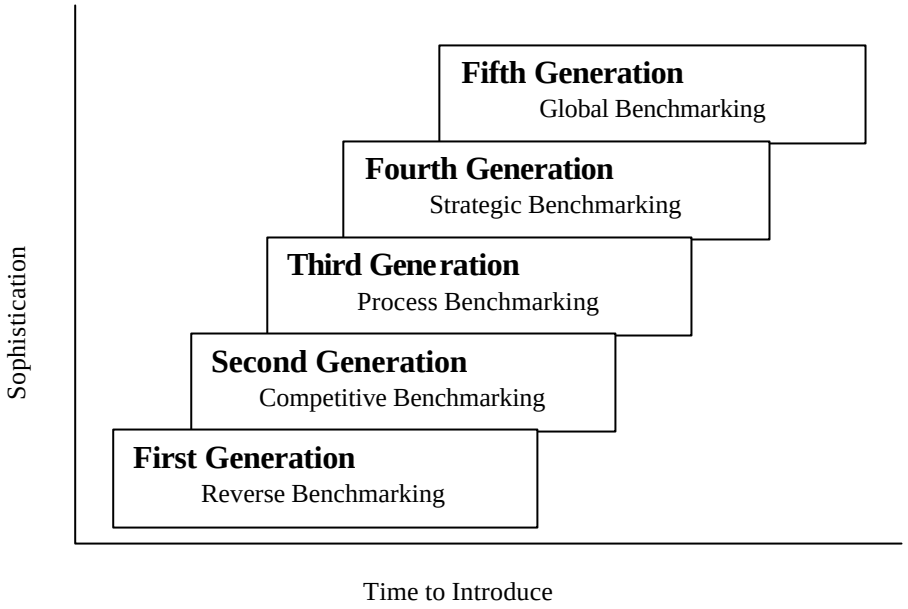

Figure 2 Benchmarking as a Developing Evaluation Tool
(Watson, 1993)

Figure Two shows the First Generation as evolving in the early nineties. It was product related and mainly described the Xerox experience. Typically it was an evaluation or comparison with similar products. The Second Generation of benchmarking evolved when product comparisons expanded to evaluating similar processes with competitors. The Third Generation of evaluation implied that comparisons occurred outside the same industry. Evaluations targeted companies with recognised strong practices independent of the industry and competitors. This really led to a lot of process evaluations. The Fourth generation is referred to as strategic benchmarking. It is a systematic process of evaluating alternatives, implementing strategies and improving performance by understanding and adapting successful strategies from external partners who participate in an ongoing business alliance. This generation of benchmarking differs from process benchmarking in terms of the scope and depth of commitment among the sharing companies. Benchmarking is used as a driver that fundamental changes the business, not just 'tweak processes'. Watson sees future generations of benchmarking in global applications where business process distinctions among companies are bridged and their implications for business process improvements are understood. In this era of global project management organisations, this generation of benchmarking will help such organisations identify and link with the best in class.

WHAT TO BENCHMARK

'*A project manager is a businessman, a psychologist, an accountant, a technician, part designer, part nuts-and-bolts. A truly rare combination of skills.*'(Birnberg, 1998) Obviously a project manager wears many hats in orchestrating the project's progress and the firm/client partnership. This section considers two questions. What are the skills and competencies required? How can they be measured and evaluated?

Wysocki (1995) proposes that two levels of characteristics determine the performance of a project manager. At the visible level are skills that can be observed, measured and improved with training. Competencies are hidden below the visible level and are more difficult to develop through training. Competencies can be seen in practice but cannot be measured directly. Wysocki used Bloom's Taxonomy of Educational Objectives and Cognitive Domain to provide six levels of project management *skills*. They are knowledge, comprehension, application, analysis, synthesis and evaluation. He used the Corporate Education Center of Boston University to demonstrate five types of *competencies* required to be an effective project manager. They are business achievement, problem-solving, influence abilities, people management and self management competencies.

The Project Management Institute (PMI) has identified eight primary *competencies* that the effective project manager should master. In an era of lean organisations, doing more with less is important. Project managers need to be highly effective people – people who possess knowledge of the technical details of their jobs as well as the capacity to get things done. The PMI captured the core project management competencies in its Project Management Body of Knowledge (PMBOK) series. The eight primary competencies are:

Scope management (includes understanding the project life cycle, construction of work-breakdown structures, change control).

Time management (scheduling with Gantt charts, milestone chats PERT/CPA networks, tracking schedule variances).

Cost management (effective employment of cost estimating methodologies, budgeting processes, tracking cost variances).

Human resource management (managing conflict, motivating matrixed resources, team building, evaluating and appraising work performance).

Risk management (identifying and modelling risk, planning for risk).

Quality management (identifying who the customers are, doing things right the first time, monitoring quality and standards).

Contract management (understanding contract and procurement processes, resolving disputes).

Communication management (understanding the impacts of different communications vehicles, avoiding communications breakdowns). (www.pmi.org)

The difference between skills and competencies can perhaps best be distinguished by the definition of competency applied by those with a psychometric leaning, that is, 'competence consists of attributes possessed by individuals'. These consist primarily of knowledge, skills and attitudes, all of which are directly measurable and quantifiable according to predetermined categories and criteria. A number of writers have questioned the accuracy and reliability of measurements relating to certain

attributes such as knowledge and attitudes (Ilgen and Favero, 1985). A less obvious but more fundamental limitation to this definition of competency is that it equates the possession of attributes with competence. Hunt and Wallace (1997) argue that the mere possession of a range of attributes may or may not in itself ensure competent performance. They give the example of valuable communication skills that may be measurable but that may be well applied or misapplied, according to the inclination of the project manager or according to adverse environments. Consequently the core competencies provided by the PMI, although measurable on a ranking scale, cannot ensure consistent application by project managers.

Having surveyed twenty-four studies delineating managerial functions, roles, skills and competency units, Hunt and Wallace advance the working definition for managerial competency as*:*

the ability to perform effectively in a given context, the capacity to transfer knowledge and skills to new tasks and situations, and the inclination or motivation to energize these abilities and capacities. (Hunt and Wallace, 1997, p.59)

Meredith, Posner and Mantel (1995) categorized the skills needed for a project manager into six skill areas: communication, organizational, team building, leadership, coping and technological skills. In 2000 Meredith and Mantel compared the requirements of a project manager to those of a functional manager and claimed that:

a project manager is a generalist rather than a specialist, a synthesizer rather than an analyst, and a facilitator rather than a supervisor. (Meredith and Mantel, 2000, p.128)

Katz in his famous article of 1991 also suggested that effective project administration rested on three basic developable though inter-related skills of human or interpersonal skills, conceptual and technical skills. He went further and claimed that although interrelated these skills can be developed independently and should be thus sort after to suit appropriate projects.

El-Sabaa (2001) used Katz's three skill types and developed a table rating the importance leading project managers attached to each skill. He then extended the survey to the career path of effective project managers. The most effective project managers appear to have extensive cross-functional experience. It is argued that a multi-disciplinary resource knowledge is a key competency of an effective project manager.

The cornerstone of evaluating whether a project has been a success or a failure has been the so-called "Iron Triangle". As Atkinson (1999) states "Cost, Time and Quality (The Iron Triangle) over the last 50 years have become inextricably linked with measuring the success of project management"(Atkinson, 1999, p.337). Atkinson argues that in fact these factors will not indicate whether the management of a project has been excellent or otherwise. The main thrust of his argument is the so-called Iron Triangle is flawed in that evaluating against these criteria really implies trying to match 'two best guesses (time and cost) and a phenomena (quality) correctly'. He argues that these three estimations (especially time and cost) are put together at a time

when the least amount of information is available regarding the project – typically in the planning stages. Gardiner and Stewart agree with this point and estimate that 50-70% of projects (depending on the type of project) will have significant budget or scheduling overruns. If this is the case then initial estimates of cost, schedules and quality should not be the baseline for evaluating management success.

If the benchmarking process centres around these three criteria translated loosely as within budget, on time and to a prescribed quality then benchmarking the management processes will be flawed as well.

Atkinson (1999) suggests the adoption of what he called the "square root" to create a more realistic view of the management of projects. (see Figure 3) He lumps together time, cost and quality, ie the 'iron triangle' into a single criterion and added three other criteria. They are information systems, benefits to the organisation and benefits to the stakeholder community. The attributes comprising each of the four components include both tangible and intangible elements, which would make benchmarking difficult to undertake. For example information systems consist of maintainability, reliability, validity and information-quality usage. Benefits to the organisation pertain to improved efficiency, improved effectiveness, increased profits, strategic goals, organisational-learning and reduced waste. Whilst benefits to the stakeholder community refer to satisfied customers and users, social and environmental impacts, personal development, professional learning, contractors profits, capital suppliers, content project teams and economic impacts on the affected community.

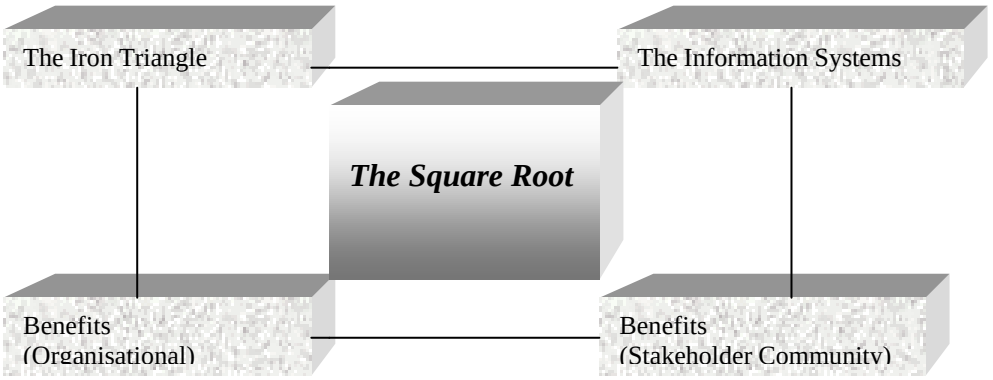

Figure 3. Atkinson's "Square Root"

The scope of Atkinson's method although logical would need substantial de-aggregation for benchmarking the management of a project. Nevertheless many authors agree with Atkinson.

Belout (1998) claims that the key areas of interest in evaluating the management of a project are effectiveness and efficiency. Efficiency is broadly understood as the maximisation of output for a given level of input or resources while effectiveness is directed to the achievement of goals or objectives. This supports the definition of Hunt and Wallace that also concentrates on capabilities and effectiveness.

Nicholas (2001) claims that: V*ariety in the sources of information increases the validity of the evaluation, particularly when several sources all lead to the same conclusion*. (Nicholas, 2001, p.414)

As has been shown there is surprisingly little agreement among educators and training program directors of many leading institutions on what competencies are required to make a good project manager. Nevertheless there is a wide variety of sources of information on this topic. Thus if or when the skills and competencies can be agreed upon the measurement thereof is widely agreed then and only then eventually will benchmarking become widely acceptable. Although at present, any agreeable generic benchmark evaluation of project manager's competencies are acceptable the debate still rages.

DRAWBACKS with using benchmarking

There are a number of reasons why it may not be good practice to introduce evaluation via benchmarking of project management. These include the appropriateness of the tool, timeliness and cost effectiveness. A main problem with using benchmarking of management practices between different projects is that projects by their very nature are unique. All projects will involve some elements that can't be directly translated between one another. There is no secure metric system than can be used between projects. Maylor's statement is very pertinent in relation to benchmarking: *Figures without clear explanation of their means of collection and the meanings of each, with clear bounds established as to what they include, are misleading*. (Maylor, 1999, p.271) Benchmarking may not be appropriate for all management processes because there might not be a comparable management situation.

The lack of comparable objectivity is a difficulty that is well recognised within project management evaluation exercises. The intangible factors effecting the management of a project include such thins as culture, politics, project environment, institutional arrangements and legislations. Culture strategy and philosophy differ between organisations and between different divisions within organisations operating in different environs.

Many factors that may have a significant impact on the implementation of a project are outside the direct control of the project manager. For example, lack of support from higher management, political interference, the environment in which the project operates in (ie economic environment) and the cooperation of key suppliers. Therefore benchmarking project management in isolation from the project perse could be in itself very misleading.(Clarke, 1999)

Clarke also argues that managing large and complex project involves simultaneously attempting to manage many differing factors (such as people, finances, risk, priorities, specifications etc) and their interrelationships. Consequently it is virtually impossible to give them all your equal attention. Therefore she argues that you should apply the Pareto rule of separating the important few from the trivial many. This means that you should identify those key factors that will have the greatest impact on the success implementation of a project and give them the majority of your management attention. This also means that these key factors should form the basis of your

management evaluation criteria. Factors that are considered critical to the success of a project should form the basis of the management evaluation criteria. Also when benchmarking the management of projects the underlying influences of comparable projects must be similar.

Benchmarking has often been found deficient because it highlights the performance gaps without giving the reasons for these gaps. Sometimes, the performance gaps identified through benchmarking have more to do with the differences in the way the organisation measure and track the performance of their systems, rather than any meaningful differences in the way each manager controls his or her project. Project management today is seen as a systematic process. The management processes are centered around computerised schedules. If these systems interact differently in the management processes then the evaluation of the managing of differing processes will be flawed.

Benchmarking is above all, a comparison. This limits any evaluation to that of the level that it was benchmarked against. Not only does a comparison be made between like with like (apples and apples) but what is often missed is the quality of the apples being benchmarked. If the management processes are at the lower end of the spectrum of quality management functions then the performance gap may be quite small. Nevertheless the scope for improvement might be quite large and this larger gap would have shown up if the benchmarked management processes were further up the quality management spectrum. So not only does the data need to be similar the choice of the level of the data is also a confounding variable. Three levels of benchmarking of the management of projects can be categorised as functional, generic and competitor benchmarking. Functional benchmarking is limited in the level of improvement to the specific functional management it can provide. Generic benchmarking can be expensive, time consuming and difficult to do. Whilst competitor benchmarking on a 'total management of the whole project' basis can be a difficult endeavour, given that competitors aim to stay ahead, not help those who compete against them. (Kerzner, 2000)

Another drawback is that benchmarking does not and cannot address problems that have not been previously recognised or encountered. If an aspect of the management is experiencing a difficulty and the comparable partner has not experienced a similar difficulty, it is impossible for the benchmarking process to provide any solution.

Often a drawback of benchmarking is based on expense. Benchmarking often requires excessive time and cost of gathering and analysing performance data. This can consume scarce resources. Benchmarking is not quick. Finding the 'right' company to benchmark the 'right' aspects of management with can be time consuming and expensive. It is also highly risky in that a lot of trust and internal knowledge has to be shared. There may be unwillingness to share information. Benchmarking does not steal results. It is an open and legal study of another organisation's management practices. (Muir, 2000) These so-called drawbacks can be offset somewhat by the benefits arising from benchmarking. Whereas audits and other forms of evaluation tend to occur at set points in time benchmarking can be a continual process that permits reciprocal benefits to both partners.

Camp (1995) defined benchmarking as 'the continuous process of evaluation of production process, products, and services with reference to those of the strongest competitors, known as best practice'. There are two key points about his definition. They are the emphasis on the 'continuous process' and the comparison with the 'strongest' competitor. If this form of benchmarking was undertaken then some of the above mentioned drawbacks would be overcome.

General Purpose of Benchmarking

Benchmarking must be a continuous process which is not just copying or imitating from others but is a process of investigation and learning from the best in a class to get useful information for improving and changing an organisation or in keeping with this paper a project manager. Bent and Humphrey link the individual competencies with the processes, administrative procedures and systems of an organisation. '*Benchmarking is the technical core of the Total Quality Management (TQM) process. It identifies the quality of current personal skill levels and company procedures/methods, and then compares this quality with the latest state-of-the art techniques*.' (1996)

Kerzner (1998) supports this notion. Since the growth of technology and systematising of project schedules through computerisation, project administration has become more encompassing and complex. As a result a project manager in the future should be flexible, adaptable, a quick learner and a good communicator. Their new skill requirements became more related to new technology. This evolution of project management changed the skill requirements expected of effective project managers. The skill base is changing at present to match the business objectives that are now seen as more important than technical objectives. New skills include knowledge of the business, risk management and integration skills. Kerzner predicts that one of the biggest skills need for future project managers will be risk management skills.

One of the strengths of benchmarking is that it seeks to identify key performance indicators for a project manager to aspire to. It is a systematic structured approach to searching for the best way to choose and then measure chosen skills and competencies. As has been shown there are numerous skills and competencies to target in project management. Benchmarking partners will work together to pick out the key performance indicators that will help both parties to improve their performances.

For project managers to maintain their capabilities and continue to improve, the application of benchmarking techniques to both skills and competencies will guide the changing skill and competency base requirements. Those project managers who keep abreast with the evolving management processes and remain flexible and adaptive to new techniques and technologies will benchmark well with the best in class. Benchmarking is one of most responsive evaluation tools to creating a learning organisation that is receptive to both external and internal best management practices. Benchmarking management practices helps accelerate an manage change by encouraging a culture of continuous improvement in the management of the projects. (Muir, 2000)

CONCLUSION

"Considering the role of world-class performers through benchmarking and adopting their principles is just one tool in the improvement process". (Maylor, 1999, p.255) Maylor's statement regarding benchmarking is made in the context of gaining the maximum benefit from a project not only in outcomes for the immediate project but also by improving the performance of management in future projects. The maximum benefit that Maylor describes, can in part, be obtained by effectively evaluating the quality of project management.

There is no single benchmark, which will cover all the aspects of management evaluation. The best method of benchmarking the management of a project will be by using the best set of matching criteria for each aspect of the management process being evaluated.

Regardless of the difficulties associated with effective benchmarking of project management practices it is predicted that the use of this evaluation tool will increase. In the opinion of Razmi, (2000) the markets are moving fast, and competition is often built of speed and top performance. Customers are more aware and demand more. Change is happening at an unprecedented rate so according to Razmi corporations in order to survive in the new century have to rethink their structures, products, processes and markets. They must re-establish themselves to be nimble and flexible and be able to handle rapid change. These thoughts are echoed in many management writings. Managers are being defined as change agents and many corporations are using projects to institute change. In order to achieve a positive change, evaluation is necessary.

One of the fundamental characteristics of project management is that a change is manifested in the system. Evaluation allows the project manager to look at what was done well, poorly and what can be done better next time. The nature of project management is that it is transitory and allows for rapid change but it must know where it needs to go. Benchmarking as an evaluation tool provides this direction. Consequently, benchmarking the management of projects is here not only to stay but to expand as a key evaluation tool in project management.

REFERENCES

Andersen, B. and Pettersen, P., **The Benchmarking Handbook**, Chapman & Hall, UK, 1996.

Atkinson, R., Project Management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria**. International Journal of Project Management**, 1999, 17, 6, pp. 337-342.

Belout, A. Effects of human resource management on project effectiveness and success: toward a new conceptual framework, **International Journal of Project Management**, 1998, 16, pp. 21-26.

Bent, J. and Humphreys, K. (Ed), 1996, **Effective Project management Through Applied Cost and Schedule Control**, Marcel Dekker, New York.

Birnberg, H. Roles of a Project Manager**, Handbook for Association for Project Managers, Australia**, 1998.

Camp, R., **Business Process Benchmarking. Finding and Implementing Best Practices**, ASQC Quality press, 1995.

Clarke, A. A practical use of key success factors to improve the effectiveness of project management, **International Journal of Project Management**, 1999, 17, 3, pp. 139-145.

Dorf, R.C. (Ed), **The Technology Management Handbook**, CRC Press, 1999.

El-Sabaa, S., The skills and career path of an effective project manager, **International Journal of Project Management**, 2001, 19, pp. 1-7.

Evans, A. **Benchmarking, Taking Your Organisation Towards Best Practice**, The Business Library, 1994.

Gardiner, P.D. and Stewart, K., Revisiting the golden triangle of cost, time and quality: the role of NPV in projet control, success and failure, **International Journal of Project Management**, 2000, 18, pp. 251-256.

Grant, R. M., **Contemporary Strategic Analysis** 3rd Ed. Blackwell Publishers in Massachusetts, USA 1998.

Hunt, J.B. and Wallace, J., A competency-based Approach to Assessing Managerial Performance in the Australian Context, **Asia Pacific Journal of Human Resources,** 1997, 35, (2), pp. 52-66.

Ilgen, D.R. and Favero, J., Limits in generalization from psychological research to performance appraisal process, **Academy of Management Review**, April, 1985, pp. 47-56.

Kasilingam, R.G., **Logistics and Transportation, Design and Planning**, Kluwer Academic Publishers, London. 1999.
Katz, R.I., Skills of an effective administer, **Harvard Business Review**. Business Classics: Fifteen Key Concepts for Managerial Success, 1991.

Kerzner, H., **Project Management: A systems approach to planning, scheduling and controlling**, 6th Ed. John Wiley, New York,1998.

Kerzner, H., **Applied Project management: Best practices on Implementation**, New York, John Wiles & Sons, 2000.

Lock, D. Book Review on Benchmarking**, International Journal of Project Management**, 2001, 19, pp. 231-254.

Meredith, R. Posner, B.Z. and Mantel, S.J., **Project Management: A Managerial Approach**, New York, John Wiley, 1995.

Meredith, R. and Mantel, S.J., **Project Management: A Managerial Approach**, Fourth Edition, New York, John Wiley, 2000.

Muir, J. **DMO Benchmarking,** Defence Materiel Organisation, Canberra, 2000.

Nicholas, J**. Project Management for Business and Technology, Principles and Practices**, 2nd Ed. Prentice Hall, 2001.

Project Management Institute, **Guide to Project Management Body of Knowledge**, Pennsylvania, PMI. 2000 Edition. PYMBOK, **www.pmi.org**.

Razmi, J. The application of graphical techniques in evaluating benchmarking partners, **Benchmarking: An International Journal**, 2000, 7, 1-7.

Watson, Gregory H., 1993, **Strategic Benchmarking**, How to Rate Your Company's Performance against the World's Best, John Wiley & Sons, New York.

Wysocki, R., Beck, R. and Crane, D., 1995, **Effective Project Management** 2nd Ed. John Wiley, New York.