LEARNING BY EXPERIENCE IN THE PROJECT-BASED ORGANIZATION

J. RODNEY TURNER, ANNE KEEGAN AND LYNN CRAWFORD

ERIM REPORT SERIES *RESEARCH IN MANAGEMENT*	
ERIM Report Series reference number	ERS-2000-58-ORG
Publication	December 2000
Number of pages	26
Email address corresponding author	Turner@few.eur.nl
URL (electronic version)	http://www.eur.nl/WebDOC/doc/erim/erimrs20001219091359.pdf
Address	Erasmus Research Institute of Management (ERIM) Rotterdam School of Management / Faculteit Bedrijfskunde Erasmus Universiteit Rotterdam PoBox 1738 3000 DR Rotterdam, The Netherlands Phone: # 31-(0) 10-408 1182 Fax: # 31-(0) 10-408 9640 Email: info@erim.eur.nl Internet: www.erim.eur.nl

Bibliographic data and classifications of all the ERIM reports are also available on the ERIM website:
www.erim.eur.nl

ERASMUS **R**ESEARCH **I**NSTITUTE OF **M**ANAGEMENT

REPORT SERIES

RESEARCH IN MANAGEMENT

BIBLIOGRAPHIC DATA AND CLASSIFICATIONS		
Abstract	This paper describes how project-based organizations use structured experience to aid the learning and development of individuals, and how they capture their experience of projects to feed that back into the improved management of future projects and the experiential learning of individuals. We show that successful project-based organizations ensure their project managers obtain a broad range practical experiences following a spiral staircase career. This takes them through lead design and project team leadership and management roles. These organizations also capture project experience through post completion reviews, and codify them in company procedures which are used as part of the development of new project managers and other professionals.	
Library of Congress Classification (LCC)	5001-6182	Business
	5546-5548.6 5548.7-5548.85	Office Organization and Management Industrial Psychology
	HD 58.82	Organizational Learning
Journal of Economic Literature (JEL)	M	Business Administration and Business Economics
	M 10 L 2	Business Administration: general Firm Objectives, Organization and Behaviour
	L 22	Firm organization
European Business Schools Library Group (EBSLG)	85 A	Business General
	100B 240 B	Organization Theory (general) Information Systems Management
	100 X	Organization Development
Gemeenschappelijke Onderwerpsontsluiting (GOO)		
Classification GOO	85.00	Bedrijfskunde, Organisatiekunde: algemeen
	85.05 85.08	Management organisatie: algemeen Organisatiesociologie, organisatiepsychologie
	85.08	Organisatiesociologie, organisatiepsychologie
Keywords GOO	Bedrijfskunde / Bedrijfseconomie	
	Organisatieleer, informatietechnologie, prestatiebeoordeling	
	Projectmanagement, Lerende organisatie, Kennis	
Free keywords	Tacit knowledge, explicit knowledge, experiential learning, procedures, benchmarking, project management support networks	
Other information		

LEARNING BY EXPERIENCE IN THE PROJECT-BASED ORGANIZATION

By
Professor J Rodney Turner and Dr Anne Keegan
Department of Business and Organization, Faculty of Economics,
Erasmus University Rotterdam
and
Lynn Crawford
Department of Design, Architecture and Construction
University of Technology, Sydney

Institution Address

Address: Department of Business and Organization
Faculty of Economics
Erasmus University Rotterdam
Room H15-3
Burgemeester Oudlaan, 50
3062 PA Rotterdam
The Netherlands

Tel: +31-(0)10-408-2723
Fax: +31-(0)10-408-9169

E-mail: turner@few.eur.nl
keegan@few.eur.nl
lynn@aipm.com

Corresponding Author:

Address: Professor J Rodney Turner
Wildwood
Manor Close
East Horsley
Surrey, England
KT24 6SA

Tel: +44-(0)1483-282 344
Fax: +44-(0)1483-284 884

E-mail: jrttgl@cs.com

LEARNING BY EXPERIENCE IN THE PROJECT-BASED ORGANIZATION

By
Professor J Rodney Turner and Dr Anne Keegan
Department of Business and Organization, Faculty of Economics,
Erasmus University Rotterdam
and
Lynn Crawford
Department of Design, Architecture and Construction
University of Technology, Sydney

ABSTRACT

This paper describes how project-based organizations use structured experience to aid the learning and development of individuals, and how they capture their experience of projects to feed that back into the improved management of future projects and the experiential learning of individuals. We show that successful project-based organizations ensure their project managers obtain a broad range practical experiences following a spiral staircase career. This takes them through lead design and project team leadership and management roles. These organizations also capture project experience through post completion reviews, and codify them in company procedures which are used as part of the development of new project managers and other professionals.

Key words: Tacit knowledge, explicit knowledge, experiential learning, procedures, benchmarking, project management support networks

INTRODUCTION

Plato begins the dialogue *Meno* with Meno asking Socrates the question:

> *Can you tell me, Socrates, whether virtue is acquired by teaching or by practice; or if neither by teaching nor by practice, then whether it comes to man by nature, or in what other way?* Jowett 1999.

This question recognizes that individuals learn through formal education and experience. In the dialogue, Plato suggests that learning obtained through formal education is *knowledge*, the science of cause and effect, derived by philosophers, whereas learning obtained from experience is *"right opinion"*, the art of intuition, practiced by poets and statesmen. In *The Republic* and *The Laws*, (Jowett 1999), Plato says that experience is an essential part of the learning of any trade or profession. In *The Republic*, he further suggests that experiential learning should take place under the guidance of a skilled practitioner, ("sitting next to Nellie"), and that often formal learning should take place after experiential learning, (post-experience learning), so that the science can provide a framework for the experience.

Competence encompasses knowledge, skills, attitudes and behaviours that enable consistent delivery of desirable results (Boyatzis 1982; Heywood *et al* 1992; Frame 1999). It is also accepted that knowledge comprises explicit (objective, codified) knowledge gained primarily through formal education, and tacit (subjective, implicit) knowledge gained (amongst other ways) through experience, (Polanyi 1967, Nonaka and Takeuchi 1995). However, research shows that the majority (85%) of project personnel gain their knowledge, both explicit and tacit, through experiential learning, (Crawford and Gaynor 1999), because formal education is fairly immature in most societies (Turner and Huemann 2000). Furthermore, this knowledge must be gained at both the individual and organizational levels, (Gareis and Huemann 2000). However, many project-based organizations are failing to obtain experiential learning at both levels, (Pinto 1999, Gibson and Pfautz 1999). Pinto reports that many organizations repeatedly make the same mistakes on their projects, having failed as an organization to:

- capture their learning from successes and failures on past projects,
- expose apprentice project professionals to organizational learning gained through projects
- encourage project teams and professionals to reflect on their own experiential learning

On the other hand Gibson and Pfautz (1999) describe a success of turning around the management of IT projects within the R&D Department of SmithKline Beecham through the:

- formalization of the project management process
- adoption of post-completion reviews
- implementation of project management support and mentoring networks

In the classically managed organization (Morgan 1995, Huczynski 1996) individual and organizational learning is the realm of the functional hierarchy, (Turner and Keegan 1999). Functions own and maintain the firms' knowledge, and provide people with careers as they climb the ladder up the functional silo. In the process, the individuals are exposed to the practices of the function, and learn the organizations business through experience. Project-based organizations, in reducing the significance of the functions, lose their ability to act as repositories of experiential knowledge within the organization, and to provide experiential learning to individuals, (Turner and Keegan 1999, Pinto 1999, Gibson and Pfautz 1999).

In this paper, we report experiential learning practices used by successful project-based organizations, identified as part of a research project into the management of the project-based organization, (Turner and Keegan 1999). We define a project-based organization as:

> *an organization in which the majority of products made or services supplied are against bespoke designs for customers.*

In the next section we describe the role of experience in the development of the project management competence of individuals and organizations. We then describe our research project. In the next section, we consider how project-based organizations structure learning experiences for individuals, and why the eclectic nature of projects requires this experience to be broad and sweeping in nature, (spiral staircase career), rather than narrow and constrained, (climbing the ladder up the functional silo). We then describe how project-based organizations use procedures to capture experience from projects, and feed that back into the management of future projects, and into the developmental experience of individuals.

EXPERIENTIAL LEARNING IN PROJECT MANAGEMENT COMPETENCE DEVELOPMENT

Learning in organizations

Kolb (1984) defines learning as:

> *the process whereby knowledge is created through transformation of experience*.

Experience is the raw material of learning and knowledge creation, and the extent to which it contributes to competence development is dependent upon the structures and strategies used by individuals and organizations to learn by experience. Learning is more than acquiring new knowledge. Transformative learning involves the questioning of prior experience and values in a way that enables modification of ideas and behaviours (Mezirow 1997). Kolb's experiential learning cycle (Knowles *et al* 1998) (Knowles, Holton III et al. 1998) has become well accepted as a way of explaining the role of experience in learning, Figure 1.

The model shows that experience alone is not enough. It is socially constructed, specific to a particular firm or culture and can be conservative and unreliable (Dodgson 1993). Experience needs to be accompanied by structured reflection and observation from several perspectives, leading to abstract concepts and generalizations, enabling the learner to develop theories for performance improvement. The Kolb model highlights the importance of experiential learning in project-based organizations where the unique nature of projects means the ability to test implications of concepts in new situations is essential to competence development.

Learning from experience is complex and dependent upon the learner, the task and the context. Experiential learning and competence development, on the job, therefore requires an active partnership between the learner and the organization in which the experience takes place (Boud and Walker 1997). This includes the preparedness and skills of the individual in learning from experience, the work experiences, guidance, support, and encouragement provided by the organization and the project management competence and approach to transformative experiential learning of the organization in terms of its structures and systems.

Thus experiential learning is a key contributor to the competence development of individuals and organizations. The project management competence of organizations is dependant on that of individuals. Project competent organizations provide environments that foster and sustain competent project management teams and through them successful project outcomes. Considerable attention has been given to identifying the skills required by project management practitioners (Pettersen 1991; Thamain 1991), and there is general agreement that, to be effective, competence should encompass knowledge and understanding of:

- generic project management practices
- the technology of the project or project application area
- the organization(s) in which the project is located
- the market in which the organization(s) are operating

In addition, effective project personnel need leadership skills (Slevin and Pinto 1991) and what Frame (1999) describes as social competencies including teamwork, political, diversity, communication and listening skills.

Competence development of project personnel

The majority (85%) of project personnel have gained their knowledge, both explicit and tacit, through experiential learning. Most project personnel hold a qualification or first degree (Crawford and Gaynor 1999, PMI 1999), but(Crawford and Gaynor 1999; Project Management Institute 1999) project management degree qualifications are rare (Turner and Huemann 2000) and an international cross industry sample found that less than 15% of project personnel currently hold any form of project management certification or registration (Crawford and Gaynor 1999). Thus experiential learning is the only source of competence development of the vast majority of project personnel, and so if project-based organizations are not making a deliberate and sustained attempt to support the experiential learning of their project personnel, they will achieve the outcomes reported by Pinto (1999).

Professional associations have attempted to codify the pathway of project management competence development through standards and associated certification programs. Several standards have been developed to describe the practice of project management; to provide guidelines for those involved in managing projects; to provide commonly accepted definitions of terms and processes; and as a basis for assessment of aspects of project management competence for professional certification or registration. These include:

- A Guide to the Project Management Body of Knowledge (PMBOK® Guide, Duncan 1996)
- ICB: International Project Management Association (IPMA) Competence Baseline (Caupin *et al* 1999)
- Australian National Competency Standards for Project Management (AIPM 1996)
- PRINCE 2, (CCTA 1996).

The third of these was developed within the Australian Qualifications Framework, AQF, (Heywood *et al* 1992); and other performance based competency standards developed as part of the United Kingdom's National Vocational Qualifications, NVQ, (OSCEng 1997; MCI 1997; CISC 1997). There are other standards for project management, such as BS6079 (BSI 1996) and ISO10,006 (ISO 1998), but neither forms the basis for assessment or certification.

These standards focus on generic project management knowledge, skills and practices. They do not attempt to address technology, organization or market specific competence.

Apart from the IPMA ICB, the standards do not codify desirable personality characteristics that contribute to project management competence. The standards do not prescribe how project management competence should be developed, but the associated certification programmes do. Evidence of competence required by the certification programmes includes:

- evidence of academic and other qualifications (not necessarily in project management)
- exams (multiple choice, short questions, essays)
- self assessment
- interviews
- exercises, tasks and simulations
- evidence of experience (project report, record of experience, portfolio of competence)

Table 1 shows how this model of competence development matches the Kolb Learning Cycle. It shows where organizations studied by Pinto are failing to support the experiential learning of individuals (and the organization), and how the work of Gibson and Pfautz supported it.

Evidence of experience is consistently required by all certification programmes and is the key factor in determining the level of certification awarded. The most rigorous programmes in terms of evidence of experience are those with performance based competency standards, including the Australian National Competency Standards for Project Management (AIPM 1996) and the United Kingdom National Vocational Qualifications (OSCEng 1997; MCI 1997; CISC 1997). These require assessment of portfolios of competence by a registered workplace assessor. The experience requirement of professional certification programmes, and in particular those associated with performance based competency standards, highlight the important role of the organization in competence development and recognition. Unless project personnel work within project competent organizations that use accepted project management practices and provide developmental opportunities for staff, it will be difficult for them to provide the evidence of experience necessary to achieve professional certification.

Competence development of project-based organizations

Although, there are several accepted standards for aspects of project management competence of individuals, there are no equivalent standards for project management competence of organizations. This is currently being addressed by a global network, mobilised under PMI's Standards Program, to develop an Organizational Project Management Maturity Model (OPM^3) to help organizations improve the management of their projects and deliver what they have committed (Schlicther and Duncan 1999). Meanwhile, there is considerable agreement amongst writers and practitioners that corporate project management competence requires the following (Graham and Englund 1997; Hoffman 1997; Kerzner 1998; Frame 1999):

- Strategic alignment of projects
- Top management support
- An effective project management information system
- Clearly defined and well formulated project management procedures
- A plan for project management selection and development
- An effective internal project management community

Table 1 also shows how these support the Kolb Learning Cycle.

The first four of these building blocks of organizational project management competence involve strategic direction, and provision of supporting structures and systems. The last two focus on people and on organizational learning which can be described as:

> *the ways firms build, supplement and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency by improving the use of the broad skills of their workforces* (Dodgson 1993).

Thus, experiential learning is considered to be the main vehicle for project management competence development of individuals and organizations. Experiential learning of individuals should be structured within competent project-based organizations and relevant contexts. Organizations need plans for project management selection and development, within a supportive project management community. To develop its own competence, the organization needs to develop competent individuals, and effective project management systems and procedures. We now see how the project-based organizations we have observed achieve these ends. We describe our research project, and then describe our observations.

OUR RESEARCH PROJECT

Table 1 shows how the project management literature and professional associations suggest project-based organizations should support the learning and development of both the organization and individuals in the organization, and where in some instances they are failing to do so. Through our study we wished to identify what practices project-based firms actually use, and particularly, recognizing that most project personnel achieve their learning through experience, how they support the experiential learning of both individual and organization. The basis for our study are in-depth semi-structured interviews with 44 members of 19 project based companies from 8 countries and 3 continents. Firms interviewed included:

a. EPC (engineering procurement and construction) contractors and sub-contractors from the water, energy, transport and telecommunications industries (WETT)
b. Equipment and solutions suppliers from information systems and technology (IS/IT)
c. Manufacturers of electro-mechanical and electronic equipment
d. Clients from IS&T, including a supplier of financial data and the IS department of a bank

On the basis Table 1 we developed research questions to be explored in interviews with these firms. We proceeded on the basis of 'theoretical sampling' (Glaser & Strauss 1967), choosing firms that could illuminate the theoretical issues we identified. Where necessary, we returned to companies and individual interviewees to expand on important emerging themes. As part of our sample, we interviewed project managers, department/function managers, human resources specialists, senior executives, and others.

Boundaries of the term 'project-based firm'

Following Archibald (1992) we conceptualize project based firms in two ways: firstly as firms whose work consists primarily of projects (Type 1 firms) and secondly as firms who although are mainly operationally oriented, undertake projects as an important part of their overall activities (Type 2 firms). In the list above, firms from groups a, b and c are all Type 1 firms: all of their work is oriented towards projects. Quotes from respondents illustrate this:

Projects are the key factor for [our company]…..the company and its success depends on all projects, not just one.

Projects are the centre of gravity….the value added for [our company] is in managing projects. Increasingly, it is also more than that. It is managing projects so that clients get quicker completion, more creative processes, better managed projects.

In Type 2 firms, projects support and improve ongoing operations and standard forms of work organization. Examples of Type 2 firms from our study are the project office of a large bank, as well as the project division a major telecommunications firm. In the latter, projects are achieving an ever higher profile. The company recently underwent a major reorganization, dubbed 'reorganization by projects'. Projects are the vehicle the company uses to attack new market spaces, realign its offerings with customer demands, and pursue technological innovations. Although routine operations are a vital part of this company, so too are projects.

In the event all of our research results relate to Type 1 organizations only, that is projects from groups a, b and c above. In the other organizations, Type 2, the development practices are aligned with the functional core of the organization.

Research questions

The questions we wished to answer through our research were:

1. What practices do project-based organizations adopt to select and develop project personnel, how do those practices support Kolb's experiential learning cycle, and how do they relate to the certification processes of project suggested by the project management literature and professional associations?
2. What practices do project-based organizations adopt to develop the organizations's knowledge of project management, how do those practices relate to Kolb's experiential learning cycle, and how do they retain that knowledge?
3. What role does the functional hierarchy, if it exists, play in the development of individuals and the retention of knowledge in project-based organizations?

Potential generalizability

Our choice of methodology and aims mean that we cannot be certain how generalisable our data are to other project-based firms. Our goal is theory development through inductive methods. We adopted a strategy of 'theoretical sampling', (reference), and chose our research partners because they could illuminate aspects of the theoretical framework and research questions. The evolving nature of this research design and the search for cases to expand on and enlighten previous data means replicability may be limited. To ensure inter-rater reliability in terms of coding the data, finding themes, and assessing prevalence of practices, both researchers analyzed the interview notes and field notes separately, coming together during the development of the study to compare themes and interpretation of the data. Meetings took place after each set of interviews during which we revised and refined the ideas, deciding where next to proceed in the study, who to interview, what questions to ask, what themes to explore, etc. As our understanding of innovation in project based firms increased, we identified new companies and new issues to explore.

Analysis and interpretation

Each new interview yielded research materials such as interview notes and secondary source material that we independently, and then later together, analyzed. During these phases we brought order to the data, organizing it into categories, themes and basic units of description (reference). During periods of joint analysis, and as a process of moving between the data and theoretical issues we also began to attach meanings and significance to the analysis, explaining descriptive patterns and looking for relationships and linkages among the descriptive dimensions. Gradually, we organized all of the data into categories and descriptive units. Several broad trends and patterns emerged during the interviews and appeared to effect all the firms.

The question of success

We wished to study development practices in "successful" project-based organizations. However, we have not attempted to define or measure quantitative criteria for success. However, we selected forms for our study that can be said to be successful against the following criteria:

- All the firms are profitable
- Many of the firms have significant longevity. All of those in group a above are at least 50 years old.
- Most are considered to be market leaders.

OBSERVATIONS ON THE EXPERIENTIAL LEARNING OF INDIVIDUALS

We have observed different experiential learning practices in organizations from different industries. In reporting individual development practices we mainly on organizations drawn from groups a and b above, namely:

- The Engineering Construction Industry (ECI) with a long history of project-based management
- High Technology Industries, including computers and telecommunications, some of which are more recent entrants

Main Contractors from the Engineering Construction Industry

In companies with a long history of project-based management, considerable effort is devoted to the training and development of project managers. We have spoken to several main contractors from the ECI with 50 years' history of undertaking contracts for clients. The ECI entails predominately mechanical construction of process plant in the oil, gas, petrochemical and power industries. The size of contracts ranges from $US 100 million to $US 2 billion, and the work is often undertaken for large companies, including oil companies and utilities. The contracts usually have tight margins, so companies that have been in business for 50 years can be considered successful. Several features typify project managers and their development in the ECI:

(a) It can take fifteen years to develop a project manager capable of managing a $US 100 million contract, and twenty-five years to develop a project director to manage a $US 1 billion contract. Potential project managers and directors are often identified in their mid twenties and developed over these periods.

(b) Project managers are viewed as a key, value-adding resource, providing firms with their main competitive edge. Several respondents mentioned the ability to add value for clients as a key competence for project managers. (There has been a shift in emphasis in the industry from reducing costs to enhancing value). For these reasons, project managers are highly valued and have the longest tenure with these firms.

(c) Most of the senior executives and directors of these firms are former project managers or directors.

Identifying and recruiting potential project managers

Potential project managers are usually drawn from the ranks of design engineers. The methods of selecting them are primarily ad-hoc, the managers of project managers acting intuitively when deciding who will make good project managers within the industry. A variety of criteria emerge as bases for identifying potential project managers. One respondent mentioned that a key criteria was:

people who are vocal with their ambitions

However, different skills are required of project managers for different types of project. Partington (1997) reports that one company from the industry used a highly regarded project manager who had managed many successful projects for clients to manage an internal change project. The management style successful on site was less copmfortable for managing internal stakeholders whose working practices he was trying to change.

Another impact on the recruitment and selection of project managers is the cyclic nature of the industry, and the fact that design engineers come and go. Some are recruited directly from university, but many join the firms to work on specific contracts. They tend to be drawn for the firm's network of previous project workers and broader industry contacts. There are few formal selection and recruitment practices in evidence in the firms we have studied. However, experience derived from past projects is often used as a critical indicator to decide whether people fit with the culture of the organization.

People identified as potential project managers are often put onto both formal and informal development programmes. Formal programmes comprise structured training and education, some with certification. Informal programs comprise mentoring by senior project managers who observe the progress of high potential candidates. Another common, informal practice is the deliberate engineering of appropriate experiences. Considerable effort is made to retain these people as project management is viewed as the key skill within these organizations.

Development of Future Project Managers – The Spiral Staircase Career

The role of project managers in the ECI is viewed as being very eclectic, requiring knowledge and experience of:

- management of the project process
- management of contractual relationships with clients, suppliers and sub-contractors
- management of the technology
- management of people in the project team
- management of the business
- management of different cultures for international projects

A broad range of experiences are required for future project managers. It is not possible to develop them by restricting their experiences to one function. Thus, rather than seeing project managers climbing the ladder up the functional silo, they have broad, sweeping careers, being exposed to a number of functions, perhaps moving back to functions they have fulfilled before in a more senior role. We have labelled this the *spiral staircase career*, (Keegan and Turner 2000). During their career, a future project manager may spend time as:

- a design engineer in the early stages
- a lead engineer of a design team, starting as a lead engineer on a small project and progressing to larger projects, perhaps after an interval elsewhere
- manager of the design function
- a project engineer or contract engineer on a project, progressing to larger projects at later stages
- an assistant project manager, then a project manager on small project , project manager on larger projects, and eventually project director

A future project manager can spend time as manager of the design function, whose role includes:

- maintaining the firm's design standards
- assigning design engineers and lead engineers to projects
- mentoring engineers in the function and assisting in identifying their development needs

In most of the companies we spoke to, the manager of the design function may not necessarily be the most senior person in the department. A highly experienced lead engineer may be on a higher grade than the departmental manager. However, it is accepted that they have different roles to fulfil, and they respect each other's position.

Managing the Process of Developing Individuals

Although considerable effort is put into the development of project managers, like many things relating to their careers in this industry, the process tends to be fairly ad-hoc. The process is managed in two ways:

- through mentoring by the design department manager
- by an informal committee planning future requirements

While an individual is working as a design or lead engineer, they have an annual review with their departmental manager. Through that review they identify future career aspirations, and development needs, including training or work experiences. Having identified work experiences required, opportunities are sought to satisfy those. The firms tend to maintain an informal committee of senior project managers and project directors, who plan the future requirements for project managers, and track development of people in the firm. They too seek out opportunities to match the development needs of specific individuals. The dilemma many firms face is between keeping somebody working on their current project or moving them to the appropriate career opportunity that has just arisen. The solution is not easy. Nobody is indispensable, and so often someone will be moved to the new project that provides them with the development opportunity they need. This may create an opportunity for another individual to replace them in the vacancy created. However, if a project is at a critical stage, then the person may be retained on the project, and the opportunity will be lost.

The Role of Formal Tuition

Courses for project managers are seen as an essential part of their development, but training tends to be post-experience. Project managers are given experience on the job, and then sent on courses to enhance their understanding. New recruits, and new project engineers are expected to work closely with the company's project and quality procedures. Thus they are given formal guidance, on the job, about the correct ways of working within the context of the company's projects. Later they are given formal tuition into the knowledge behind those procedures. Early training will be provided in the company, and will relate to the firm's ways of working. Later training will be more specific to the individual. It may be provided by courses from an industry provider, such as the Construction Industry Institute (in the US), the European Construction Institute (in Europe), or the Engineering Construction Industry Training Board, (in the UK), or it may be via a university masters course.

The role of functions

These organizations tend to create a project organization project-by-project, (Turner and Keegan 2000). The knowledge of the organization is retained within a functional structure, from which the projects draw resources. Thus the functional organization is significant both as a reporitory of knowledge for the organization and as a competence pool for projects.

High Technology Industries: Knowledge-based Firms

In high technology industries, the process of training and developing project managers tends to be more formal. Formal education and training, often linked to certification, plays a much more significant role. Many of these organizations view themselves as knowledge-based firms, and they often have a strong project focus, and in some cases functions have been eliminated entirely. In these situations, experiential learning poses unique challenges. Practices we have observed are:

- pairing of project personnel
- a strong emphasis on certification
- the use of project mentoring and support networks

A project-focus and the absence of functions

One firm we interviewed, the Viennese subsidiary of a global company, had a strong project focus, having eliminated functions entirely. Experiential learning takes place entirely within projects. The firm provides bespoke computer and information technology systems. They employ approximately 200 people in Vienna serving the needs of mainly Austrian clients. They have abandoned functional departments in the largest and most strategically important area, the Information Systems Group, ISG, and adopted a fully project based way of organizing. Employees within ISG are allocated to projects, which when completed are disbanded. The employee is immediately allocated to another project. There are no functional departments to which people belong and around which they form an identity.

The elimination of functions and the creation of the purely project-based firm have advantages, including the reduction of overheads associated with functional departments. However, there are disadvantages when functions are de-emphasized or eliminated. People may feel somewhat lost, lacking a 'place' to hang their hat, or constancy in terms of the people with whom to work. We call this 'no home *syndrome'* (Keegan and Turner 2000). There is also no where in the organization that acts as repositories of learning. The Viennese subsidiary above could only do it because they received support from the European head-office, including centres of excellence, which we shall discuss next.

Pairing in the absence of 'Nellies'

A common practice adopted in this industry to overcome the leaking away of valuable knowledge and experience and to aid individual learning is the practice of 'pairing'. Where feasible, firms assign additional people on a project so two people are available to do the same job (two systems administrators, two programmers). The rationale is to allow people to work together on similar tasks, especially new ones, so each person can learn alongside another and the knowledge can be captured through their communication. In a supplier of business and financial data products, we have uncovered a pattern of innovation that relies heavily on the simultaneous and unplanned creativity of employees, (Keegan and Turner 1999). This pattern of innovation and learning is shaped by the complex and unpredictable nature of the firm's markets for which there are few standards, and even fewer guidelines. Firms such as these use a variety of 'memory carriers' (Van der Bent *et al* 1998) such as the INTRANET, project review procedures and formal and informal meetings to capture learning independently of individuals, as we shall discuss in the next section.

The practice of pairing people on projects reflects another feature of the industry. While "sitting next to Nellie" has been a classic training and learning practice for decades, there are very few Nellies in High Technology companies. So rapidly changing are the technologies and solutions that these firms offer to clients, there are few people experienced enough in the organization with whom newcomers can be paired to provide mentoring and coaching opportunities. 'Nellies' are created by pairing people who learn from one another through experimentation, rather than transfer of learning from an experienced individual to an apprentice. Although there may be some redundancy, there is a greater chance that knowledge will be captured more effectively than if a person works alone. This system also ensures that knowledge is developed and learning captured continuously over the timescale of the project instead of simply at the end. The widespread use of mentoring as a form of training in recent years reflects the importance of ongoing learning and development in a changing environment.

Certification

Perhaps the absence of prior history is also evident in the strong emphasis high technology firms place on certification of project managers. The majority of people seeking certification from the Project Management Institute of North America are from the IS/IT industries, (Crawford and Gaynor 1999, PMI 1999), and many organizations from the industry use it as a key step in measuring the development of project personnel, including those from our sample.

Project support and mentoring networks

Another common practice, reflecting the rate of change in the industry is the use of project support and mentoring networks, (Gibson and Pfautz 1999). A common practice is a quarterly or monthly gathering of project managers, at which they hear about development in the management of projects, providing an opportunity to share meet with other project personnel, and thereby share experiences. These were most evident in the IS/IT industry, but are in fact used by firms from across our sample. The form they take may vary, including:

- a quarterly conference held by an EPC contractor from the telecommunications industry
- an informal, quarterly dinner-lecture held by the projects group of a Dutch bank
- membership of the European Construction Institute for EPC contractors from the Engineering Construction Industry, the ECI providing regular meetings

Summary

Table 2 summarizes our findings for practices adopted for the experiential learning of individuals, showing how they relate to Kolb's experiential learning cycle, and what the certification programmes look for.

OBSERVATIONS ON THE EXPERIENTIAL LEARNING OF ORGANIZATIONS

In the absence of functions, individual learning is useless without practices to ensure the firm owns and retains knowledge. The firm can engage in formal learning, with the maintenance of company libraries, for instance. But it must adopt experiential learning practices to learn how to manage the unique features posed by its projects, and gain performance improvement. Not only do many of the firms interviewed put significant effort into the development of project managers, they also put effort into their development as organizations. Capturing, recording and disseminating experience are key to developing organizational competence, and feeding that into the development of project managers and other project management professionals. Practices observed which organizations use to capture experience include:

- the use of internal project management procedures
- end of project reviews
- benchmarking
- project management self-support groups or conferences
- the use of the INTRANET
- moving people around the organization
- the development of people

The use of Internal Project Management Procedures

Internal project management procedures are a key way organizations capture knowledge and experience. Many of the companies in our sample use them to capture best practice within the firm. They are the collective representation of the firm's experiences. Most Project Management Maturity Models map increasing maturity through the use of procedures and their consolidation within the organization, (Ibbs and Kwak 1997).

Most organizations treat the procedures as flexible guidelines, to be tailored to meet the needs of individual projects. One firm from the engineering construction industry told us that new recruits and new project personnel are told to follow the internal procedures strictly on their first project (when they will be in a support role – sitting next to Nellie). On the second and subsequent projects, they can gradually reduce the amount they refer to the documentation, as they internalize the firm's good practice. They are also allowed to adapt the procedures to the needs of the individual projects as their experience of the correct ways of working grows.

Ericsson have a procedure called PROPS, which should be used on all projects, although it is not mandatory. PROPS is designed to be tailored to the needs of individual projects, particularly to the size of project, (see Payne and Turner 1999). PROPS represents good practice within Ericsson, but that good practice is flexible enough to be adapted to the size and type of project. PROPS is being continually updated to reflect new experiences, and the changing technology and nature of projects. It was first published in 1987, and is now in its third edition. There is a product development manager for PROPS is located in Ericsson's project management headquarters within Stockholm.

The United Kingdom's government has developed its internal project management procedure, PRINCE 2, (CCTA 1996). This was originally designed for information systems projects, but the second edition was designed with a greater business focus. PRINCE 2 certification is becoming mandatory to bid for many projects in both the public and private sector in the UK. In this way the government is contributing to not only the increasing competence of public sector projects through the capturing of best practice, but also to the increasing project management competence of the society, (Gareis and Huemann 1999). Organizations which have not captured their own experience in project procedures are able to use industry standard procedures, such as PRINCE 2 and ISO 10,006, (ISO 1998). ISO 10,006 is largely based on the PMI Guide to the Body of Knowledge, (Duncan 1996).

There are apocryphal stories of people applying PMI's Guide to the PMBoK® to the letter on every project, and their project performance falls. This is not a fault with PMI's PMBoK®, but with the way it is being applied. Every project is different, and so every project requires a unique procedure (Payne and Turner 1999). The standard procedures represent captured experience and best practice, but they do need to be tailored project by project. Hopefully that tailoring is marginal, but it needs to be consciously done. It is part of a project manager's tacit knowledge built up through their own experiences that enables them to know how and where the procedures need to be tailored to the needs of individual projects. People who have the lack of maturity that makes them want to follow procedures to the letter should not be allowed to practice as project managers.

End of Project Reviews

End of project reviews play a vital part in capturing experience within organizations. PRINCE 2 and ISO 10,006 suggest a review be conducted at the end of every project, and company standard procedures updated to reflect that learning. Ericsson's PROPS procedure also requires this, as does ABB's internal procedure. Most Project Management Maturity models show at the higher levels of maturity that organizations continually benchmark their procedures and processes, gathering data about project performance, storing that as historical data to help plan future projects, and thereby improving overall project performance.

However, our data reveals less than satisfactory use of end project reviews. When asked how and whether these reviews are used to capture individual learning and enhance organizational learning, the answer is "Not a lot!" Many organizations find the practice very difficult to enforce, and where it is enforced, it becomes a meaningless box-ticking exercise. An IS/IT contractor in New Zealand told us that the post-completion reviews were an essential part of their quality assurance procedures, but that there was no check on the quality of the outputs from that step. Further, where reviews are conducted, it can be very difficult to transmit the learning to the rest of the organization. There are two problems (Keegan and Turner 2001):

1. A project may last for several years. Valuable learning experiences take place at the beginning of the project, but are not captured until the post-project review at the end, if at all. This problem has been observed in most of the companies taking part in our study.

2. When learning is successfully captured in post-project reviews, it needs to be transmitted to the rest of the organization (Nonaka & Takeuchi 1995). Updating internal procedures may achieve that. However, it may be several years between issues of the procedures, delaying distribution of the learning. A more subtle problem is how to ensure people are working to the current version. People become less reliant on the procedures as their experience grows, so they may not quickly assimilate the new issues. . We discuss below practices adopted by organizations to distribute learning in other ways.

Benchmarking

Another way of learning is by benchmarking project performance. It is usually not effective to benchmark projects internally, because in doing so the firm will be comparing like performance with like performance. It is essential to benchmark against projects undertaken by other firms within the industry. Gareis and Huemann (1998) describe benchmarking of high technology companies and projects, and in (1999) how they plan to benchmark the project oriented society. The European Construction Institute and the Construction Industry Institute of the United States are conducting a benchmarking exercise for the ECI in the two continents, and have about 4000 projects in their database. None of our sample firms have specifically mentioned benchmarking. However, we know that Unisys in Vienna are part of Gareis and Huemann's programme, and all of our sample from the engineering construction industry are part of the ECI/CII programme.

Practices adopted by Project-based Organizations to distribute Experiential Learning

We saw that there can be a delay between learning experiences being gained on projects and being captured in post completion reviews or project benchmarks. Further delays occur between the experiential learning being captured and recorded in the internal project procedures and the dissemination and adoption of the new procedures. Successful project-based organizations adopt many practices to ensure the learning experiences are gained by the organization at large before they are eventually reflected in the procedures.

Centres of Excellence and International Programmes

Many of the companies we studied are international companies with operating arms in many countries. These organizations all institute international mechanisms for retaining learning and disseminating that learning throughout the company. There are two main practices. Firstly, there are international centres of excellence in specific project processes (such as bid management). Secondly, there are international programmes on issues of specific importance to companies at a given time (such as Y2K programmes). These international centres offer advice to operating companies and record changes in 'company ways of doing things'. For example, within Ericsson, the Project Management Institute is Stockholm is responsible for maintaining their PROPS procedure and running their quarterly conference discussed next. A similar group also exists within ABB, also based in Sweden. Where local deviations are examined and determined to be successful, the Centres of Excellence will codify these, provide training, and retain the learning within the company. The programmes operate in a similar manner. They determine what operating companies affected should be doing in terms of best practices.

Project Management Self-support Groups or Conferences

Many organizations run project management self-support or mentoring groups. Ericsson has a quarterly conference attended by project managers from around the world. As well as general papers describing current developments both within Ericsson and outside, they give delegates opportunities to make smaller paper presentations to describe their own experiences. ABB run a similar conference twice a year. The Dutch Bank, ABN-AMRO, run a quarterly afternoon meeting in Amsterdam for their Dutch staff. An internal or external speaker makes a presentation, followed by questions and answers. There is then a buffet supper to give staff members an opportunity to network and exchange experiences. The Benelux Region of the Engineering Construction Institute provides similar opportunities for the ECI as a whole within the Benelux Countries.

Many organizations provide more formal mentoring. One company with an extensive array of mentoring practices is the Dutch Consultancy Pink Elephant. Mentoring is an integral aspect of their career development and knowledge management.

The use of the INTRANET

Many organizations are now experimenting with the use of the INTRANET. Java based project-management software is becoming common-place, as is the use of e-rooms. Ericsson have developed the concept of e-rooms. Many projects have a virtual project office on a central server. Project plans, progress reports, issues registers, etc are posted in the e-project office. The system is supported by a powerful search engine. If someone has a similar project, or problem, they can search and interrogate existing or completed projects. It is up to the person with the problem to search. This is different to what Digital did in the early 1990s. Then a person with a problem would e-mail everybody else in the organization, and it was up to the person with the solution to respond. This often did not work because the people with the solutions were too busy. In Ericsson, it takes project managers no longer to develop and maintain plans and issues register in the e-room than elsewhere. Another tactic is to award people points when the post information in the central e-room, and to charge them for accessing it. In that way people are encouraged to keep the information in the e-room current.

Moving People around the Organization

Finally, a technique used for spreading experience is to move people around the organization. By posting people in another town or country, experience is transferred as people make contacts with new colleagues. This is a slow method of transferring experience, but it is effective. One of the people we interviewed in Ericsson had recently been transferred from the central project department in Stockholm to the Malaysian Office to take current best practice to Malaysia. Similar expatriate secondments are very common in the ECI.

The development of people

Finally, many organizations recognize project personnel as a key resource, and view the effort pu into the development of individuals as an investment in the organization's own learning. As the tacit knowledge of individuals is increased, the tacit knowledge of the whole organization increases by a process of osmosis, even if the individual subsequently leaves.

The role of functions

Most of the organizations we have interviewed have not eliminated functions. The functions remain in a central competence pool, to act as a service and supplier of resources to projects. Functions appear to be essential to the learning and development of individuals and organizations. As we have seen, there are various specialist forms of functions used, such as centres of excellence, including central project management development centres. Where functions have been eliminated, the firm is a subsidiary of a larger organization which retains functions and centres of excellence to act as repositories of knowledge for the subsidiary.

Summary

Table 3 shows how our observations compare with the theory of development of project-based organizations as presented in Table 1.

CONCLUSIONS

Explicit and tacit knowledge are both essential to the performance of individuals and of organizations. Both can be gained by the individual from on the job experience, and by the organization by capturing, recording and disseminating experiences from projects.

The majority of project personnel receive their learning through experience on the job, (Crawford and Gaynor 1999), and yet, as Pinto 1999 reports, many project based organizations are failing to support the experiential learning of individuals and of the organization. Reasons for this situation may include that:

1. project-based organizations, in reducing the significance of the functional hierarchy are reducing its ability to support experiential learning of individuals and act as repositories of organizational learning (Turner and Keegan 1999)
2. most societies are immature in the education they are able to provide to project personnel, (Turner and Huemann 2000).

In this paper we have reported on practices adopted by project-based organizations in supporting the experiential learning of individuals in the organization, and of the organization as a whole. Some of the organizations we have observed are over sixty years old, and so their practices have supported a lengthy history, and some have international reputations as successful firms. Hence we can conclude that against these criteria the firms observed can be judged as successful, and so the practices as those used by successful firms.

Practices adopted for structuring on the job experiences for individuals include:

- the spiral staircase career
- mentoring and career review committees and procedures
- on the job pairing
- project management support groups and networks
- pre- or post-experience tuition

Practices used by organizations to capture, record and disseminate project experience include:

- the adoption of standard project management procedures, (tailored for individual projects)
- post-project reviews
- benchmarking
- centres of excellence
- project support groups
- the use of virtual project offices
- moving people around the organizations

Most project-based organizations retain functions in a competence pool, to act as a service and supplier of resources to projects. There are various specialist forms of functions used, such as centres of excellence, including central project management development centres.

Firms that adopt these practices report superior project performance. Firms reporting poor project performance appear not to be using these practices.

REFERENCES

AIPM. 1996. *National Competency Standards for Project Management*. Spit Junction, NSW: Australian Institute of Project Management.

Archibald, R.D. 1992. *Managing High-Technology Programs and Projects*, 2nd edition. Wiley, New York.

Boud, David and Walker, David. 1997. *Experience and Learning in the Workplace: Reflection at Work*. Geelong, Victoria: Deakin University.

Boyatzis, Richard E. 1982. *The Competent Manager: a model for effective performance.* New York: Wiley.

BSI. 1996 *BS6079: Guide to project management.* London: British Standards Institute.

Caupin, Gilles, Knöpfel, Hans, Morris, Peter W. G., Motzel, Ernst, and Pannenbäker, Olaf. 1999. *IPMA Competence Baseline, Version 2.0.* Zurich: International Project Management Association.

CCTA. 1996. *PRINCE 2: Project Management for Business.* London: The Stationery Office.

CISC. 1997. *Raising standards: Construction Project Management: NVQ/SVQ Level 5*. London: The Construction Industry Standing Conference.

Crawford, Lynn and Gaynor, Fran. 1999. Assessing and developing project management competence. *Learning, Knowledge, Wisdom, Proceedings of the 30th Annual PMI Seminars and Symposium, Philadelphia*. Sylva, NC: Project Management Institute.

Dodgson, Mark. 1993. Organizational learning: a review of some literatures. *Organisation Studies.* **14**(3): 375-394.

Duncan, William R. 1996. *A Guide to the Project Management Body of Knowledge*. Sylva, NC: Project Management Institute.

Frame, J. Davidson. 1999. *Project Management Competence: Building Skills for Individuals, Teams and Organizations.* San Francisco: Jossey-Bass Publishers

Gareis, Roland and Huemann, Martina. 1998. International research project PM-benchmarking: benchmarking of the PM-process. *Project Management: Professional Magazine of the Project Management Association Finland.* **5**(1): 34-35.

Gareis, Roland and Huemann, Martina. 1999. IPMA Research: PM-competence of the project oriented society. *Project Management: Professional Magazine of the Project Management Association Finland.* **4**(1): 34-35.

Gareis, Roland, and Huemann, Martina. 2000. Project management competences in the project-based organization. *The Gower Handbook of Project Management, 3rd edition.* Ed Turner, J. Rodney, Simister, Stephen J. and Lock, Dennis. Aldershot: Gower.

Glasser and Strauss. 1967.

Gibson, Lesley R. and Pfautz, Susan. 1999. Re-engineering IT project management in an R&D organization – a case study. *Managing Business by Projects, Proceedings of the NORDNET Symposium, Helsinki.* Ed. Arrto, Karlos A., Kähkönen, Kalle, and Koskinnen, Kai. University of Technology Helsinki.

Graham, Robert J. and Englund, Randall L. 1997. Creating an Environment for Successful Projects: the Quest to Manage Project Management. San Francisco: Jossey-Bass Publishers.

Heywood, L, Gonczi, A and Hager, P. 1992. *A Guide to Development of Competency Standards for Professions.* Canberra: Australian Government Publishing Service.

Hoffman, Edward J. 1997. NASA project management: modern strategies for maximizing project performance. *Project Management Journal.* **27**(3): 4-5.

Huczynski, Andrzej A. 1996. *Management Gurus: what makes them and how to become one.* London: International Thomson Business Press.

Ibbs, C William and Kwak, Young-Hoon. 1997. *The Benefits of Project Management: financial and organisational rewards to corporation.* Sylva, NC: Project Management Institute.

ISO. 1998. *ISO10,006: Quality Management – Guidelines to Quality in Project Management.* Geneva: International Standards Organization.

Jowett, Benjamin. 1999. *The Essential Plato.* Book-of-the-Month Club.

Keegan, Anne and Turner, J Rodney. 2000. Managing human resources in the project-based organization. *The Gower Handbook of Project Management, 3rd edition.* Ed Turner, J. Rodney, Simister, Stephen J. and Lock, Dennis. Aldershot: Gower.

Keegan, Anne and Turner, J Rodney. 2001. *“”. Management Learning, special edition on Project-based Learning*, to apear.

Kerzner, Harold. 1998. *In search of excellence in project management: successful practices in high performance organizations.* New York: Van Nostrand Reinhold.

Knowles, Malcolm S., Holton, Elwood F. III and Swanson, Richard A. 1998. *The Adult Learner,.5th ed*, Houston, TX: Gulf Publishing Company.

Kolb, David A. 1984. *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.

MCI. 1997. *Manage Projects: Management Standards - Key Role G.* London: Management Charter Initiative.

Mezirow, Jack . 1997. *Transformative Learning: Theory to Practice.* San Francisco: Jossey-Bass Publishers.

Morgan, Gareth. 1997. *Images of Organization, 2nd edition.* Thousand Oaks, CA: Sage Publications.

Nonaka, Ikujiro, and Takeuchi, Hirotaka. 1995. *The knowledge-creating company.* New York: Oxford University Press.

OSCEng. 1997. *OSCEng Levels 4 and 5: NVQ/SVQ in (generic) project management*. London: Occupational Standards Council for Engineering.

Partington, David A. 1997. *PhD Thesis.* Cranfield University.

Payne John H and Turner, J Rodney. 1999. Company-wide project management: the planning and control of programmes of projects of different types, *International Journal of Project Management*, **17**(1): 55-60.

Pettersen, N. 1991. Selecting project managers: an integrated list of predictors. *Project Management Journal* **22**(2): 21-25.

Pinto, Jeffrey K. 1999. Managing information systems projects: regaining control of a runaway train. *Managing Business by Projects, Proceedings of the NORDNET Symposium, Helsinki.* Ed. Arrto, Karlos A., Kähkönen, Kalle, and Koskinnen, Kai. University of Technology Helsinki.

PMI. 1999. *The PMI project management fact book*. Sylva, NC: Project Management Institute.

Polanyi, Michael. 1967. *The Tacit Dimension*. New York: Doubleday Anchor.

Schlichter, John and Duncan, William R. 1999. Excellence through standards: an organizational PM maturity model. *PM Network.* **1999**(February): 18.

Slevin, Dennis P. and Pinto, Jeffrey K. 1991. Project leadership: understanding and consciously changing your style. *Project Management Journal* **22**(1):

Thamhain, Hans J. 1991. Developing project management skills. *Project Management Journal.* **22**(3): 39-44.

Turner, J Rodney and Huemann, Martina. 2000. Formal education in project management: current and future trends. *Connnections 2000, Proceedings of the 31st Annual PMI Seminars and Symposium, Philadelphia*. Sylva, NC: Project Management Institute.

Turner, J Rodney and Keegan, Anne. 1999. The versatile project-based organization: governance and operational control. *The European Management Journal.* **17**(3): 296-309.

Van der Bent, Jan, Paauwe, Jaap. and Williams, A. Roger T. 1998. Organizational Learning: An exploration of organizational memory and its role in organizational change processes. *RIBES Paper 9855*. Rotterdam Institute of Business Economic Studies, Erasmus University Rotterdam.

FIGURES AND TABLES

Table 1: Project management competence development and the Kolb Learning Cycle

Kolb Learning Cycle	*Certification requirements*	*Failures reported by Pinto (1999)*	*Success reported by Gibson et al (1999)*	*Organizational development*
Concrete experience	Project portfolio	To expose apprentice project personnel	Post completion reviews	Project manager development
Observation and reflection	Self assessment	To capture and reflect on experience	Post completion reviews Project support & mentoring networks	Project community
Abstract concepts	Exams	To capture experience and expose pm staff	Formalize project process	Information system Procedures
Testing of concepts	Interviews, exercises			
General				Strategic alignment Management support

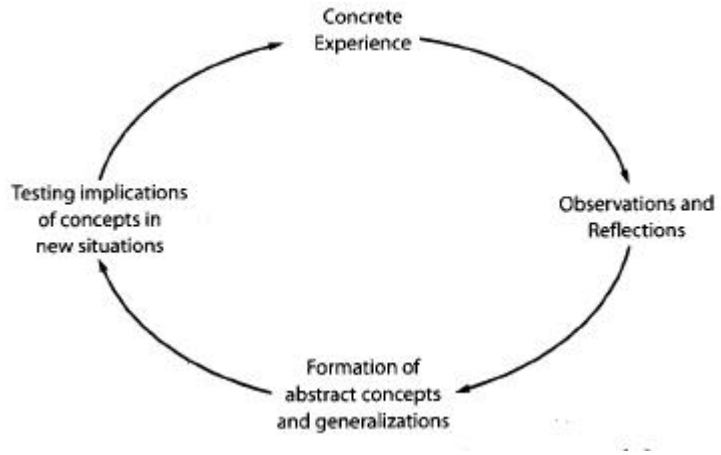
Table 2: Findings on the experiential development of individuals in the project-based firm

Kolb Learning Cycle	*Certification requirements*	*Selection in the WETT indsctries*	*Development in the WETT industries*	*Development in the IS/IT industry*
Concrete experience	Project portfolio	Does the face fit	Spiral staircase career Managed process	Pairing Certification
Observation and reflection	Self assessment	Overt ambition favoured	Spiral staircase career Support networks	Pairing Certification Support networks
Abstract concepts	Exams	Engineering qualifications favoured	Post experience training	Certification
Testing of concepts	Interviews, exercises	Staff used as contractors initially		Certification
General				

Table 3: Findings on the experiential development of the project-based organization

Kolb Learning Cycle	*Theory from Table 1*	*Theory observed*	*Theory not observed*	*Other practices observed*
Concrete experience	Project manager development	Yes		Pairing Overseas postings
Observation and reflection	Project community	Yes		Post completion review Benchmarking
Abstract concepts	Procedures Information system	Yes INTRANET		Centres of excellence
Testing of concepts				
General	Strategic alignment		No	
	Management support	Yes		

Figure 1: Kolb's Experiential Learning Cycle



ERASMUS **R**ESEARCH **I**NSTITUTE OF **M**ANAGEMENT

REPORT SERIES
RESEARCH IN MANAGEMENT

Publications in the Report Series Research* in Management

Impact of the Employee Communication and Perceived External Prestige on Organizational Identification
Ale Smidts, Cees B.M. van Riel & Ad Th.H. Pruyn
ERS-2000-01-MKT

Critical Complexities, from marginal paradigms to learning networks
Slawomir Magala
ERS-2000-02-ORG

Forecasting Market Shares from Models for Sales
Dennis Fok & Philip Hans Franses
ERS-2000-03-MKT

A Greedy Heuristic for a Three-Level Multi-Period Single-Sourcing Problem
H. Edwin Romeijn & Dolores Romero Morales
ERS-2000-04-LIS

Integer Constraints for Train Series Connections
Rob A. Zuidwijk & Leo G. Kroon
ERS-2000-05-LIS

Competitive Exception Learning Using Fuzzy Frequency Distribution
W-M. van den Bergh & J. van den Berg
ERS-2000-06-LIS

Start-Up Capital: Differences Between Male and Female Entrepreneurs, 'Does Gender Matter?'
Ingrid Verheul & Roy Thurik
ERS-2000-07-STR

The Effect of Relational Constructs on Relationship Performance: Does Duration Matter?
Peter C. Verhoef, Philip Hans Franses & Janny C. Hoekstra
ERS-2000-08-MKT

Marketing Cooperatives and Financial Structure: a Transaction Costs Economics Analysis
George W.J. Hendrikse & Cees P. Veerman
ERS-2000-09-ORG

---

* ERIM Research Programs:
LIS Business Processes, Logistics and Information Systems
ORG Organizing for Performance
MKT Decision Making in Marketing Management
F&A Financial Decision Making and Accounting
STR Strategic Renewal and the Dynamics of Firms, Networks and Industries

A Marketing Co-operative as a System of Attributes: A case study of VTN/The Greenery International BV,
Jos Bijman, George Hendrikse & Cees Veerman
ERS-2000-10-ORG

Evaluating Style Analysis
Frans A. De Roon, Theo E. Nijman & Jenke R. Ter Horst
ERS-2000-11-F&A

From Skews to a Skewed-t: Modelling option-implied returns by a skewed Student-t
Cyriel de Jong & Ronald Huisman
ERS-2000-12-F&A

Marketing Co-operatives: An Incomplete Contracting Perspective
George W.J. Hendrikse & Cees P. Veerman
ERS-2000-13– ORG

Models and Algorithms for Integration of Vehicle and Crew Scheduling
Richard Freling, Dennis Huisman & Albert P.M. Wagelmans
ERS-2000-14-LIS

Ownership Structure in Agrifood Chains: The Marketing Cooperative
George W.J. Hendrikse & W.J.J. (Jos) Bijman
ERS-2000-15-ORG

Managing Knowledge in a Distributed Decision Making Context: The Way Forward for Decision Support Systems
Sajda Qureshi & Vlatka Hlupic
ERS-2000-16-LIS

Organizational Change and Vested Interests
George W.J. Hendrikse
ERS-2000-17-ORG

Strategies, Uncertainty and Performance of Small Business Startups
Marco van Gelderen, Michael Frese & Roy Thurik
ERS-2000-18-STR

Creation of Managerial Capabilities through Managerial Knowledge Integration: a Competence-Based Perspective
Frans A.J. van den Bosch & Raymond van Wijk
ERS-2000-19-STR

Adaptiveness in Virtual Teams: Organisational Challenges and Research Direction
Sajda Qureshi & Doug Vogel
ERS-2000-20-LIS

Currency Hedging for International Stock Portfolios: A General Approach
Frans A. de Roon, Theo E. Nijman & Bas J.M. Werker
ERS-2000-21-F&A

Transition Processes towards Internal Networks: Differential Paces of Change and Effects on Knowledge Flows at Rabobank Group
Raymond A. van Wijk & Frans A.J. van den Bosch
ERS-2000-22-STR

Assessment of Sustainable Development: a Novel Approach using Fuzzy Set Theory
A.M.G. Cornelissen, J. van den Berg, W.J. Koops, M. Grossman & H.M.J. Udo
ERS-2000-23-LIS

Creating the N-Form Corporation as a Managerial Competence
Raymond vanWijk & Frans A.J. van den Bosch
ERS-2000-24-STR

Competition and Market Dynamics on the Russian Deposits Market
Piet-Hein Admiraal & Martin A. Carree
ERS-2000-25-STR

Interest and Hazard Rates of Russian Saving Banks
Martin A. Carree
ERS-2000-26-STR

The Evolution of the Russian Saving Bank Sector during the Transition Era
Martin A. Carree
ERS-2000-27-STR

Is Polder-Type Governance Good for You? Laissez-Faire Intervention, Wage Restraint, And Dutch Steel
Hans Schenk
ERS-2000-28-ORG

Foundations of a Theory of Social Forms
László Pólos, Michael T. Hannan & Glenn R. Carroll
ERS-2000-29-ORG

Reasoning with partial Knowledge
László Pólos & Michael T. Hannan
ERS-2000-30-ORG

Applying an Integrated Approach to Vehicle and Crew Scheduling in Practice
Richard Freling, Dennis Huisman & Albert P.M. Wagelmans
ERS-2000-31-LIS

Informants in Organizational Marketing Research: How Many, Who, and How to Aggregate Response?
Gerrit H. van Bruggen, Gary L. Lilien & Manish Kacker
ERS-2000-32-MKT

The Powerful Triangle of Marketing Data, Managerial Judgment, and Marketing Management Support Systems
Gerrit H. van Bruggen, Ale Smidts & Berend Wierenga
ERS-2000-33-MKT

The Strawberry Growth Underneath the Nettle: The Emergence of Entrepreneurs in China
Barbara Krug & Lászlo Pólós
ERS-2000-34-ORG

Consumer Perception and Evaluation of Waiting Time: A Field Experiment
Gerrit Antonides, Peter C. Verhoef & Marcel van Aalst
ERS-2000-35-MKT

Trading Virtual Legacies
Slawomir Magala
ERS-2000-36-ORG

Broker Positions in Task-Specific Knowledge Networks: Effects on Perceived Performance and Role Stressors in an Account Management System
David Dekker, Frans Stokman & Philip Hans Franses
ERS-2000-37-MKT

An NPV and AC analysis of a stochastic inventory system with joint manufacturing and remanufacturing
Erwin van der Laan
ERS-2000-38-LIS

Generalizing Refinement Operators to Learn Prenex Conjunctive Normal Forms
Shan-Hwei Nienhuys-Cheng, Wim Van Laer, Jan Ramon & Luc De Raedt
ERS-2000-39-LIS

Classification and Target Group Selection bases upon Frequent Patterns
Wim Pijls & Rob Potharst
ERS-2000-40-LIS

New Entrants versus Incumbents in the Emerging On-Line Financial Services Complex
Manuel Hensmans, Frans A.J. van den Bosch & Henk W. Volberda
ERS-2000-41-STR

Modeling Unobserved Consideration Sets for Household Panel Data
Erjen van Nierop, Richard Paap, Bart Bronnenberg, Philip Hans Franses & Michel Wedel
ERS-2000-42-MKT

The Interdependence between Political and Economic Entrepeneurship
ERS-2000-43-ORG
Barbara Krug

Ties that bind: The Emergence of Entrepreneurs in China
Barbara Krug
ERS-2000-44-ORG

What's New about the New Economy? Sources of Growth in the Managed and Entrepreneurial Economies
David B. Audretsch and A. Roy Thurik
ERS-2000-45-STR

Human Resource Management and Performance: Lessons from the Netherlands
Paul Boselie, Jaap Paauwe & Paul Jansen
ERS-2000-46-ORG

Average Costs versus Net Present Value: a Comparison for Multi-Source Inventory Models
Erwin van der Laan & Ruud Teunter
ERS-2000-47-LIS

A Managerial Perspective on the Logic of Increasing Returns
Erik den Hartigh, Fred Langerak & Harry Commandeur
ERS-2000-48-MKT

Fuzzy Modeling of Client Preference in Data-Rich Marketing Environments
Magne Setnes & Uzay Kaymak
ERS-2000-49-LIS

The Mediating Effect of NPD-Activities and NPD-Performance on the Relationship between Market Orientation and Organizational Performance
Fred Langerak, Erik Jan Hultink & Henry S.J. Robben
ERS-2000-50-MKT

Extended Fuzzy Clustering Algorithms
Uzay Kaymak & Magne Setnes
ERS-2000-51-LIS

Sensemaking from actions: Deriving organization members' means and ends from their day-to-day behavior
ERS-2000-52-MKT
Johan van Rekom, Cees B.M. van Riel & Berend Wierenga

Mining frequent itemsets in memory-resident databases
ERS-2000-53-LIS
Wim Pijls & Jan C. Bioch

Possible futures for the HR function in different market
ERS-2000-54-ORG
Roger Williams, Jaap Paauwe & Anne Keegan

Quantity versus Quality in Project Based Learning Practices
ERS-2000-55-ORG
Anne Keegan & J. Rodney Turner

Crew Scheduling for Netherlands Railways. "Destination: Curstomer"
ERS-2000-56-LIS
Leo Kroon & Matteo Fischetti

The Management of Innovation in Project Based Firms
ERS-2000-57-ORG
Anne Keegan and J. Rodney Turner