CONSTRUCTION PROJECT
- GOOD PRACTICE

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The scope of knowledge presented in the manuals is necessary in activities of managers - construction engineers, managing undertakings in conditions of modern market economy. The manuals are approved by the European AEEBC association as a basis for recognizing manager qualifications. Modern knowledge in the field of management in construction, presented in the manuals, is one of prerequisites to obtain EurBE (European Building Expert) cards, a professional certificate documenting the qualification level of a construction manager in EU.

The manuals are designated for managers - construction engineers, students completing postgraduate studies “Management in construction” and students completing construction studies. Postgraduate studies are a recognized program, and graduates receive certificates recognized by 17 national organizations, members of AEEBC.

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More information:

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CHAPTER 1

INTRODUCTION

The term „project management” encompasses a wide spectrum of operating methods. The scope and type of implementation of particular methods depend on the type and requirements of a given project. It turns out that spectacular and highly innovative operations are not the only ones to bring success. Relatively simple and well-selected operating methods very often lead to successful accomplishment of a target set for a complex projects. It is particularly important to prevent projects from generating other expenses and points of dispute than those needed to ensure its successful completion.

The Manual M13 includes case studies related to the execution of investment projects that turned out to be successful for all the execution stage stakeholders: client, contractor and designer. The contents of each case study are subordinated to the analysis of factors relating to the project completion, such as:

- factors relating to project management;
- factors relating to selecting suppliers;
- client-related factors;
- project team-related factors;
- contractor-related factors;
- project manager-related factors; and,
- factors relating to business and work environment.

The manual has been prepared by a team whose members come from four EU member-states, Great Britain, Germany, Portugal, Poland and Turkey. Collected reports from best-managed projects lead us to the conclusion that, given the character of the industry, it is difficult to establish a set of principles or practices whose implementation would result in the successful accomplishment of every project. Nevertheless, practical experience gained from various projects enables us to define a set of guidelines that should make the execution of a project compliant with the assumed time, cost and quality criteria.
CHAPTER 2

FACTORS DECISIVE FOR SUCCESS OF CONSTRUCTION INVESTMENTS

(A. DIZDAR)

A construction project is carried out as a result of a combination of various events and interactions, be they scheduled or unscheduled, which occur in the functioning period of the given facility, while participants and processes evolve in the constantly changing environment. It turns out that during the project execution some factors are more important than others.

Although there might be many similar criteria and opinions, there are some differences which relate directly to the parties concerned and the type of services they provide. For instance, it is the financial potential of a business that is the priority and it will be somehow included in each of the three lists (the designer’s, the owner’s and the contractor’s list). The owner wishes for the project to be completed on time and within a specified budget, while the designer and the contractor expect specific profitability or revenue targets to be achieved. It is a key success indicator and the parties should agree on common measures that would make the project execution possible and successful.

Obviously, there are also other factors, specific to each of the three groups mentioned above. For instance, the designer seeks projects likely to provide them with professional development opportunities and satisfaction from work carried out among the employees. As for the contractor, it is safety which will be of the utmost importance to them, which under normal conditions will not be of as much importance to the other two groups, because employees are far less exposed to hazards while designing or operating/maintaining the building than workers hired by the contractor to carry out works at the building site. The owner always wants to be sure that each erected building meets the functional criteria set up for it and is free from long-lasting defects or does not require long maintenance operations. As one can suspect, expectations may vary to a certain extent, even within the staff of a single company involved in a given
construction project. Among significant factors one can quote are; compliance with internal budgets; job satisfaction; and, good project execution capable of bringing further projects in the future, or, at least, being a marketing tool for similar projects to be carried out for other clients. For instance, two designers working on the same project are likely to perceive success in an entirely different way. An experienced designing engineer (project engineer) may care for both meeting the internal budget criteria and fulfilling the client’s needs. A less experienced designer with less responsibility may consider that their success will consist in gaining valuable experience and, as a result, may focus to a lesser extent on compliance with internal budgets.

Having conducted thorough research based on the available academic work, we have defined a range of variables decisive for project success. A meticulous review of available books and articles reveals that the factors impacting the other variables can be classified as follows:

- factors relating to project management;
- factors relating to selecting suppliers;
- client-related factors;
- project team-related factors;
- contractor-related factors;
- project manager-related factors; and,
- factors relating to business and work environment.

Factors relating to project management
The management method is crucial to the success of a given project. Using proper management tools, managers can plan and perform their construction projects in such a way that they should be as successful as possible. It is accompanied with other project management process variables such as good communication, control mechanisms, feedback possibilities, problem solving, coordination process efficiency, decision-making process efficiency, monitoring, project organisational chart, compliance of works with the plan and the schedule as well as previous project management experience associated with the aforementioned factors. This element is influenced by a number of additional factors, such as; communication system; control mechanism; feedback possibilities’ organisational structure; safety and quality assurance programme; supervision of works carried out by subcontractors; and, finally, general attitude to management.

Factors relating to selecting suppliers
Two elements are used to assess this factor: purchasing method (selection of a project designing and construction organization method) and tender procedure
(procedures adopted to select a project team and specifically general contractor).

Client-related factors
The most important project stakeholders include the project manager, client, contractor, advisers, subcontractor, supplier and manufacturers. Factors relating to the client are mainly; client characteristics, their type and experience; knowledge of project organisational structure; project financing; client’s trust in the project team; complexity of site works; properly defined scope of works; owner’s mistrust of risk; and, project management by the client.

Project team-related factors
Designers play an important role in each project, since they are involved in it from the moment they come up with the project idea to the moment the project is completed. Project team-related factors include professional experience, project complexity and errors/delays in drafting project documentation.

Contractor-related factors
The general contractor and subcontractors assume their duties once the project reaches the building site stage. Variables at this stage include; the contractor’s professional experience; building site management; supervision of work and involvement of subcontractors; contractor’s financial liquidity; efficiency of the cost control system; and, the rhythm of information flow.

Project manager-related factors
The project manager is another key stakeholder in a construction project and their competencies have a huge impact on project planning, scheduling and communication. This factor’s variables take into account the project manager’s skills and personality, their involvement, expertise, experience and authority. Construction projects require team-oriented approach. Thus, the integration of a team comprising of various stakeholders is very important. Efforts made by each team member (owner, architect, site manager, contractor and subcontractors) are an important element to successful completion of each project.

Factors relating to business and work environment
Environment affects the success of a project. It encompasses all external factors influencing the construction process, including social, political and technological systems. Elements used to assess it include economic, social, political, physical environment, relations within the industry and the level of technological progress.
Although practices and procedures related to construction project management have been the subject of much interest and development, due to the nature of this industry it is quite difficult to establish a set of principles or practices that would ensure a successful delivery of any given project. However, based on practical experiences from a range of projects, it is possible to identify a set of guidelines, which, when put in to practice, should ensure project delivery within the requisite parameters of time, cost and quality.

The principles set out below relate to construction project management as well as contractual relationships and attempt to capture both the “hard” and “soft” sides of construction project management.

### 3.1 ESTABLISHING CLEAR LINKS BETWEEN PROJECT AND

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STRATEGIC PRIORITIES, INCLUDING AGREED MEASURES OF SUCCESS

- Is it known how the priority of this project compares and aligns with the other delivery and operational activities?
- Have the critical success factors (CSFs) for the project at each stage been defined?
- Have the CSFs been agreed with suppliers and key stakeholders for each stage?
- Is there a clear project plan that covers the full period of the planned delivery and all business change required, and indicates the means of benefits realisation?
- Is the project founded upon realistic timescales, taking account of statutory lead times and showing critical dependencies such that any delays can be handled?
- Are the lessons learnt from relevant projects being applied?
- Has an analysis been undertaken of the effects of any slippage in time, cost, scope or quality? In the event of a problem/conflict at least one must be sacrificed.

3.2 ENSURING SUPPORT, OWNERSHIP AND LEADERSHIP

- Does the project management team have a clear view of the interdependencies between projects, the benefits, and the criteria against which success will be judged?
- If the project cuts across organisational boundaries, are there clear governance arrangements (including a communication plan) to ensure sustainable alignment with the business objectives of all organisations involved?
- Are all proposed commitments and announcements first checked for
delivery implications?

- Are decisions taken early, decisively, and adhered to, in order to facilitate successful delivery?
- Does the project have the necessary approval to proceed from its nominated investment decision maker, either directly, or through delegated authority to a designated Project Sponsor or Project Manager?
- Does the Project Sponsor or the Project Manager have the ability, responsibility and authority to ensure that the business change and business benefits are delivered?
- Does the Project Sponsor or the Project Manager have a suitable track record of delivery?

### 3.3 ENSURING EFFECTIVE STAKEHOLDER ENGAGEMENT

- Have the right stakeholders been identified for all the stages?
- Has identified the rationale for doing so (e.g. the why, the what, the who, the where, the when and the how) been identified?
- Has a common understanding and agreement of stakeholder requirements been secured?
- Does the business case take account of the views of all stakeholders, including users? Is there clear understanding of the process to manage stakeholders (e.g. ensures buy-in, overcome resistance to change, allocate risk to the party best able to manage it)?
- Has sufficient account been taken of the current organisational culture?
- Whilst ensuring that there is clear accountability, how can any conflicting priorities be resolved?
### 3.4 ENSURING EFFECTIVE PROJECT MANAGEMENT AND RISK MANAGEMENT SKILLS

- Is there a skilled and experienced project team with clearly defined roles and responsibilities? If not, is there access to expertise, which can benefit those fulfilling the requisite roles?
- Are the major risks identified, weighted and treated by the Project Sponsor, and Project Manager and/or project team?
- Has sufficient resourcing, financial and otherwise, been allocated to the project, including an allowance for contingencies?
- Are there adequate approaches for estimating, monitoring and controlling the total expenditure on projects?
- Are there effective systems for measuring and tracking the realisation of benefits in the business case?
- Are the governance arrangements robust enough to ensure that "bad news" is not filtered out of progress reports?
- Are all the team members accountable and committed to help ensure successful and timely delivery?

### 3.5 ENSURING SEQUENCING AND SCHEDULING OF ACTIVITIES

- Has the approach been tested to ensure it is not 'big-bang' (e.g. in IT-enabled projects)?
- Has sufficient time been built-in to allow for planning applications in property & construction projects, for example?
- Have the delivery timescales been kept short so that change during development is avoided?
- Have enough review points been built-in so that the project can be stopped, if changing circumstances mean that the business benefits are no longer achievable or no longer represent value for money?
• Is there a business continuity plan in the event of the project delivering late or failing to deliver at all?

3.6 EMPHASISING LONG TERM VALUE FOR MONEY RATHER THAN INITIAL LOWEST PRICE

• Is the evaluation based on whole-life value for money, taking account of capital, maintenance and service costs?
• Does the evaluation approach enable the balancing of financial factors against quality and security of delivery?
• Does the evaluation approach take account of business criticality and affordability?
• Is the evaluation approach business driven?

3.7 UNDERSTANDING OF (AND COMMUNICATION WITH) SUPPLY CHAIN

• Have the suppliers understood the project delivery approach and agreed that it is achievable?
• Have the suppliers’ assumptions contained in their proposals been checked and understood?
• Has it been confirmed that the project will attract sufficient competitive interest during procurement?
• Are the project management team sufficiently engaged with the industry to be able to assess supply-side risks?
• Is there a clear strategy for engaging with the industry, or are the
sourcing decisions being made on a piecemeal basis?

- Are the processes in place to ensure that all parties have a clear understanding of their roles and responsibilities and a shared understanding of desired outcomes, key terms and deadlines?
- Do we understand the dynamics of industry to determine whether our acquisition requirements can be met, given the potentially competing and fluid environment?

3.8 INTEGRATION BETWEEN CLIENTS, THE PROJECT TEAM AND THE SUPPLY CHAIN

- Has a market evaluation been undertaken to test market responsiveness to the requirements being sought?
- Are procurement routes which allow integration of the project team being used?
- Is there early supplier involvement to help determine and validate what outputs and outcomes are sought for the project?
- Has a shared risk register been established? Have arrangements for sharing efficiency gains throughout the supply team been established?

It is recommended that these issues are considered and discussed in detail during strategy and pre-construction stage to ensure that the project management skills are being utilised to its fullest extent to deliver a successful project to the satisfaction of all stakeholders.

A best practice guidance on contract management framework (particularly relevant to the pre-construction and construction stages) based on the lessons learned on various projects has been outlined below.
3.9 THE GOOD PRACTICE FRAMEWORK

The framework defines the four blocks – structure and resources, delivery, development, and strategy – comprising 11 areas (see figure below) that organisations should consider when planning and delivering contract management, together with the key activities that fall under each of the 11 areas.

Fig. 3.1. The good practice contract management framework

Whilst the framework focuses on the operational phase of the contract, contract management success and the activities undertaken are strongly influenced by

Source:
what has happened during the tendering/contract award phase, in terms of both ‘hard’ outputs, such as the terms and conditions that have been agreed and the type of relationship between customer and supplier that has been established during the tendering/contract award phase. In this way, the tendering/contract award phase and the contract management phase should be seen as a continuum rather than distinct phases, with contract management planned for from the start of the procurement process. Some of the key issues that can influence contract management include the following:

- Whether contract management staff have been involved in the earlier tendering/contract award phase.
- The style of the tendering process. An adversarial tendering process may lead to a more adversarial or confrontational relationship during the contract management phase, although good working relationships between the staff on both sides who will manage the contract can be developed, at the same time that separate, sometimes tough, negotiations are taking place to finalise the contract.
- The ‘cultural fit’ between customer and supplier. For example, if one party feels comfortable working in a very process-driven, detailed manner, while the other prefers a more open, high-level relationship, then developing successful contract management will be more challenging.
- A contract where one party feels they are disadvantaged by the terms and conditions, or the commercial terms, of the contract may lead to more adversarial contract management.
- Key hard outputs that have a major impact on the design and effectiveness of contract management – such as key performance indicators and service level agreements – are often determined during the tendering/contract award phase.
CHAPTER 4

THE FRAMEWORK
(A. MUKHERJEE, S. PEACE, S. AKRAM, P. R. NOWAK, P. O. NOWAK)

The key activities to be undertaken under each of the 11 contract management areas are set out below. The numbering is not intended to indicate that the activities should be executed in a sequential manner. Indeed, many of the areas and activities are relevant throughout the contract management phase. Not all of the 11 areas are equally relevant to all contracts. Generally, the more developmental and strategic areas and activities (areas 8 to 11) become increasingly important the higher the contract risk and the greater the opportunity to add value.

4.1 STRUCTURE AND RESOURCES

Area 1: Planning and governance
(Preparing for contract management and providing oversight)
1.1 There is a planned transition from the tendering/contract award phase to the contract management phase, and a handover to the contract manager. The cost of contract management is included in the business case and budgets.
1.2 Contract ownership is clear, with the budget holder, senior responsible owner (SRO), and contract manager clearly defined. There is continuity of governance as far as possible.
1.3 There are well defined processes and a clear contract management plan, with a focus on outputs and a ‘whole life’ approach to performance.
1.4 Overall ownership of contract management across the organisation is clear, with a ‘contract management senior responsible owner’ with responsibility for driving organisation-wide contract management performance.
1.5 Contract management processes are aligned with, among others, wider organisational governance processes, operational boards and risk structures.
1.6 Contract management issues and performance are reported through the governance structure with senior level engagement.
1.7 Regular assessment and evaluation takes place to ensure that the cost of contract management activities is justified and proportionate to the benefits obtained.
1.8 Knowledge management is embedded, capturing key data and lessons from contract management process and experience both within the organisation and more widely.
1.9 Professional contract management guidance is developed, or identified from external sources, and made available to contract managers.

Area 2: People
(Ensuring the right people are in place to carry out the contract management activities)
2.1 The contract manager has continuity (ideally through involvement during the tendering/contract award processes) and a handover from the staff responsible for the tendering/contract award.
2.2 The contract manager has a detailed knowledge of the contract and other relevant issues, such as service level agreements, and on-going supplier performance.
2.3 The contract manager has the appropriate skills (both specific contract management skills and more general commercial awareness and expertise), with access to relevant training and development. Experienced contract managers are deployed on key contracts.
2.4 Contract managers have accurate job descriptions, roles are positioned at an appropriate level and salary, and there is a career path for contract management staff.
2.5 Contract managers have clear objectives and reporting lines and their performance is managed through reviews and appraisals.
2.6 The contract manager has appropriate delegated authority to manage the contract effectively.

Wider staff issues
2.7 Balanced contract management teams are brought together, with an appropriate range of skills. The teams may vary in composition over the life of the contract to meet specific needs.
2.8 Contract management is adequately resourced, in proportion to the importance of the contract (primarily but not exclusively its cost) and there are enough staff to carry out the required activities.

2.9 The organisation has a contract management ‘community’, allowing contract managers to share good practice. The community also plays a role in the wider government contract management/procurement community.

Area 3: Administration
(Managing the physical contract and the timetable for making key decisions)
3.1 Hard copy contracts are stored and logged, and are easily accessible when required. For complex contracts, a summary and/or contract operations guide is produced.
3.2 Contract management software is used for recording key information, to give, for example, search capability. Relevant on-going contract management information and documentation is retained and managed.
3.3 There are mechanisms in place for identifying key contract ‘trigger points’, such as notice periods.
3.4 There is regular and ad hoc reporting of contract management information.
3.5 There are mechanisms in place for handling administration around contract closure or termination.
3.6 The customer considers the cost of contract management activities to the supplier, and the cost is proportionate to the contract size and risk.

4.2 DELIVERY

Area 4: Managing relationships
(Developing strong internal and external relationships that facilitate delivery)
Roles and responsibilities
4.1 The contract manager understands his/her own role and has clear visibility of well-structured roles and responsibilities on the supplier side.
4.2 The responsibilities of the contract manager and the supplier are clear, and potentially defined in a ‘joint statement of intent’ or similar document.
Continuity and communications
4.3 Continuity of key supplier staff is desirable (ideally through involvement during the sales process). Where this cannot be achieved, there is a handover from the staff responsible for the tendering process.
4.4 Both regular structured and informal communication routes between the contract manager and supplier are open and used. Customer and supplier staff are co-located where appropriate.
4.5 Users are given clear expectations and an understanding of the contract and the services/performance to be delivered (for example, through newsletters or briefings).
4.6 Communications between the contract manager, supplier and other stakeholders (users of the contract and others such as technical experts) are effective and stakeholders are involved in contract management processes, where appropriate.
4.7 Problem resolution processes are well defined and used and are designed to ensure that minor problems do not escalate and cause relationship issues. A ‘blame culture’ is avoided (for example, through the use of a ‘relationships charter’ or similar document). Good practice contract management framework.

Area 5: Managing performance
(Ensuring the service is provided in line with the contract)
Service delivery
5.1 Service management is well structured. Baselines are understood by both parties and suppliers understand the service they are required to deliver. The contract manager ensures that the customer organisation provides the supplier with the information and contacts needed to deliver the service.
5.2 A performance management framework is in place when the contract is signed. The framework is comprehensive, objective and provides incentives for the supplier to meet or exceed agreed performance standards.
5.3 Service levels agreements are in place, and are linked to business needs, understood by the supplier, and monitored by the contract manager and/or end users.
5.4 Supplier performance is assessed using clear, objective and meaningful metrics, linked where appropriate to the Office of Government Commerce’s ‘Common Assessment Framework’ for monitoring suppliers.
5.5 Reporting is, as far as possible, on a focused, ‘by exception’ basis, with supplier self-measurement and reporting where appropriate, but with independent checking mechanisms to alert the customer to performance issues (for example, user feedback).
5.6 Clear processes are in place to handle operational problem resolution and resolve issues as quickly as possible.
5.7 Where appropriate, user compliance with the contract is monitored and managed to ensure maximum operational effectiveness and value for money.
Feedback and communications
5.8 Regular and routine feedback is given to suppliers on their performance.
5.9 There are clear contact points for service users both within the supplier organisation and with the contract manager. Users understand what the contract is intended to deliver, and are involved in the assessment of supplier performance where relevant. Users understand escalation routes where issues arise.

5.10 Changes in user requirements are captured and considered as part of formal change and contract management processes.

5.11 There are formal performance reviews with suppliers, with documented improvement plans agreed where necessary, covering both operational issues and adherence to key contractual requirements, for example, on data security.

Section One Good practice contract management framework

Area 6: Payment and incentives
(Ensuring payments are made to the supplier in line with the contract and that appropriate incentive mechanisms are in place and well managed)

Payment and budgets
6.1 Payment mechanisms are documented and are clear and well understood by all parties (including incentives, penalties, and non standard charges).

6.2 Payment processes are well defined and efficient. Appropriate checks and authorisation processes are in place for paying invoices.

6.3 The costs of the services delivered and contract management costs are mapped against budgets and allocated appropriately.

6.4 Payment changes after the contract is let, for example from contract variations or benchmarking/ market testing, are made using contractual provisions and demonstrated to provide value for money.

Payment and incentive mechanisms
6.5 Incentive structures (financial or non-financial) relate clearly to desired outcomes, and are well managed and governed, with appropriate checks and approval mechanisms.

6.6 Service credits or equivalent mechanisms are well managed and governed, and proportionate to supplier profitability.

6.7 Where open-book or similar financial/pricing mechanisms are used, the process is managed professionally and fairly.

6.8 The contract manager takes action where necessary to avoid the organisation being ‘locked in’ to onerous commercial terms throughout the contract period, such as price escalation or ‘compulsory’ maintenance payments.

Area 7: Risk
(Understanding and managing contractual and supplier risk processes and plans)
7.1 Contractual/supplier risk management is in place with clear responsibilities and processes, identification of who is best placed to manage risk and supplier involvement where appropriate.
7.2 Risks are formally identified and monitored regularly, with mitigating actions developed and implemented where possible and ‘obsolete’ risks removed from consideration where appropriate.
7.3 Escalation and reporting routes are in place for risk governance.
7.4 Contingency plans are developed to handle supplier failure (temporary or long-term failure/default). Exit strategies are developed and updated through the life of the contract.

Contractual terms
7.5 Contractual terms around termination are understood and monitored by the contract manager.
7.6 Contractual terms around warranties, indemnities and insurance are understood and monitored by the contract manager.
7.7 Contractual terms around security and confidentiality are understood and monitored by the contract manager, particularly issues relating to the security/confidentiality of personal data.
7.8 Dispute resolution processes are in place, including agreed adjudication procedures, mediation, and arbitration.

On-going supplier risk management
7.9 The contract manager monitors the supplier’s financial health and business performance (including through the use of credit rating agencies).
7.10 The contract manager monitors the supplier’s compliance with contractual ‘non-performance’ issues (for example, on tax and sustainability targets).

4.3 DEVELOPMENT

Area 8: Contract development
Effective handling of changes to the contract
Change processes
8.1 The contract is regularly reviewed (with a view to updating where necessary) to ensure it meets evolving business needs.
8.2 Processes are in place that clearly lay out the governance of contractual change – who needs to approve what and how it will happen – with a focus on effective and prompt change implementation.
8.3 There are clear processes for the management of minor changes and contract variations, with a focus on the cost/effort being proportionate to the importance and value of the change.
8.4 There are more rigorous processes to handle major contractual changes, including clear approval mechanisms and accountabilities, and controls to demonstrate that changes offer value for money.
8.5 Where appropriate, value for money testing of existing services takes place through benchmarking or other processes.
8.6 There are processes to cover the introduction of new services under the contract, including market testing where necessary.
8.7 Dispute handling processes are in place to handle change related issues.

Processes for different types of change
8.8 Both parties have a clear understanding of the arrangements for any extension of the contract (both scope and time) and related issues.
8.9 Processes are in place to handle commercial (financial) changes to the contract in a fair and structured manner.
8.10 Price changes are managed fairly and effectively with the use of mechanisms such as benchmarking, competitive tendering (for example, for major additional works), or other techniques such as open book pricing as appropriate, to test value for money.
8.11 The rationalisation of specifications and demand management are considered as options to achieve better value for money.

Area 9: Supplier development
Improving supplier performance and capability
Processes
9.1 Processes are in place that clearly set out how supplier development activities will be planned, managed and governed.
9.2 Clear processes for benefits measurement and capture are in place to ensure that supplier development is focused on continuous improvement and achieving value for the customer organisation.
9.3 The customer organisation understands what motivates and drives the supplier and how supplier development fits with the supplier’s goals.
Improvement activities
9.4 Supplier operational performance improvement activities (for example, ‘Lean’ and ‘6-sigma’), with potential input or assistance provided by the customer organisation.
9.5 Joint working or shared activities between the two parties for the benefit of both the supplier and customer (for example, process improvement, shared training, task forces or joint project teams).
9.6 Supplier improvement activities relating to wider government initiatives, with input or assistance provided by the customer organisation (for example, on sustainability, disability employment issues, use of SMEs (Small and Medium Sized Enterprises) and BMEs (Black and Minority Ethnic suppliers)).

9.7 Shared risk reduction programmes or activities.

9.8 Supply chain development activities (for example, the development of second/third tier supplier performance).

9.9 Shared management activities (for example, supplier boards) to drive performance improvement.

4.4 STRATEGY

Area 10: Supplier relationship management
Having a programme for managing and developing relationships with suppliers

10.1 A supplier relationship management programme is planned and structured with appropriate governance and senior ownership.

10.2 A benefits realisation plan is in place for supplier relationship management. There is a clear sense of what value is to be generated for both parties.

10.3 There is a focus on capturing innovation from the supplier where necessary or valuable.

10.4 Knowledge management issues are addressed, including knowledge capture from suppliers.

10.5 The supplier relationship management programme considers all the supplier’s interactions across an organisation and on a pan-government basis, including work with the Office of Government Commerce.

10.6 Board level supplier/customer organisation interfaces and relationships are planned and managed in line with overall supplier relationship management objectives.

Area 11: Market management
Managing the wider market issues that impact on the contract, but lie beyond the supplier

11.1 Processes are in place to evaluate and review options around delivering services in-house or outsourcing.
11.2 Market intelligence is used to maintain an understanding of the market and of alternative suppliers (to inform benchmarking, contingency planning and re-competition strategies).

11.3 The capacity and capability of potential suppliers is analysed, and linked to wider government analysis, for example, by the Office of Government Commerce.

11.4 There is on-going evaluation of emerging technologies and practices, and identification of opportunities from both immediate and parallel market sectors.

11.5 Market making is undertaken where appropriate to stimulate competition and ensure the requirements can be delivered by the market. There is an understanding of issues such as switching and bidding costs.

11.6 A re-competition strategy and plan is put in place in a timely manner. The contract manager feeds into strategy development for the ‘new’ procurement process.
CHAPTER 5

CASE STUDY 1: HEATHROW T5 – A MAJOR PROJECTS ASSOCIATION

(A. MUKHERJEE, S. PEACE, S. AKRAM, P. R. NOWAK, P. O. NOWAK)

Introduction
Following the longest public inquiry in UK planning history, in the late summer of 2002 BAA started the five year assembly phase of the £4.3 billion Terminal 5 (T5) programme at Heathrow Airport. In September 2007 the works were formally handed over to the operator, Heathrow Airport, for a six month operational readiness period prior to opening on 27 March 2008.

This case study focused on how this complex programme of works – located on a site the size of Hyde Park between the world’s most heavily used runways – has been delivered whilst remaining on course to achieve its stated objectives of cost, time, quality and safety.
Key figures from BAA and first tier suppliers involved in running the project provided an insight into their experiences, observations and lessons learned.
Particular focus was given to the T5’s team’s unique approach to project management, enabled through the bespoke T5 Agreement.

3 www.majorprojects.org
Setting the scene

The T5 programme is effectively a series of major projects in their own right, involving many disciplines and a variety of stakeholders. The importance of the history and background to the T5 project, and what it comprises in terms of size and complexity, cannot be over emphasised. For instance, there is more to the project than simply the creation of the assets. Planning requirements imposed a number of obligations, such as landscaping, environmental and archaeological considerations and the building of several logistical centres, including a railhead and an off-site factory for the fabrication of reinforcement steel structures.

T5 has two delivery phases. Phase 1 consists of the main concourse building (T5A), at which people will arrive and check in and the first satellite building concourse (T5B), together with the air traffic control tower and other
infrastructure and buildings supporting the facility. Phase 1 provides a capacity for about 27 million passengers per annum.

Phase 2 comprises the second satellite building concourse (T5C) and when completed will add a further three million annual passenger capacity.

The T5 road and rail interfaces and transport arrangements were outlined. Roads converge into a single facility known as the multi-storey car park (MSCP5), which provides access and parking for buses, coaches, taxis and cars immediately in front of T5A. For rail users, the Piccadilly line extension (PiccEx) and the Heathrow Express extension (HexEx) run into a new station beneath T5A. The T5A building and its satellites T5B and T5C are connected by a sub-surface passenger track transit system, which conveys arriving and departing air passengers in an automated people mover.

Some of the numerous work in progress challenges during the five year construction phase were explained. For instance, the requirement to divert the course of two rivers running directly across Heathrow to the airport perimeter meant that the site was effectively bisected in two until the new channels had been constructed. Relocating the rivers also required the capture and relocation of both the habitat and various species living within it, such as the water vole.

![Fig. 5.2. Heathrow Terminal T5A (left) and Terminal T5B (right)](#)

The T5 Agreement

The development and introduction of the T5 Agreement, a form of contract which represents a significant departure from commonly held concepts about contracting, is unique in its own form.

Various factors shaped BAA’s thinking. For instance, events such as the Heathrow tunnel collapse in 1994 pointed to the need for holistic thinking about risk, supported by integrated teams that would solve problems in a multidisciplinary way. During the 1990s numerous major projects were running late, and the construction industry was being challenged by reviews and reports identifying cultural issues that had to be overcome before construction
performance would improve, for example the adversarial relationships that existed between construction firms, consultants and clients. Emergent thinking led to the New Engineering Contract (NEC), first published in 1993. BAA became one of the first companies to use it, bringing project management into contract thinking and developing a more ‘relational’ culture, where the client was starting to work with the contractors to solve problems as and when they arose.

The size and scope of the T5 project, where 16 projects were being managed in a single programme, presented a number of challenges that posed potential risks to BAA. The principal aim of the T5 Agreement was as an enabler and a bridge to ensure that the risk to the company could be managed and that it was in the contractor’s interests to be involved in managing the risk. This required changes in thinking and approach, as outlined in the following illustration:

### Table 5.1. T5 contracting approach

<table>
<thead>
<tr>
<th>“Traditional” contracting</th>
<th>T5 contracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer of risk</td>
<td>Cannot transfer risk</td>
</tr>
<tr>
<td>Priced to a defined scope</td>
<td>Remains flexible</td>
</tr>
<tr>
<td>Profit at risk</td>
<td>BAA holds the risk</td>
</tr>
<tr>
<td>Compliance/remedies driven</td>
<td>Active risk management</td>
</tr>
<tr>
<td>Silos</td>
<td>Success driven</td>
</tr>
<tr>
<td>Cost of failure (?)</td>
<td>Value for money</td>
</tr>
<tr>
<td>Difference of underlying assumptions</td>
<td></td>
</tr>
</tbody>
</table>

How T5 was delivered
The procedures and processes that were required to support the T5 agreement involved a change in people’s behaviours and thinking, and the creation of an integrated team environment.
BAA took all the risk, all the time: they paid defined costs around the build element, put a ring fence around the contractor’s profit and overheads, and
thereby eliminated the need for the contractor to price the risk. In return for BAA taking all the risk, the contractors had to think and work differently and embrace the concept of a single integrated team. Although part of the integrated team, BAA ensured that the right person led the teams. In some teams this would be BAA, in others a contractor or consultant. Aligned against this structure were the target costs, a shared incentivising mechanism and a set of insurance products that underpinned that whole process. Some of the ways in which BAA engendered goodwill and encouraged personal responsibility amongst an organisation of 8,000 people were considered. For example the health and welfare of the staff was a priority, there were reward schemes for individuals and teams who went beyond the call of duty, and staff at all levels were asked to be accountable for four targets – making T5 safe, delivering quality and keeping within budget and schedule.

The supplier’s view
Two senior representatives from two of the leading first tier suppliers provided their perspective on the application of the T5 Agreement. Both suppliers endorsed the view that the T5 Agreement created a very positive environment in which to operate. As integral members of the design and construction team their voices were just as important as anyone else’s, and their employees regarded themselves as part of a T5 team, rather than as seconded employees of particular companies. Everyone was committed to the delivery of the project, and operations were carried out safely, together – something that does not always happen within the construction industry. It was felt that the T5 Agreement principles should be replicated in other projects. Two projects were described which demonstrate the value of the Agreement. In the first, as a key member of the delivery team, the supplier had the opportunity to raise some concerns about a design which had some inherent programme and cost risks. BAA then facilitated a debate with all the relevant parties, which resulted in changes which satisfied all sides. The second project involved problems in the fabrication and production stage of another part of the programme. BAA’s approach to risk, with the emphasis on a solution rather than allocating blame, enabled the team to direct their energies into resolving the issues in a pragmatic, not adversarial, way.
The client’s perspective
The client’s perspective of the challenges of the T5 project and the key lessons learned, revolves around the main themes of BAA’s approach to the creation of an environment for success, for example:

1. The contract – T5 Agreement
The ‘softer’ people issues presented the greatest challenge. Suppliers and subcontractors were chosen not just for their technical skills, but also for behavioural competence and an understanding that the Agreement had a fundamentally different set of assumptions from traditional contracting.

2. Risk management
A great deal of research was undertaken before deciding on the stance to be taken regarding risk management. BAA chose to hold all the risk all the time because it enabled transparent working arrangements with the supply chain. BAA played an active role in shaping and influencing the outcomes.
3. Influencing behaviours
Engendering the right mindset in all of the team members presented one of the most significant challenges of the project. At the outset few people embraced the T5 approach, and a great deal of time was required with senior personnel to explain the behaviours expected.
At the highest levels people wanted the same result as BAA, a quality job, an enhanced reputation and a predictable cost outcome. The main challenge was embedding the T5 culture and ways of working across the programme and BAA spent time with the human resources directors of the top 50 suppliers to ensure that this happened.

4. Communications
Influencing behaviour is closely connected with communications. The iconic nature of T5 meant that BAA could remind individual employees to feel proud that they were members of the team that was creating and delivering a large infrastructure project safely, on time, on budget and to a defined quality.

5. Performance management
BAA explained some of the many challenges faced in setting up and managing performance at an effective level and depth, both within BAA itself and throughout the project teams. For example, T5 was packaged into a large number of separate projects and subprojects, but performance was measured at subproject level. When applying commercial judgement to performance issues, these had to be seen in the context of the overall project. The challenge for the client and for the integrated team was to see where there were trade-offs and interdependencies between the various subprojects, a skill that took time to perfect.
BAA is formulating a third generation of agreement frameworks, in which the principles of the T5 agreement will be maintained:
- long-term relationship frameworks;
- project awards based on performance;
- progressive dependence on and development of trust in supplier capability;
- pre-agreed commercial models with incentives and targets;
- collaborative working with real-time transparency;
- active management of risk and opportunity; and,
- an alliance driven by common objectives, behaviours and values.
Conclusion
Perhaps the key lesson of T5 is that risk management is not simply part of project management, but that project management exists to support risk management. Meeting the challenge of project management in a complex programme such as T5 depends on the flexibility to change and improve the plan when circumstances change.
‘Uncertainty’ is a synonym for ‘risk’ and the T5 team clearly got on top of the uncertainties and produced the forecast outcome with creativity, confidence and initiative.
CHAPTER 6

BAA CASE STUDIES

(A. MUKHERJEE, S. PEACE, S. AKRAM, P. R. NOWAK, P. O. NOWAK)

6.1 BAA’S PAVEMENT TEAM: INTEGRATION TEAMS ACHIEVE SAVINGS OF 30% OVER 5 YEARS

BAA’s runway and apron construction were undertaken by a partnering arrangement between BAA and AMEC and three key suppliers. It was run by a fully integrated team that formed what was in effect a virtual company. Staff were seconded from the individual companies and shared office facilities where IT and administration were provided by AMEC. "An outsider would find it difficult to match individuals to parent companies," remarked BAA general manager Richard Jeffcoate: "We pick the best person for the job, irrespective of whether they're client or contractor staff."

AMEC's Andrew Ellis explained: "We've lived together for nearly five years now and learned how to make partnering work. The results are impressive.” BAA general manager Richard Jeffcoate added: “It is all about getting best

value for money. We moved towards partnering and an integrated team when we realised that traditional procurement methods offer very little scope to improve value for money."

The Challenge
BAA were spending about £35M pa on the pavements at Heathrow, Gatwick, Stansted and Southampton. They invited AMEC Civil Engineering to work in partnership to procure £130M of projects over 5 years. AMEC were keen to improve cash flow and break the cycle of unpredictable profits and losses. BAA believed that cost savings in the region of 30% over the life of the framework were obtainable.

Implementation
The Pavement Team completed their projects and moved a long way from traditional shadowing of roles in the early days to a fully integrated culture. Management appointments were made on ability, irrespective of company affiliation. Integration increased trust and helped to promote further integration. 2nd tier suppliers accepted management roles in the team, further strengthening the concept of partnering along the supply chain.

Benefits achieved
The key benefits demonstrated by carefully measurements against agreed benchmarks were:

- The client was confident that the team provided value for money;
- Benchmarks were established that enabled the team to measure its own performance against similar projects in the UK and overseas;
- Measuring allowed the team to identify areas for improvement more easily;
- The contractor had greater predictability of workload because the client had committed to over 50 projects in five years with an average value of £2.5m;
- Cost and programme predictability improved so that projects routinely finished on time and within budget;
- Construction costs were reduced by close to 30%;
- The total time for projects was been reduced by 30%;
- Safety performance improved and was well above industry average; and,
- Staff productivity increased to around 250% of the industry average.
6.2 HEATHROW TERMINAL 5: 97% RECYCLING OF WASTE ACHIEVED

Introduction
Heathrow is the world's busiest airport. Increasingly, affordable flights meant that Heathrow was pushed to capacity and needs to expand. Terminal 5 was one of Europe's largest construction projects, with 16 major projects and 147 sub projects. It is designed and built to cater for around 30 million passengers every year.

Terminal 5 was a mega project. It was the subject of the UK’s longest ever planning inquiry because of its potentially sweeping environmental and economic impacts.

BAA were responsible for getting it right. They had to secure Britain’s future as a centre for aviation, while balancing and safeguarding the environmental, social and economic interests of all stakeholders. BAA had a Code of Construction Practice for T5 that involved:

- Keeping people informed;
- Managing construction impacts;
- Respecting the local environment; and,
- Responding to concerns.

In addition to the main terminal building, the T5 construction project consisted of:

- Two satellite buildings;
- 60 aircraft stands;
- A new air traffic control tower;
- A 4,000 space multi-storey car park;
- The creation of a new spur road from the M25;
- A 600-bed hotel;
- The diversion of two rivers;
- Over 13km of bored tunnel, including extensions to the Heathrow Express and Piccadilly Line services.

Standardised design

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6 Case Study Reference: Constructing Excellence Demonstration Project 317
Design teams adopted the principles of standardisation in design, prefabrication and modularisation, dramatically reducing waste generated during construction and maximising efficiencies in material use and delivery.

Just in time
The innovative ‘just in time’ logistics strategy adopted at T5, and on site housekeeping practices such as designated storage areas and segregated vehicle and pedestrian routes ensured that materials were delivered to the work place as they were needed and not stored on site. This reduced the amount of material damaged on site, and so reduced waste. The proactive logistics strategy also reduced the over-ordering of materials. Typically, on a construction site, this can account for 10% of materials ordered, which then often end up unused in a skip.

Reduction in packaging
BAA worked with suppliers to reduce the amount of packaging delivered to the T5 site. To ensure buy in, sustainability workshops were run for suppliers focusing particularly on reducing packaging waste. Other steps were taken to reduce waste from the outset:

- All suppliers were encouraged to reduce packaging as far as possible and choose reusable materials to package their products;
- Where packaging was unavoidable suppliers were encouraged to take back the packaging they supplied for reuse;
- Agreements with the cable suppliers enabled cable drums to be returned to the supplier for reuse; and,
- Standard specifications for products such as paint enabled them to be ordered in large quantities, thus reducing waste and enabling large packaging to be returned e.g. ICI Dulux paint cans were returned to the supplier.

Consolidation of waste
On site consolidation of waste using compactors and roll packers, whilst not reducing the weight of waste, significantly reduced the volume of waste sent off site, reducing the number of vehicle movements. Consolidation of hazardous materials during construction significantly reduced the transport of these materials.

Reuse of waste materials
BAA was committed to reusing waste materials on T5 where possible to reduce waste sent to landfill, to cut down on vehicle movements and reduce carbon emissions.
Key achievements include:
- Waste soil, topsoil and other aggregates processed on site under a waste management licence exemption and reused in the construction;
- 300,000 tonnes of waste concrete and demolition material from T5 crushed by a designated team and reused on site;
- Biopiles used to treat the contaminated soils. Aerating the soils promoted the natural bacterial activity to break down the hydrocarbon. The clean soil was then reused on site;
- Excavated inert soils and clays used as backfill and for landscaping;
- Multiple use of temporary works e.g. shuttering used several times over, and then broken up and timber used for protection of finished works;
- Waste arising from road sweeping activities processed on site through a series of oscillating screens, filters and belt presses to remove solids and clays for reuse, with the cleaner water then disposed of. A mobile dewatering plant operated a similar system on a small scale, processing silty water in situ across the site;
- A materials take back scheme run by the on site market place made surplus products and materials from one part of the project available to other project teams;
- Lengths of cable too short to be of use to the permanent systems installation team were made available to the logistics team for use in the temporary systems on site; and,
- Surplus paint of good quality was made available to local community projects through the Community Re:Paint initiative.

Recycling
Where possible designated skips were provided for general, wood, metal and cardboard waste to encourage segregation for recycling. Waste cable and plasterboard were also segregated for recycling and in the offices, paper was collected through a desktop recycling box scheme. General waste was further processed and sorted by the waste contractor, who typically recycled 87% of the waste they processed.
Specific recycling initiatives include:
- Temporary site drainage – high density polyethylene pipe recycled by a specialist contractor – EWMS (Express Waste Management Services Ltd).
- Biodegradable waste from the on site canteens was collected separately so that it could be composted in a biogas plant.
Segregation of hazardous waste

Segregation of the hazardous waste stream was undertaken at the workface by the project teams who separated out aerosols, paints, solvents and other hazardous waste into designated hazardous waste drums. These were collected by the hazardous waste contractor (Envirogreen) and sorted and consolidated on site prior to collection.

Decanting of liquid wastes, such as paints, allowed contaminated packaging to be crushed on site with can crushers, significantly reducing the volume of hazardous waste.

Aerosol degassers punctured aerosol cans, removing any paint residues and rendering the can non-hazardous. The inert can was then recycled with the metal waste from site.

Weekly collections of oils and oil contaminated water facilitate recovery of the oil and its recycling to clean fuel oil. The segregation of other hazardous waste such as paints or solvents enabled recovery of the products for recycling, or for use as a secondary fuel.

Toolwash stations provided across the project ensured wash water contaminated with paints, grouts, solvents etc was adequately controlled and disposed of, in compliance with T5’s discharge consents and waste management procedures. Contaminated water was collected in drums at the toolwash stations and discharged to foul sewer in accordance with the discharge consent. Only clean rainwater was allowed into the surface water drainage system, which discharged to a local lake.

Use of recycled products

BAA strove to include products with a high recycled content in the construction of the buildings and infrastructure. Over 80,000 tonnes of recycled and secondary aggregates were bought onto the project in addition to the crushed aggregates generated on site. This included crushed glass from local municipal recycling banks that was used in the construction of the site roads. Up to 30% of the concrete mix used in the construction of the buildings, taxiways and aircraft stands is pulverised fuel ash (PFA), a waste product from the power generation industry. Using this recycled product and an innovative variable thickness concrete saved over 9,100 tonnes of CO2 emissions. Additional benefits of products such as these include cost savings and a higher quality product.

During construction a single waste contractor, Ethos Recycling Ltd, was appointed to centrally manage and collect all waste. This waste contractor, based in Uxbridge, typically achieves recycling or recovery of 87% of inert waste. Remaining waste is either sent for waste for energy or landfilled. The contractor was committed to increasing these recycling rates. In addition, 43% of hazardous waste (i.e. oils, solvents, mastics, fluorescent tubes) was typically
recycled or recovered, facilitated by Envirogreen, the specialist hazardous waste contractor. T5 achieved in excess of 97% recycling of the waste generated during construction as a result of the combination of the onsite recycling activities, and the recycling provided by the waste contractor (EthosRecycling Ltd). Over 80% of waste, by weight, was recycled on site.

Disposal
T5 had two dedicated Rear End Loaders (RELs) and one skip lorry that collected waste from across the site. The waste was compacted in the RELs to ensure that each vehicle leaving site, left full. This saved over 6,500 vehicle movements. The vehicles were weighed on a weigh bridge on leaving site and again when arriving at the waste transfer facility, to ensure compliance with waste legislation. Waste contractor vehicles were badged to enable them to be identified by the local community. The community were encouraged to be vigilant and report any vehicles they suspect of not adhering to the correct procedure. Vehicle movements were also closely monitored using a GPS logging system.

Training and Monitoring
Every sub-project within T5 had an environmental plan, which identified the potential environmental impacts of their project and the mitigation measures to be implemented to reduce these. These measures were agreed with the T5 Environment Manager. Waste management was a key component of this plan. Each project on site had an environmental coordinator who undertook a weekly environmental inspection, to check compliance with the waste management procedures, and other environmental issues. The Environmental coordinators from each project then got together monthly to share best practice across the project.

Full inductions were given to members of staff on each sub-project area of the site, to ensure that all staff followed the waste management procedure correctly and to encourage them to reduce and reuse waste.

To motivate and educate site workers, posters were put up around the site explaining why they should recycle, and where the waste goes. Pictures of good and bad practice found on site were used to demonstrate clearly the waste management behaviours expected on site. Each month an Environment Initiative award was awarded to the project team who demonstrated environmental excellence. This was often awarded for waste management initiatives.
Achievements

Key achievements on the project included:

- Consideration of waste during design, construction and into operation of Terminal 5 enabled the successful implementation of the waste hierarchy and,
- Over 97% of waste material recycled or recovered.

Lessons Learned

Effective waste minimisation and the promotion of recycling requires the commitment of everyone on site. Numerous initiatives across T5, from the bottom up, local initiatives suggested and implemented by the workforce, to the top down strategic approach to logistics have all contributed to the achievements in waste management at T5. Having a designated team to coordinate waste management, working closely with the waste contractor promoted team working and a solution led approach to waste management and generating improvements in performance.

“We are proud of our achievements in waste management at T5. The client led approach to implementing the waste hierarchy, delivered by the dedicated waste team and environment team at T5 has enabled real successes. Shared site wide resources and services have created efficiencies in waste management, and encouraged innovation. The engagement and hard work of all our contractors and suppliers has ensured proactive waste minimisation and promotion of recycling across the breadth and duration of Terminal 5.”

Rebecca Garner, T5 Environment Manager, BAA.
Introduction
Heathrow Terminal 5’s M&E Buy Club brought in a new era of openness, collaboration and striving for ‘world class’ results. It replaces the industry’s traditional approach based on secretive deals with favoured suppliers. Instead, the Buy Club pools the expertise and buying power of five first tier mechanical and electrical contractors and arranges for each of 13 specialisations to be supplied from (generally) one supplier who is then responsible for supplying all 16 projects at Terminal 5.

Beyond Terminal 5, the Buy Club model can be either adopted entirely or adapted to suit the circumstances facing other projects. The only essential prerequisite is having more than one specialist contractor doing similar work. As a direct result of this partnering approach, BAA made savings of between 10 and 30% of the budget for mechanical and electrical equipment and materials. Commodities, such as cables and bulk supplies, are yielding savings at the lower end of this range, while inputs which are more design intensive, such as low voltage switchgear, are producing savings of close to 30%.

Instead of asking potential suppliers to do up-front work as a favour, the Buy Club ensured their commitment by appointing them early and engaging them in design. The results are ‘lean’ manufacturing and installation. Collaboration to meet Buy Club targets requires planning by first tier suppliers. One important benefit is that for all but the first project, mechanical and electrical procurement is taken off the critical path.

Early agreement of benchmark prototypes means suppliers are actively involved in design, know exactly what is required and can budget and plan accordingly. An open-book approach to quality reveals issues before they become problems. The Buy Club was so successful for mechanical and electrical that BAA used the same approach for Terminal 5’s £200m fit out and £50m communication systems packages. The model of having first tier contractors and their suppliers

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7 Case Study Reference: Constructing Excellence Demonstration Project BAA
Heathrow
partnering to drive down costs is applicable to other large projects as well as groups? of smaller projects.
In essence, the Buy Club was a consistent approach to the £600m spend on M&E equipment and materials across the whole terminal. Specifications addressed the quality and lifecycle actually required and the best-value solution. The Buy Club applies best practice procurement processes that are normally used for selecting 1st tier suppliers at the 2nd tier.

Benefits achieved
The benefits include:

Cost: BAA were banking 10-30% of the budget for M&E equipment and materials. Commodities, such as cables and bulk supplies, are yielding savings at the lower end while inputs which are more design sensitive, such as low voltage switchgear, are at the top.

Time: Instead of asking potential suppliers to do up-front work on a favour basis, the Club bought their commitment via early appointment, engaged them in the design and promoted ‘lean’ manufacturing and installation. Collaboration to meet Buy Club targets enforces planning by 1st tier suppliers. Consequently, M&E procurement comes off the critical path for all but the first project.

Quality: Early agreement of benchmark prototypes (these are locked away for future reference) meant that suppliers were actively involved in the design, know exactly what is required and budget and plan accordingly. The rigorous planning BAA expects of the Buy Club reduces the likelihood of manufacturers being asked to produce ‘rush jobs’, which can compromise quality. An open-book approach to quality reveals issues before they become problems.

Safety: Planning by the Buy Club reduced the potential for unsafe working in order to cutting corners.

Logistics: Simplifying the supply chain across the entire terminal made the logistics so much easier to manage.

The environment: Environmental issues accounted for 5% of the tender assessment score. BAA’s environmental policy for construction is written into all Buy Club contracts.

Reusing the process
The Buy Club was so successful for M&E that BAA used the same process for the £200m fit out and £50m communication systems packages. The model can be adopted or adapted for procurement in other large projects as well as smaller repetitive ones.
Construction logistics
The biggest differences which everyone working in the construction of T5 noticed, were how the logistics and the delivery team were organised. Without a fresh approach, the effects on the local environment caused by construction traffic alone would be unacceptable congestion, noise and pollution. That is partly why BAA has created a Master Logistics Plan to control the whole delivery process, which keeps construction traffic off local streets. The plan built on BAA’s experience with the Heathrow Consolidation Centre (HCC), an existing facility at the opposite end of the airport. It handled materials for upgrading Terminals 1 to 4. The HCC bought three main benefits:
1. Deliveries to the Centre and removal of waste and packaging were controlled so as to minimise local environmental impact.
2. Materials could be batched and delivered overnight to the work place ‘just-in time’ for planned tasks to be done more efficiently.
3. Contractors gain a better understanding of the distribution process and learn how to make it less chaotic through the application of logistics methods observed in manufacturing and retailing.

T5 had two consolidation centres. Colnbrook Logistics Centre (CLC) was a railhead handling bulk materials mainly for civil engineering. Heathrow South Logistics Centre (HSLC) controlled manufactured products. Materials were assembled into packages sufficient for a day’s installation work. There was limited storage for modules on trailers. The objective was to hold only a one-day buffer in the consolidation centres. Deliveries to the site via the one gate are programmed on a 30-second cycle.
The difference was that contractors ‘pull’ supplies when needed. “Deliver today what will be installed tomorrow” is the maxim all T5 contractors and material suppliers need to adopt.

Team working: achieving success together
Contracts with 1st tier suppliers were different from traditional contracts. The ‘rules’ for working with BAA were set out in The T5 Agreement which had three sections: The Delivery Team Handbook, Handbook Data and Referenced Contract Documents. It was all based on BAA’s acceptance that as the client, “the buck stops here”. The noticeable differences from mainstream construction contracts were:
*Flexibility*: The T5 Agreement was a flexible contract because things would change. It didn’t ‘look’ like a conventional contract.
*Integrated teams*: It was important to create relationships with better than normal management practices and processes to ensure the desired result is achieved by working together.
Responsibility is not the same as liability: Responsibility on T5 was the duty to achieve an objective or undertake an action. Accountability is the extent to which an individual is answerable for their responsibilities as an employee on the project. Liability is the legal obligation of a company to meet its responsibilities and to rectify or reimburse the cost of defects or non-performance.

Risk: The risk of achieving a successful T5 rested almost entirely with BAA.

Teams
T5 had organised delivery activities, not with conventionally formed teams (by disciplines or companies), but with teams assembled around customer products. Example customer products include the steps along a passenger’s journey (car parking, check-in, lounge, shopping, embarking) or services for BA (offices, baggage systems, logistics centres). Their solution creates teams at different levels to rationalise the skills of consultants, contractors and suppliers. The difference here goes beyond willingness to participate in a multidisciplinary team. Individuals are ‘rebadged’ as members of a virtual company, T5, for the duration of their assignment.

For the sake of economy and to reduce the notion of blame, BAA has negotiated project-wide insurance that covers all suppliers for construction all risks, public liability, professional indemnity and marine cargo.

Setting new standards
BAA were looking for at least a step up from normal performance. Having procured the best companies and people in each field, the lowest acceptable level of performance expected of everyone is “best practice” which BAA determined by benchmarking from what the market offered. This is the basic legal obligation.

But building “the world’s most successful airport” demanded what BAA called ‘exceptional performance’. The T5 Agreement said: “Exceptional performance is world class when it is better than anyone else has achieved so far.” Anyone contemplating ‘business as usual’ need not apply.

Best value solutions
The T5 Agreement empowered the team to make rational decisions about cost and value, taking account of planned and reactive maintenance, the cost to business of faults and the life cycles. BAA said: “Our experience all too often shows that, in keeping with customer demands, too many components and systems are removed before the end of their design life.” Team members analyse, recommend and decide on the basis of whole life cost. It was on this landscape that BAA set up the M&E Buy Club.
The T5 M&E Buy Club
A Buy Club is a team of 1st tier suppliers which agrees common supply chain strategy, sourcing and logistics requirements for purchasing equipment, materials and services from 2nd tier suppliers. The M&E Buy Club was the first of its kind in T5 and is probably unique in the UK construction industry. The Buy Club supported the whole T5 programme in delivering T5 at the lowest possible price by delivering the **best value** and **driving out waste**. Its role was to:

- Create the best commercial environment to make this happen;
- Agree the last possible dates for change; and,
- Improve planning so that it is better than best practice.

The Core Team consisted of 10 members including the Team Leader and the T5 Building Services Integration. There were 5 1st tier M&E contractors and a TECHT team of cost consultants. During the start-up there was a Facilitator to assist the Team Leader in planning the collaborative structure, defining meeting agendas and identifying difficulties and ways around them. Members were selected for their knowledge of the market and supply chain expertise.

**Shared Values of the team included:**

- Be honest and open;
- Come to meetings;
- No hidden agendas;
- Contribute;
- Resolve issues/make decisions;
- Work together, support each other;
- Complete actions on time;
- Collaboration; and,
- Respect for people.

The Core Team’s role was to formulate strategy, endorse acquisition plans, endorse tender enquiries and endorse evaluations. The Core Team’s monthly meeting was the link back to the main companies. These meetings typically covered; specialist teams’ progress; Buy Club process review; ongoing procurement issues; and, decisions.

**Mini clubs**
There were 13 specialist buying teams known as Mini Buy Clubs:

- Cables;
- Lighting and lighting control;
- Cable containment;
- Ductwork and accessories;
- LV switchgear;
- Fans;
- Pipework, valves and pumps;
- Modules;
- Control systems;
- Emergency lighting;
- Communication systems;
- Bulk purchase; and,
- Air handling and fan control units.

There was another specialist team handling freight management and more Mini Buy Clubs emerged as the programme progressed. Each mini club had a Team Leader, a Champion in the Core Team and several members drawn from the cost consultants and 1st tier contractors. The Mini Clubs met fortnightly and followed a 12-stage process:
1 Obtain technical information.
2 Pre-qualify suppliers.
3 Acquisition plan.
4 Prepare tender enquiry.
5 Issue tender (common briefing).
6 Mid-bid interviews.
7 Evaluate bids.
8 Suppliers’ presentations.
9 Recommendation.
10 Place orders.
11 Feedback.
12 Operations.

Procurement process
A team of procurement specialists from BAA, Mace and TECHT (the cost consultants) designed the procurement process. It was a deliberate move away from the traditional contractor’s approach which squeezes the supply chain on cost and which usually involves only one or two preferred suppliers. Adapting to this openness and ‘democracy’ is the toughest challenge for seasoned purchasers.
Much of this is already best practice for securing 1st tier suppliers. BAA’s innovation is to apply the same rigour at the 2nd tier. Although the T5 Agreement was between BAA and 1st tier contractors, it imposed a duty on 1st tier suppliers that terms with 2nd tier suppliers will be no more onerous than the T5 Agreement. This duty is passed along the supply
chain and BAA reserves the right to audit compliance with the spirit of the T5 Agreement at any level.

How the idea transfers
The M&E Buy Club proved such a success that the process was rolled out to the Fit Out and Systems teams in T5. The fit out packages were procured via an integrated procurement team working to maximise commonality and value, and taking the lessons learnt and protocols developed by the M&E Buy Club. The Fit Out Buy Club comprised Balfour Beatty (rail station and tracked transit system), Laing O’Rourke (car park), Warings (air traffic control tower), Mace and Llewellyn Rok (main terminal team – T5A) and Mansell (satellite team – T5B). BAA also procured a number of packages directly.

The packages procured by this Buy Club included:
- Hard floor finishes;
- Doors and hardware;
- Raised floors;
- Ceilings and bulkheads;
- Internal walls;
- Internal roofs;
- Joinery and wall panelling;
- Applied wall finishes; and,
- Architectural and general metalwork.

Mace’s procurement leader in the integrated team, John Williams, echoed the conclusions of the M&E Buy Club. He said: “We’re getting far more diverse opinions and experiences, and pulling together expertise from the different supply chains. This means we are in a far better position to achieve the exceptional performance that being a part of T5 demands.”

The T5 Buy Club Model
Looking beyond T5, the Buy Club model can be either adopted entirely or adapted to suit circumstances. The only essential prerequisite is having more than one specialist contractor doing similar work.
To adopt or adapt the model successfully it is necessary to:
- Focus on integrated team working;
- Take a consistent approach to procurement across whole projects or multiple projects;
- Use only best-value solutions based on specifications which address the quality and life cycle actually required;
- Have open-book accounting;
Apply the best practices normally used in selecting 1st tier contractors to select materials and equipment suppliers.

Buy Club – the pros and cons

The strengths of the Buy Club model are as follows:

- A common approach to the market promotes a better rapport with suppliers;
- Drawing together the diverse expertise of several 1st tier contractors makes it easier to meet and exceed best practice standards;
- Having only one process reduces 2nd tier suppliers’ cost of tendering;
- Economies of scale and administration mean that initial purchase savings in the range of 10-30% can be expected;
- A single procurement process leads to more uniform design and equipment, thus simplifying operation and maintenance; and,
- The open-book approach to quality focuses everyone’s mind on problem solving.

The weaknesses of the Buy Club model are as follows:

- The number of people involved can be considerable; and,
- Dependence on other 1st tier suppliers means you can only proceed as quickly as the slowest member of the team.

Opportunities include:

- Combined purchasing presents further opportunities for logistics specialists to streamline the distribution between factory and workplace;
- 1st tier contractors will naturally be focused on their own deliverables;
- Working together in the Buy Club reveals opportunities to exploit commonality;
- Procurement can move off the critical path for all but the first project, thus relieving downstream pressure on the programme; and,
- Enforced planning reduces the number of ‘rush jobs’, thus reducing the risk of accidents.

Threats to its success are:

- Inadequate support from top management of 1st tier contractors will discourage team members; and,
- Players who are not open and honest in transactions will undermine the process.

Threats to existing players in the supply chain include:

- Existing ‘preferred’ or ‘partner’ status suppliers to individual 1st tier
contractors may be locked out by consensus decisions; and,
● Wholesalers will be by-passed unless they adapt their practices and show that they add value instead of cost.

Recommendations for a successful Buy Club are:
A Buy Club is ideally suited to large projects where several contractors responsible for sub-projects purchase similar equipment and supplies. The concept is also applicable to purchasing products that are used by many trades, such as cables, conduits, fixings and supports. Contractors seeking to increase their buying power and gain a better understanding of the supply chain could form a Buy Club with competitors. The benefits await those willing to make the effort. But the process requires coordinated input from the client and 1st tier contractors, so be sure you have everyone’s commitment. Consensus must be achieved at every step in the process. In complex situations this is more likely to be achieved with professional facilitation. Imposing discipline on the chaotic state of logistics is the next big opportunity for contractors. A Buy Club provides an ideal environment to address logistics with other contractors.
A major innovative Public Finance Initiative project to deliver army accommodation fit for the 21st century to time and budget.

Project Allenby/Connaught is the Ministry of Defence’s (MoD’s) redevelopment project for the army barracks in Aldershot and around Salisbury Plain. The project delivers the accommodation necessary to enable organisational changes in the army and addresses problems created by an outdated army estate. It will provide a modern living and working environment,

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with associated support services, for some 18,000 personnel. The 35-year PFI contract has a capital value of more than £1 billion and a through life value of more than £7 billion.

Achievements and benefits

- A strategic approach to Defence estate planning, together with community and stakeholder involvement, has been adopted.
  Benefits: There is about 30 per cent more land available for disposal, leading to financial benefits and extra land for local housing needs.
- The PFI contract allows an emphasis to be placed on through life costs associated with constructing and maintaining the new facilities.
  Benefits: The preferred bidder, Aspire Defence, takes the risk on through life costs for 35 years. This, in turn, provides Aspire with a powerful incentive to deliver a robust, fit for purpose estate.
- A strong emphasis has been placed on the delivery of a sustainable development.
- Innovative solutions such as a campus style layout and “pairing and sharing” concepts have been used.
  Benefits: Improved demarcation between soldiers at work and off-duty activities. Better land use and a more flexible garrison layout that is able to cope with future changes to the army.
- Modular construction methods have been used to provide living accommodation.
  Benefits: Reduced overall construction time on site by about nine weeks, compared to traditional techniques (30 per cent faster).
- A combination of latest construction methods and basic incentives in a PFI contract has saved the project time and money.
  Benefits: Barracks completely rebuilt in 13 months, instead of 24 months, reducing disruption for the garrison and construction overheads.

Introduction

As a major client, the MoD understands the complex inter-related principles for construction excellence. This has occurred through consultation with key stakeholders, such as the Office of Government Commerce (OGC), the Commission for Architecture and the Built Environment (CABE) and Constructing Excellence (CE). Project Allenby/Connaught is an excellent example of how all these elements are being applied to major defence projects.
Background
The project originated in the Strategic Defence Review (SDR) carried out in 1998. The key requirements of the SDR included:
- Providing accommodation for army units returning from Germany;
- Reorganising and relocating of army units to improve operational effectiveness; and,
- Improving the living and working environment for military personnel (a major factor influencing morale and effectiveness of the military services).

The project provides accommodation and associated support services for units based in Aldershot Garrison and around Salisbury Plain in Wiltshire. The Salisbury Plain Garrisons are Tidworth/Netheravon/Bulford, Larkhill and Warminster.

Project objectives
The project has seven main objectives:
- To construct barrack accommodation as strategically identified by the SDR.
- To improve living and working quarters for all personnel, with special emphasis on Single Living Accommodation (SLA).
- To deliver high quality support services.
- To achieve whole life performance and value for money.
- To ensure a smooth transition.
- To develop a collaborative and trusting relationship with the contractor.
- To encourage developments which benefit the Army and the wider community.

Strategic Development Planning (SDP)
The key to achieving these objectives was to adopt an innovative approach to land use within the garrisons. A series of detailed studies were carried out by the MoD. These examined land capacity, infrastructure, efficient land use, potential land alienation and sustainability. Consideration was also given to how best the estate could be developed to meet the MoD’s modern needs. A SDP was created that laid out the development principles for the garrisons over the next 40 years.

Single Living Accommodation (SLA)
Particular attention was paid to SLA, one of the seven main objectives. The existing SLA consisted of a mixture of obsolete Victorian and Edwardian dormitory style quarters, and old-fashioned 1970s concrete system buildings, all offering little privacy or comfort for the soldiers. The project needed to identify
and provide new SLA by pioneering ‘Z standard’ SLA for all trained soldiers. The project will deliver 10,700 Z standard SLA rooms.

Sustainability
The MoD estate covers about one per cent of the UK land mass. It is committed to maintaining and developing the estate in a sustainable manner. Factors such as the environment, public access, heritage, planning and social factors, are all taken into account. Sustainability is an important feature for the Allenby/Connaught project. As part of the PFI competition process, bidders were invited to present their proposals for a range of innovatory client requirements, including:

- Combined heat and power plants;
- Rainwater collection;
- Solar heating;
- Sustainable urban drainage solutions;
- Building management systems; and,
- Waste disposal.

The competition documents also set out a contractual requirement, that new buildings should achieve an “excellent” rating against the BREEAM criteria and refurbished buildings should achieve a “very good” rating.

Selecting a suitable PFI partner
The project ran its competition to select a PFI partner under EU procurement regulations. Before selecting the preferred bidder, an OGC GatewayTM 3 review was carried out. This review was part of a pilot programme within the MoD, aimed at confirming the value of such reviews for defence procurements. (GatewayTM reviews were originally designed for civil procurements only).

The review highlighted many areas of good practice, with some recommendations for improving the robustness of the selection process further. It provided valuable independent evidence, which the project team cited when it sought central approvals for its business case. In June 2003, the MoD named its preferred bidder for the project.

The construction challenge
The project had to provide 360 new buildings, 155 refurbished buildings and 418 demolitions spread over a nine-year construction period. When completed, the garrison facilities will have an internal area exceeding 1.1 million square metres, together with the legacy estate. The scale of this task is complicated by the following factors:

- The garrisons are to operate on a live basis throughout the project;
Most of the accommodation needs to be built inside the ‘wire’;
Opportunities for moving soldiers to alternative accommodation during the construction period are extremely limited; and,
All building works must take account of security and counter-terrorism requirements, as well as building regulations.

Part of the solution
To solve the construction challenge, The PFI Contractor adopted some practical solutions, such as off-site modular concepts – completed in a factory under a controlled environment. Full modular units were preferred over prefabricated walls because they improve consistency, build quality and safety on site. The key advantages in applying a modular system are:

- Less energy is required to achieve the same output;
- Most of the prefabrication is completed in a factory, under a controlled environment;
- Reduced construction timescale (after foundations are laid);
- Less site traffic makes it logistically easier to manage site operations;
- Less labour involved in construction, reducing risk of health and safety incidents;
- Increased confidence in meeting project deadlines – the production of modules is a systematic repetitive process; and,
- Ability to stockpile modules to ensure a smooth flow to site.

Risk reduction
With a proposed production run of more than 100 junior soldiers’ blocks, the MoD and the Contractor agreed it would be prudent to undertake risk reduction activities for the modular concept. It was decided, before signing the main PFI contract, to construct a demonstrator block as a test-bed to make sure the facilities were robust and fit for purpose. The demonstrator block is now home for 36 soldiers in Perham Down. The Contractor used an advanced automated assembly process to ensure standardisation of replication. This is important for long term, large-scale projects, and helps to reduce risk and programme slippage by making events more predictable.
Fig. 7.2. Modules

Demonstrator block
The Perham Down demonstrator block was handed over in January 2005 and has since been occupied by soldiers. The soldiers are providing regular feedback to both the MoD team and the Contractor on issues such as furnishings, layout, security, function, privacy and comfort. The demonstrator block was subjected to the same sustainability requirements as the main contract buildings will be. The building gained an excellent rating from BREEAM, as well as significant credits under the Green Guide for EcoHomes. The credits were for:

- Reducing CO2 emissions to 14.2kg/m2 per year, with less than or equal to 60 kg/m2 per annum as the bottom limit (8/10 credits);
- Improving building performance across the site by 39 per cent, compared with relevant building regulations part L (5/5 credits);
- Reducing water consumption to 21.5 cubic metres per year, with less than 30m3 per annum as best baseline (5/5 credits);
- Providing public transport is available within 1200 metres (1/2 credits);
- Providing local amenities are positioned within 500 metres (3/3 credits); and,
- Waste segregation and recycling materials – maximum credits for
providing internal and external bins or storage to separate cans, glass, paper and card (6/6 credits).

Lessons learnt

- Emphasis was placed on strategic development planning over a 40-year timescale. This has provided opportunities to create more efficient, flexible and sustainable estate solutions, compared to traditional single site planning over shorter timescales.
- Focus was placed on outputs rather than inputs. This maximises the private sector’s ability to introduce innovation into projects. In so doing, it has been essential to clarify requirements such as MoD counter-terrorism measures for buildings and structures.
- An open approach to communication both within the MoD and with external stakeholders was adopted, resulting in better projects and smoother implementation. For example, Allenby/Connaught has further developed its SLA concept by exchanging lessons learned with MoD’s other major initiative, Defence Estates’ (DE) Project SLAM (Single Living Accommodation Modernisation).
CHAPTER 8

BAA CASE STUDIES CASE STUDY 3: HIGHWAYS – ADOPTING A FLEXIBLE APPROACH⁹
(A. MUKHERJEE, S. PEACE, S. AKRAM, P. R. NOWAK, P. O. NOWAK)

Lincolnshire County Council is working with Framework Contractors to deliver £23.6 million of coastal access improvement works. The first phase of the project was the Partney by-pass, which was completed in August 2005. The highway works at Partney were delivered three months ahead of contract programme, saving about £260K. This was achieved despite encountering numerous issues with the geology, ecology and archaeology of the site. The achievements of the project can, in many ways, be attributed to a bespoke framework, developed by the council to better procure its construction projects.

Fig. 8.1. Partney by-pass

Achievements and benefits

- Lincolnshire County Council developed an overarching bespoke framework.
  Benefits: The project delivery team was committed and involved from an early stage, resulting in continuity and ownership through to completion

- Start on site date for the Partney by-pass project was brought forward by more than a year.
  Benefits: This facilitated upfront consultation, allowing time for innovation and provision of best value solutions. It made the programme more flexible, facilitating the resolution of major issues that arose during the project works.

- The Partney by-pass project was completed three months ahead of schedule.
  Benefits: This saved about £260K and more than 21,000 man-hours. The bypassed route was open and operational during the busy summer holiday period, helping to ease traffic flows and improve the quality and times of journeys.

- Target cost and value management procedures were adopted throughout the project.
  Benefits: The project is approximately 500K under budget with no loss of quality.

- A safety culture was embedded throughout the contractors team. In total one workshop and sixty seven safety meetings were held.
  Benefits: 110,000 man-hours worked, no accidents reported.

- There was good planning and signage throughout the works.
  Benefits: No road traffic accidents during construction.
  - Emphasis was placed on engaging with the local community.
  Benefits: There was full support and involvement by the local community.

- Lincolnshire County Council funded archaeological excavation in advance of the construction of Partney by-pass.
  Benefits: This has ensured that the history of the village is preserved, benefiting both the county’s people and its heritage.
Introduction
Following Egan’s Rethinking Construction\textsuperscript{10} report, Lincolnshire County Council sought to adopt a framework contracting approach to its construction projects. This shortened the length of the procurement process for its construction projects, providing more time upfront to consider innovative solutions as well as the mitigation of risks.

The objectives for the framework were to demonstrate:
\begin{itemize}
  \item Innovation;
  \item Cost efficiency;
  \item Best value; and,
  \item Continuous improvement.
\end{itemize}

The council developed an overarching bespoke framework with core principles of quality and rates submissions. Two contractors were awarded the framework in February 2004 (to run for seven years until 2011). By appointing two contractors, risk is reduced, comparison allowed and idea generation facilitated. The contractual structure of the framework also permits the council to enter into further professional and construction services contracts under NEC.

The framework was first used on the initial coastal access improvement scheme – the Partney by-pass project. Works were scheduled to start in June 2005, but as a result of the framework agreement, the programme was brought forward to March 2004.

Project Background
Partney is a small village on the south-eastern edge of the Lincolnshire Wolds. The village’s importance is highlighted by the fact that two major medieval roads (now the A16 and A158) once met at a T-junction in the centre of the village. In recent years the amount of traffic passing through has been increasing, especially during the summer holidays, when people visit coastal resorts. The A16 is the main north-south route from Grimsby to Boston and the A158 is the east-west route from Lincoln to Skegness. Traffic accidents and congestion problems have resulted in the need for a by-pass around Partney. The by-pass consists of two new roads that skirt around the east and west of the present village.

Principles and objectives
The council made quality a priority for the delivery of the Partney by-pass project. This issue is reflected in their Local Transport Plan overall objectives:
- To create an economically successful county;
- To develop inclusive communities; and,
- To improve quality of life.

These high level objectives were to be facilitated through the framework agreement, which placed great emphasis on best value and innovation. The strategic emphasis on quality is reflected in the project specific objectives of the coastal access improvement plan:
- To improve the environment for residents (access, safety, noise and air pollution);
- To improve safety and reduce delays for through traffic;
- To reduce accidents;
- To improve journey time and reliability for tourists, bus services and tour operators;
- To help boost the tourism industry on the coast by further reducing the area’s periphery and, in turn, benefit the area’s economy; and
- To reduce severance and community impact caused by existing high traffic levels through the villages.

There was a further key target for the Partney by-pass to be open to holiday traffic in August 2005. This was a high priority, as the route has heavy traffic during the summer months, particularly to and from Skegness.

Major issues
At the project concept stage, the major issues were to:
- Start one year early; and,
- Minimise the works for new structures.

The consultation phase identified further potential issues with archaeology, geology and ecology. Therefore, it was necessary for the project team to:
- Manage known and unknown archaeology;
- Manage the existing ecology; and,
- Consider the geology.

As the project progressed to construction in July 2004, problems were faced with heavy rain and adverse weather. This was unexpected for the time of year and posed a major risk to the programme of works. In total, 6 weeks were lost to adverse weather conditions.
Successful initiatives

Local community
Lincolnshire is home to about 657,000 people, spread over a wide area. The project team conducted surveys before starting the works at Partney and found that 88 per cent of the public wanted the by-pass. This was a major factor for the team, as it highlighted that the majority of the public supported the works. It provided the team with the opportunity to engage with the local residents to ensure that their needs were met.

The support of the local community was encouraged by the production of monthly progress reports. Representatives from the project team would also attend parish council meetings, ensuring any issues were addressed. The senior project leader personally informed landowners about the programme of works, explaining all issues to them. All local residents were openly invited to visit the site as often as they liked during the works process. This was a huge success. About 500 people visited during the construction phase. A local school produced a project about the works and visited the site, encouraging the children to take an active interest in their local environment.

The project team were also conscious about engaging with local sub contractors. This benefited both the local community and the project. It supported the local economy and ensured that those employed on the project provided a high quality endproduct. By using local resources, it enabled the project team to have a quick response to any issues that arose, as the workforce resided in the area.

Upfront consultation

The Partney by-pass project was due to start in June 2005. However, the procurement framework had been developed by the council and awarded to two contractors in February 2004. This allowed the project (with advanced works) to start more than a year earlier, in March 2004, with the main works scheduled to start in July 2004. Therefore, four months were provided for upfront consultation and evaluation before the main works were due to start. The consultation phase allowed the project delivery team to become involved with the works from an early stage. This provided continuity and facilitated ownership of the project. It also meant that the site and surroundings were fully assessed before the main works began. This enabled a full understanding of the major risks and issues associated with the project site. By July 2004, the site had been cleared, with risks both identified and managed. This made the timescale and costs more certain and brought forward the start of the main works on site. The framework and upfront consultation also assisted the project team in managing the adverse weather experienced in August and October 2004. All
parties were quickly able to meet and decide on the best course of action. They sought to find an economic way of delivering the programme that would still enable them to finish on time. In total, 14 changes were made to the programme within the first year. This was due to the fact that the team had acted proactively at the consultation phase, identifying all issues and courses of action. Therefore the project team had a central, informed knowledge store, from which they could respond quickly and flexibly to any problems.

Archaeology

Fig. 8.2. Archaeological works

The importance of archaeology in the Partney area was highlighted during the consultation phase. Lincolnshire County Council had funded archaeological excavation in advance of the construction works. The first stage, in 2002, was an assessment of the proposed by-pass route, which looked at old documentary records, including maps of the area, previous archaeological work and aerial photographs. Between 2003 and 2004, excavations by archaeologists from Cambridgeshire County Council Archaeological Field Unit targeted the interesting sites. An English Heritage inspector decreed that two sites were of national importance. Upfront funding and targeting sites of archaeological
importance helped to inform the project team about the Partney area. It facilitated the identification of potential risks and enabled programmes to be created. The project team believe that by identifying potential problems, it gave them more options later to change the programme and mitigate risks. In partnership with Cambridgeshire County Council, the team produced a 16-page booklet on the archaeological excavations at Partney. This is a valuable public resource and current proposals are to publish a book about the site.

Ecology

![Partney by-pass construction site](image)

Fig. 8.3. Partney by-pass construction site

The project team appointed an ecological clerk of works to lead on all environmental matters. A number of issues were identified during the consultation phase as having an impact on the site:
- Badgers;
- Water voles;
- Nesting birds;
- Bats; and,
- Diversion of a stream.

Of these five key ecological issues, the location of two badger sets posed the greatest risk and interruption to the project. To resolve the situation with one badger set, the proposed route of the southern road was moved by 20 metres. However the second set was located on the proposed north-south road, which was flanked by archaeological sites. Therefore the project team, in consultation with English Nature, built a new set to accommodate the badgers. This was successful and preserved both the badgers and archaeological findings on the site. All ecological developments were tracked in an environmental action plan.
This beneficial source of lessons learnt can be used for future improvement work projects.

Geology
- The site at Partney is located on the edge of the Lincolnshire Wolds. Along the 4km route of the new bypass, the geology has four distinct areas:
  - Alluvium over clay;
  - Clay over sandstone;
  - Sand; and,
  - Sandstone.

To reduce earthworks costs, the scheme was designed to use the better quality sand in the main embankments and the marginal clay in the environmental bunds. There was no requirement for off-site disposal. Due to the adverse weather, areas of the site very quickly became water–logged, making construction works almost impossible. The project team evaluated the effect on the programme and considered cost–effective solutions. This was to add lime to areas of saturated silty clay. This allowed works to continue and ensured that the programme was kept on track.

Lessons learnt
- Upfront consultation
  This allowed the project team time to identify and manage risks at the beginning of the project. This provided flexibility in the programme to manage issues as they arose. Thus the project was delivered three months ahead of schedule, saving about £260K.

- Focus on quality
  The project team wanted to provide a quality product. They engaged with locals to understand their needs. As a result, average house prices have risen and the streets are safer for children to ride bikes to school. The general quality of life has improved

- Framework
  This was developed with one objective in mind – to better procure construction projects. The Partney project has shown the true value of the framework agreement. It provides an open forum for all parties to proactively confront and solve problems. Without the framework, traditional tender routes would have been followed. This potentially would have delayed the project by about 12 months, as the earthwork season would have been missed. Over this period, costs would have risen in line with inflation, potentially costing the project an
extra £204K. The framework has an added benefit of keeping the project team together, so the lessons learnt from Partney can be taken forward to other schemes.
CHAPTER 9

CASE STUDY 4: INTERNATIONAL 4-STAR BUSINESS HOTEL
(G. SIMSCH, P. SCHWERDTNER, J. MÜLLER)

9.1 INTRODUCTION

The term project management can be used to cover a broad range of different methods. The focuses and type of specific construction vary depending on the project type and requirements. In practice, it seems that actions that are not particularly spectacular or especially innovative are those that lead to success. Comparatively simple, but targeted, measures are the best way to achieve the defined project goals efficiently. In particular, what must be avoided is that the project management itself takes more work and raises more questions than ultimately could improve the project execution.

Chapter 9.2 gives an initial introduction to seven project management phases. This phase consideration supports structured project execution and, thus, leads to a reduction of project complexity to a manageable level.

A project is presented in chapter 9.3, which was successfully completed as a partnership model. The project scope is described using different key figures. The essential success factors of the project are covered in detail in chapter 9.4. Examples are given for all project management phases and particular advantages are highlighted.

The key statements are then summarised in chapter 9.5.
9.2 PROJECT MANAGEMENT PHASES

A project in accordance with DIN EN ISO 9000:2000 is a one-off process with a start and end date, which is achieved through the targets and taking existing, possibly limiting, basic conditions into account. Projects vary hugely in their complexity. The project management requirements increase with growing complexity, in order to achieve the objectives using suitable resources and actions.

All construction projects fulfil the criteria of a project. Complex systems and projects occur in particular in turn-key projects given the high number of project participants and the variety of possible construction cycles combined with other project features (sequence of job activities etc.). The number of external interfaces, for which time and/or technical factors have to be considered, can be in the high three-figure range, according to scientific studies.

The aforementioned basic conditions require structured project management for efficient and target-oriented execution. Division of the project management into different phases is the recommended first step. Seven phases are differentiated at Bilfinger Berger Hochbau GmbH, which are only explained briefly below. It should be mentioned that these phases are relevant for the tendering, design and execution phase of projects. Even the guarantee phase can be divided accordingly. The later stages, however, concentrate on the period just before the conclusion of contract (start of initialisation) up to acceptance (completion of the project).

**Fig. 9.1. Project management phases**

**Initialisation:** The essential requirements for project execution must be clearly defined on conclusion of contract (particularly dates, costs, quality). The contractor uses this as the basis for planning the resources required for execution of contract.
Organisation: Responsibilities and interfaces are clearly shown using a project plan and organigrams to ensure smooth cooperation. External partners must usually be taken into account at this point as well.

Structural planning: Further conditions for ordered site operation are created by defining production-oriented service packages and introducing administrative rules (filing, document lists etc.). This also includes definitions for the documentation of services.

Operations planning: Performance workflows, cycles and milestones are planned in detail using production-oriented operations planning based on the contractual time schedule, which is generally roughly planned. This also affects preparatory activities such as planning activities or the awarding of contracts to subcontractors. This produces essential tools for controlling and managing the project.

Realisation: The services to be delivered for the client (creation of final planning documents, execution of construction work etc.) are provided in the building phase, plus the necessary internal measures (e.g. updating the work execution estimate) in accordance with the operations planning.

Management + controls: Based on the previously created documents (target status), comparisons with the actual project progress (actual status) are performed as needed at defined intervals. This relates to all project goals (particularly dates, costs, quality), because any deviations could lead to difficulties as the goals are interlinked. It is crucial to clarify the causes and take steps if deviations are identified between the target and actual status.

Completion: The client’s acceptance represents a substantial milestone in the completion of the project. Handover of documents (as build documents, operating instructions etc.), creation of the final certificate and targeted return of the personnel and equipment resources to the company are usually still outstanding.

The aforementioned project management phases differ in terms of specification and depth depending on the type and size of the project in question. It is up to the responsible project manager to set the project-specific requirements.
9.3 PROJECT PRESENTATION

The plot is in the direct vicinity of the Frankfurt Exhibition Grounds on the site of the former freight yard (see Figure 9.2). The freight yard was decommissioned and completely dismantled a few years ago by Deutsche Bahn AG. This meant there was a new plot in the middle of Frankfurt am Main ripe for development with construction projects.

Given the central location the client planned to build an international 4-star business hotel with 288 rooms, restaurant, conference rooms, a fitness area and four shops. The plans also included an underground garage with at least 130 parking spaces.

Accordingly, a high technical standard was required by the planning offices. The planning was initially generated up to and including phase 4 HOAI (fee structure for architects and engineers; phase 4 covers the approval design) by the client with the support of his assistants (in parts up to phase 5/6 HOAI; phase 5 covers the execution planning and phase 6 the preparation for tendering). These documents formed the basis for putting the subsequent design and construction services out to tender.

The contract between Vivico Real Estate GmbH (hereafter referred to as the client) and a consortium of executing companies (hereafter referred to as the contractor) was concluded to create a turn-key building project. In addition to all necessary construction work on the site (with the exception of excavations and foundation piles due to the client's direct commissioning), this included consulting services during the approval phase and the creation of the final design. A so-called "partnership model" was agreed for this purpose, which was intended to encourage trusting and cooperative project execution.
Fig. 9.2. Location of the project (see position of the tower cranes)

Fig. 9.3. Exterior view of the hotel
The following facts and figures show the scope of the project and highlight the architectural and technical peculiarities:

Plot area: 3,800 m²
Effective building area: 21,225 m²
Number of storeys: 10 (of which 2 underground)
Build period: 19 months
Architecture: "Towel-shaped" building: protruding cubes and slightly curved façade in keeping with the Grimshaw architecture of Exhibition Hall 3.
Interior architecture: Special lighting, some furnishings with visual motifs, glass and wood panelling
Building shell: Concrete frame structure with flat slabs
Building services: Fan coils (heating, cooling, ventilation), prefabricated bathroom cells, under floor heating (lobby), bank of 3 lifts
Exterior amenities: Flat roofs with extensive plantation.

The following chapter presents some of the "success factors" and peculiarities of the project. Understandably, these aspects merely represent a selection of the significant measures and milestones in a project of this magnitude. There were many other factors that were crucial to the project's success. This is certainly not intended to be a complete list.

9.4 SUCCESS FACTORS

Successful completion of the project was based on a partnership model and emphasising the cooperative approach. Firstly, this is not unusual. After all, in Germany there are comprehensive cooperation obligations enshrined in the regulations of the Civil Code (BGB) and in the VOB/B Part B (contracting rules for the execution of construction works). However, practical experience shows that realisation of a partnership model during project realisation can avoid a confrontational approach.

The contracting partners' positive assessments after completion of the project demonstrate that adherence to the defined principles is possible and that doing so makes a substantial contribution to achievement of the defined project goals.
Incentive scheme (initialisation)

It is traditional in Germany to include sanctions for breaches of duty, or missed targets, in the contract. The payment of incentives for particularly good work, or when certain objectives are achieved, is still the exception, although the advantages of positive performance incentives are indisputable. An essential aspect of the above is that agreement of a bonus payment equates to the contracting partners' objectives, whereas in the event of penalties the contractor is often only seeking a solution to avoid additional payments.

A target price was only agreed after two months of joint design revision. All project participants were expected to adhere to these budgetary constraints and even to undercut them where possible. As every project is subject to a certain need for changes, the total also includes an amount for contingencies events. The price was also broken down into a precise list of own scope of works, external scope of works and fees with different partial amounts. Any adjustments to the target price were described in the section on work changes in line with the contract.

The special incentive in this agreed partnership model, however, related to the contractor's involvement in cost savings. These could be achieved by optimising the design or cost-effective contracting for outside services. The agreement of corresponding bonuses requires innovative thinking on the part of the contractor and the use of entrepreneurial thinking to the benefit of the client. The following division of saved costs was agreed for cost savings:

- Cost savings up to 5 %: Client: 50 %, Contractor: 50 %
- Cost savings > 5 – 10 %: Client: 70 %, Contractor: 30 %
- Cost savings > 10 %: Client: 90 %, Contractor: 10 %

This division takes into account that savings above 10 % seemed rather improbable following the joint design revision at the start of the project. However, the contractor should also be motivated by the high share for cost savings under 5 % to introduce comparatively minor optimisation suggestions. A project result improvement of 2-3 percentage points is certainly lucrative when one considers the standard margins on construction projects. In addition to innovations in technical building services and in the façade design, optimisation potentials were also identified, which were achieved through a high degree of prefabrication (e.g. shortening of construction processes):

- Prefabricated concrete parapets; and,
Prefabricated bathroom cells.

At this moment it is not possible to realize contract agreement based on exclusively sanction-based contracts.

Communication (organisation)

Communication is vitally important because of the number of project participants and the complexity of today's projects. The majority of documents are now exchanged electronically. This occurs either by e-mail, or professional document management systems (DMS) are used. These systems make structured data exchange simpler and ensure that all sent data is documented. The electronic method has its limitations when it comes to efficient coordination procedures, which require different points of view and ideas to be heard and incorporated in the decision-making process, and review of copious quantities of design documents. Experience shows that face-to-face meetings are a quicker means of finding solutions.

For this reason, a communication and discussion culture was instigated early on, which incorporated the partnership approach. Accordingly, the project participants were invited to a kick-off meeting to get to know one another. The essential project participants (client, contractor, occupant and planner) then played an active role in the meetings, all sending competent representatives authorised to make decisions. Meetings were only held after agendas had been distributed in advance, to ensure that all partners could prepare individually. The agendas were also intended to clarify the central theme of the meeting to support target-oriented discussion and, conversely, to avoid extensive discussion of all project themes.

The discussion culture also included clarification of relevant points within meetings, so that all participants left meetings with concrete decisions with regard to further action. The results were recorded. This was a conscious decision to avoid open issues having to be solved by extensive correspondence. This process was crucial in keeping to the specific target dates for design and execution.
Change management (structural planning)

A one-sided right to change the scope of works on the part of the client was included in the contract, comparable to the regulations of the VOB/B. In addition, different process steps for agreement of a change in the scope of works were described in relation to the peculiarities of the partnership model. The relevant process steps are shown in the following illustration.

![Fig. 9.4. Process for changes in the scope of works](image-url)
The defined periods for the submission of an offer by the contractor and agreement on a change in works proved especially helpful. These defined periods motivated both contracting partners to clarify any required changes in works as soon as possible. This was not generally a major hurdle – when there was a corresponding willingness to reach agreement – at least for so-called "technical amendments". An "open-book" principle was also agreed so that the client was constantly informed about the economic conditions of contracting. Prompt agreement on amendments is sensible for turn-key projects to avoid a "backlog" and to ensure deadline and budget security for both contracting partners. This consistency is essential in partnership models to ensure transparency as regards adherence to the target price. This puts the contractor in a position to make suitable alternative proposals on saving potentials if it appears likely that the target price will be exceeded (contractually required here).

Scheduling (operations planning)

Due to early conclusion of a rental contract with an occupant, the client was keen to achieve prompt completion of the design and construction work. A time schedule was created to realise this objective – as is the standard – and was agreed as a contractual component. The contracting partners predominantly used this time schedule for decision-making periods and as a support tool for transparency over deadline constraints.

Retrospective changes by the client or delayed decisions are the most frequent causes of process disruptions on construction projects. The consequences are usually aggravating for both parties. While the client incurs additional costs without an increase in benefit, the contractor cannot assess and claim for all difficulties that have actually arisen. Therefore, it is in the interests of all parties to avoid disruptions through clear-sighted operations planning.

The explicit definition of decision-making periods for award of contracts, sampling inspections etc. led to a high degree of deadline security on the project at hand. Additional buffer periods, for example, were created through efficient stepping of the design and execution processes. Different design variations were developed and evaluated for the cost-intensive trades of the technical building equipment and the façade – including the later operating costs – without endangering the advised completion date. This enabled the client to deal with a
well-founded selection of qualities and technical systems, while prompt cost finding contributed to secure decisions.

![Sprinkler control centre and façade (rear aspect)](image)

**Figure 9.5. Sprinkler control centre and façade (rear aspect)**

Of particular note is the approach to identified problems in operations planning. The client would usually leave the contractor to solve these difficulties. The client recognises changes either through his own supervision of construction activities or through receipt of updated time schedules. Any deviations between the target and actual status then leads to an intensive exchange of correspondence with assignment of blame and demands for redress on both sides. When bottlenecks and required alterations to the design and construction workflow were identified, the contractor contacted the client promptly to coordinate the next steps in the process. In addition to removing the need for an
extensive exchange of correspondence, the transparent approach to operations planning also helped to strengthen mutual trust.

Common updating of the target scope of works (realisation phase)

The fact that the client had secured an occupant early on also facilitated joint revision of the design documents and tenders for subcontractors in line with the occupant's requirements. This usually carries the risk that necessary specifications are set too late, or are non-binding or unclear, due to unstructured processes and missing authorisations at the operational level on site.

Two measures were intended to counter these undesirable developments. Firstly, all final design documents were reviewed by trade by each relevant project partner. This gave the participants the chance to raise queries immediately and to get clarification. It was also possible, under consideration of the contractual agreements, to discuss any differences of opinion as regards differentiation between contractually stipulated works and retrospectively arranged, amended or additional works. This direct exchange between the parties has proved to be extremely efficient, particularly on turn-key projects that have a variety of details to be specified in the course of the development.

Integrating a furnishings service provider in the design process enabled the parties has proved to be extremely efficient, particularly on turn-key projects.
Fig. 9.6. Quality standard of the rooms with sample materials
Moreover, they were able to avoid a protracted discussion with regard to additional remuneration. It is normal for conflicts of this kind to hinder achievement of deadline targets. Immediate specification of the execution "on its merits" was mandatory to resolve each adjustment to the final design documents. The contractor's high professional expertise and planning experience helped to clarify the risks of cost-incurring changes in the meetings and made the client's decisions easier. This process resulted in an enormous advantage for on-going project delivery/implementation/completion. The client and the implementing construction company have the same understanding of the target services.

Quality management (management + controls)

The term Quality Management has not been without its detractors since the introduction of DIN EN ISO 9001. The primarily element-based standard (20 elements) demanded a lot of administrative effort from companies interested in certification, while the corresponding benefits were not always clear. Additionally, the standards in question had very generalised wording and permitted little flexibility.

The introduction of the process-oriented DIN EN ISO 9001 in 2000 took practical requirements into account. There was also an emphasis on one essential principle of quality management, the continual improvement process (CIP). This principle can be explained by the PDCA cycle (Plan-Do-Check-Act, see also illustration below). The four phases can be described as follows:

Plan: Defining targets, planning actions
Do: Realising actions
Check: Checking target achievement
Act: Introducing improvement measures
This principle was realised under consideration of the basic conditions and requirements of a construction process. The target definition (Plan) represented the contractual agreements and the planner's final design documents. These documents illustrated the target scope of works for the executing firms and were realised according to the operations planning (Do).

The client and the general contractor agreed to set up a joint defect tracking list (Check) in parallel to this process. This list fulfilled several purposes. Firstly, it was intended to strengthen trust between the contracting partners with regard to execution quality through a transparent approach to defects. Secondly, there was a particular focus on identifying "systematic" (i.e. recurring) defects and so-called "fundamental" defects (e.g. with ramifications for the functionality of the building).

Furthermore, the local site supervisor ensured that any defects identified during execution were resolved consistently. Measures were also taken to prevent repetition of systematic defects (Act). This process enabled the contractor to ensure a high quality of execution and to avoid delaying resolution of cost and time-intensive defects until the period after acceptance.
Acceptance procedure (completion)

The acceptance of a work performance is highly significant in the execution of a construction project, due to the development of appropriate outcomes (reversal of the burden of proof, start of the defect liability period etc.). Careful planning and preparation of this milestone makes implementation easier for all participants and ensures high customer satisfaction. This also includes quality management during execution as described in the previous section.

On projects of this magnitude it is not possible to review all works for contractual conformity in one day. As a result, the contracting partners agreed to conduct interim site inspections, during which any identified defects were documented in a jointly signed record and then had to be resolved by acceptance. A corresponding regulation was included in the contract.

To increase objectivity and to guarantee the correctness of the identified defects, the client and the contractor agreed to enlist the services of a jointly appointed expert. The expert was able to achieve a consensus on how to proceed when there were differing opinions in the event of deviations from the expected qualities and was able to attest to the fault-free status of the works. This support proved to be particularly helpful in assessing the area of the technical building equipment. The contracting partners agreed on cost sharing with regard to the costs for the acceptance process.

Ultimately, thanks to the aforementioned measures, they succeeded in keeping the number of defects identified at acceptance to a figure less than 100. This low volume of defects on a turn-key project of this magnitude and level of requirements was a major factor contributing to the high customer satisfaction.

A positive side effect of the high execution quality and successful completion of acceptance was – certainly also due to the open-book principle when adjusting the target price – an expedited final certificate for the project. The agreement on the contractor's final payment was settled within six weeks after completion.
Fig. 9.8. Restaurant

Fig. 9.9. Reception
The high level of complexity in projects requires structured project management, particularly in turn-key projects, in order to handle the requirements at hand. In this context, it is best to divide project management into seven phases; initialisation, organisation, structural planning, operations planning, realisation, management and controls, and completion. Relevant success factors for the individual phases of project management and their implementation were described in detail using the example of an executed turn-key project (new build of a 4-star business hotel). All measures were based on the contractual partnership model agreed between the investor and the tasked consortium. The limitations of the standard procedure were also explained to highlight the advantages of the relevant measures.

The selected examples illustrated that it is the transparent and simple actions and methods of project management that lead to the desired success. Orienting (one's) project management to the needs and possibilities of the client is a crucial success criterion. By achieving the originally defined project goals, both parties assessed the project overall as an outstanding example of cooperative project management.

In conclusion, four "principles" can be identified, which implicitly form the basis of all illustrated measures:

**Prevention:**
There has to be a clear-sighted approach to achieve early recognition of as many disruptive factors as possible and to ensure smooth project execution.

**Discipline:**
The planning and resolutions must be implemented consistently throughout the entire project period, even if this is not always easy in the sometimes hectic daily schedule.

**Transparency:**
Planning and initiated measures within project management must be clear and comprehensible for the project partners.

**Trust:**
Mutual trust between the project partners forms the basis for cooperative project execution and is supported by professional realisation of the above aspects.
CHAPTER 10

CASE STUDY 5: CONSTRUCTION OF ARKADIA SHOPPING CENTRE
(D. WALASEK)

10.1 INTRODUCTION

Arkadia was build and still is Poland's largest shopping centre boasting the stores of top domestic and foreign brands, stylish restaurants, cafes and a cinema. All of them under a single roof, surrounded by unusual architecture - glass rooftops, high street-like galleries, fanciful mosaic tiling and natural stone walls. The favourite meeting place of stage artists, singers, media people and foreigners. A stylish, elegant, friendly and fashionable place.

The concept behind Arkadia was to rediscover the essence of trade and its importance for the growth of the city. The design of the Centre was inspired by the city.

Its thematic malls (named Kopernik, Vistula, Canaletto, Twardowski) evoked the concept of 19th century European galleries, while the public space in front of Arkadia, which includes a city square with a wide choice of catering establishments and a park, is an excellent place for leisure, a walk, sports and cultural events. The layout and names of the malls evoke diverse areas of human life, thought and environment: science, culture, myths and the city itself.

The design of the Canaletto Mall is based on the urban architecture evoking the atmosphere of a high street. The name of the mall highlights the unique nature of Warsaw as a city aspiring to become a large European metropolitan centre.
The architectural design of the Vistula Mall is associated with the Vistula, the largest Polish river. Aquatic motives built into the floor and ceilings give the impression of a flowing river. Bright colours and lighting in the form of masts ensure a relaxing atmosphere.

The Twardowski Mall evokes the world of myths and fairytales. The interior architecture reminds us of the legend of Master Twardowski, a legendary alchemist, who sold his soul to the devil in exchange for great wisdom and the secrets of magic.

The Copernicus Mall is an expression of the idea of science. The decorations evoke astronomy and mathematics, while reflecting discovery passion and works by Poland's greatest astronomer – Nicolas Copernicus.

The following information listed below simply prove that Arkadia was the one of the biggest schemes completed recently in Europe:

- Total surface was 287000m²;
- Commercial surface was 110000m²;
- Project value 270,000,000 €;
- 20 hypermarkets;
- 250 shops;
- 20 restaurants;
- 4,300 car park places; and,
- 15 screen multiplex.

The building was built of mainly of reinforced concrete slabs and columns founded on piles. Some zones, such as Hypermarket Carrefour and the cinema, were constructed of steel structure.

The relevant plans of the First and Second Floors as well as sections of the Shopping Centre are presented in drawings 1, 2 and 3.
Fig. 10.1. Floor Plan - level 0.00

Construction of the Centre was not easy, not only from a management point of view. It was necessary to gather a team of highly skilled professionals to provide efficient site logistics, especially when supplying enormous quantities of mass construction materials.
Fig. 10.2. Floor plan – level +6.60

Fig. 10.3. Cross sections of the building
One of the key issues was to provide the efficient controlling for that particular type and size of the project, accepted by the Insurer and combined with the statutory requirements requested by all Local Authorities involved. The main responsibility consisted of two combined functions. One was based on the Building Code in Poland (Clients Representative on Site) and the second was based on insurance requirements (10 years guarantee certificate of building stability and water tightness) in close co-operation with all Project Team members.

The project physically started in October 2002 and the Client Representative was required to practically manage all technical aspects according to the Polish Building Code, as well as according to building insurer requirements. Three months before the start of the project, all procedures were prepared and, at the right moment, presented to the General Contractor and its 6 subcontractors. It was required to control all elements, including reinforcements, which were required to be approved by Consultants.

Some statistical information concerning the 2-year project can easily prove the scale and complexity of the construction of this Scheme:

- 40 000 of structural elements were officially handover;
- The building was founded of 2 400 drilled piles;
- 10 000 columns;
- Total surface 250 000 m² of the reinforced concrete slab;
- 10 000m² of pavements;
- 15 000m² of natural stone floors;
- 100 000m² of masonry;
- 128 000m³ of concrete;
- 15 000 tons Reinforcement;
- 1 700 tons of steel structure;
- 20 000m² Cladding;
- 1 800 handover protocols;
- 5 volumes of Site Log;
- 7 000 execution building drawings;
- 2 000 modification sketches and drawings;
- 30 detailed instructions;
- 4 300 car park places;
- 3 modifications of Building Code in Poland;
- 1 400 workers on site; and,
- 10 years of stability and waterproofing warranty.
The Technical Control and Inspection team consisted of 8 highly professional staff – including assistant and other building, sanitary, HVAC and electric inspectors, and to co-ordinate their activities in connection with the project program, Client requirements, general contractors contract and its subcontracts with major trade general contractor as well as trade contractors. Each decision was key with regards of the insurance point of view and was targeted to keep the risk on an acceptable level. The scope of missions, on such a big project consisted of the following: security of the person, landscape decontamination, fire protection, water tightness and stability required complex technical and managerial knowledge. The knowledge had to be shared on direct link with my headquarters in France where the final technical advice were made.

However we had to instruct all M&E contractors to apply for permission for roof and slab perforation, as well as to provide to us with drawings and relevant check calculations related to the suspension of all cables and HVAC ducts. The relevant procedures, including perforation register and permission for perforation application form, were proposed and then implemented. The structure of the technical control is presented in picture 1.

According to construction regulations in Poland, the Site Manager takes full legal responsibility for all aspects of health, safety and welfare on site. The role of the technical inspector (Client representative according to Polish Building Code) is mainly technical but one of the Building Code’s paragraphs allows him to give dispositions to Site Manager and to all other technical staff on site. On Arkadia, it was necessary to decide to be involved also in improving condition of health and safety. Personal protection of each worker e.g. helmets (not commonly used on every of site in Poland) become standard on that particular site. It was applied several psychological techniques like rejection of reinforcement handling until all health and safety regulations are applied on that location requesting all technical staff to fire from that site all workers who not respect the Health and Safety rules on the site and to stimulate H&S satisfactory safety level on site. The Site was several times inspected by the Labour Inspectorate in Poland, and the inspectors confirmed in their protocols that the site was safe.

The site location was near Umshlag Platz, a place where Germans had transported Jews from the Warsaw Ghetto to concentration camps during the Second World War. The railway station was bombed by the RAF, so several times explosives, bombs etc. were found during excavation works. In one of the locations, approximately 500 bombs were found. It was necessary to stop in consequence all activities on site until professional verification and check by specialists from the Military Technical Academy. The check was directly linked
with execution of piles and in consequence scanning was performed to 3 metres below the ground to eliminate risk of potential explosions. However, the military authorities stated that additional checks were not necessary (legally required). At the end of the Project, the Client Representative’s clear conscience was a result of its professional and managerial approach.

The building Code in Poland requires professional judgment at all key stages of the construction stage. All works that will be covered require an official hand-over by the technical inspector-client representative. All works have to be judged on technical and management aspects, Value for money and completion of the project on time and within budget are the key criteria of such judgments. It is obvious that on every project the person who takes personal responsibility, and who works for the Client, has to take all possible options into consideration. This is to find a compromise and the right solution. On the Arkadia project the CFA piles (Continuous flight augers) (approx.2400) were not correctly positioned and this required taking the right decision at the very beginning of the project on what solution had to be applied. The structural designer and the designer responsible for piling were requested to provide a universal solution for the rest of the possible cases. They proposed such a solution and, on the basis of only one drawing it was possible to hand over all elements related to the substructure (foundation pads and then columns). This saved on time required for technical approval (contractually it was 14 working days for each of drawings to be approved). A similar approach was applied to approximately 2000 situations when it was the Client Representative’s duty to decide whether the modifications proposed by the structural engineer were minor or major.
Fig. 10.4. Structure of the Technical Control and Inspection on site
10.2 SEQUENCE OF THE WORKS

The construction began in late October with the erection of approximately 2400 drilled piles. As shown in picture 5, after few months more than 50% of the piles were already installed. The picture also shows that 7 of the 12 tower cranes were installed. The tower cranes were located on the piles as the whole building.

The structural designer provided the unusual solution of foundation extending the reinforced concrete column with the pile. Transfer of the vertical load was by piles heads with restriction of very precise alignment of those elements to avoid unexpected moments. Such a solution required very strict geodetic control of the piles execution. The special measurement equipment installed on each of four drilling machines helped significantly to control correct rotation moment and rotation speed, as well as the length of each of the piles.

The subcontractor for the foundation works collected all drilling machines from all around Europe, so the control machines “spoke” different languages – Polish, French, Hungarian and Romanian - as did their operators.

The drilling was done up to 20 m and diameter was up to 120cm depending of the structural and geological requirements. The foundation works and structural concrete elements were concreted in the low temperature (even -15°C) with application of the electrical heating of the shuttering.
Picture 6, taken 2 months later, shows that all piles are already driven in addition to the previously completed 2 storeys of the building. The General Contractor was prepared to execute up to 10000m² of the concrete slab every week. That fact explains why such very good progress was feasible. Such progress required implementation of very specific and detailed hand over procedures and coordination of the inspectors, contractors and mixed concrete suppliers. The template for the relevant hand over protocol complying all state requirements is presented on fig. 10.6.
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REQUEST No

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1. Kierownik Budowy / Site Manager
2. Kierownik Robót / General Foreman

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</tbody>
</table>

Odbiór dokonany przez/ Present :

1.Inspektor Nadzoru – /Site Supervisor
2.Kierownik Budowy- /Site Manager
3.Kierownik Robót- /Foreman

Fig. 10.6. Handover protocol
Those protocols allowed for detailed control of the execution drawing preparation as well as management of all certificates, attestations and conformity of the executed works with the technical documentation. Every day around 5 pm it was a short coordination meeting where a detailed programme of hand over activities for the following day was set up. I would like to mention that all structural elements, especially their reinforcement was handed over by just 2 inspectors working full time with support of the one being on reserve to comply all the time with very tight programme which as an example is presented in the picture 10.7.

![Fig. 10.7. Site view, site logistics and sequence of the works – April 2003](image)

Four months later, in August, the majority of concrete works were already completed. Such good progress with the works allowed the General Contractor to close the majority of the building before winter and to continue after heating the finishing works. At that stage, activities of the site inspection were related to checking the right quality of the finishing works by implementation of the efficient control procedures. It was required from each from subcontractors to provide for approval detailed instruction and self-control instructions. Each of them were then required to implement those procedures.

Picture 10.8 shows building closed, except for the area of the cinema. A change in cinema operator caused a delay in the works in that particular area and resulted in the late opening of the cinema a few months after the official opening of Arkadia.
Fig. 10.8. Construction programme of the Arkadia Shopping Centre
With regards to the programme, in January 2004 the final works were continuing. These works mainly involved natural stone tiling. The specific procedures of the control were applied especially by random control of all performing works, including the parameters of the mortar, its curing in realistic conditions and by adequate laboratory tests. As a result of such a strict control, some of the areas were not positively approved and the subcontractor had to do some percentage of the works again.

Fig. 10.9. Site view site logistics and sequence of the works – January 2004

At the end of February and beginning of March 2004, the majority of works were conducted directly by the tenants who had moved in. Technical control and detailed inspection were applied to all shops and restaurants. Each shop was controlled 4 times by the team of inspectors consisting of construction, HVAC and electrical engineers. Each inspection required completion of a report which had to be presented to our Client. Every week the summary report concerning the progress of the control, comments and conclusions was produced.

October 19th 2004 was the day of official opening of the centre. Approximately 80% of shops and restaurants were opened that day. From then on, the outstanding works on shops was only allowed to be carried out overnight.
CHAPTER 11

CASE STUDY 6: WARSAWA WILENSKA SHOPPING AND SERVICE CENTRE
(J. SOBIERAJ)

11.1 INTRODUCTION

The topic of the study is description of the investment project, consisting of construction of Warszawa Wileńska Shopping and Services Centre, located in Warsaw, at the existing Wileński Railway Station. The facility combined the function of a railway station and a shopping and services center. Within the structure of the total area of 116 814 m², Carrefour hypermarket occupies 17 611 m², including 8611 of the shopping space and 4 303 m² of storage and delivery space. The office part (constructed in accordance with class A standard) occupies the area of 12 000 m². The agency agreement for lease of office space was signed with CB Richard Ellis. The Centre also has parking for 1330 cars.

Investors in the facility, which commenced in June 2000, were European Retail Enterprises Group and Carrefour. The architectural design was prepared by A.B.I. & Arpes, while the structural design was prepared by BWL Company. The General Contractor for the facility (built as a monolithic structure) was Warbud S.A., which entered a consortium agreement with Radex S.A.
11.2 INVESTMENT INFORMATION

11.2.1. HISTORY

Wileński Railway Station was built in 1862 as a final terminal station. Initially, it was called „Petersburski Railway Station” due to the construction of a railway station from Petersburg to Warsaw, which was to be served by the station. The undertaking consisted of construction of a shopping centre and regeneration of the existing station.

The low-standard railway station building survived the 2nd world war and, after some small repairs, was used until the 1950s.

In the following years, the ticket offices, waiting rooms and the bar were moved to a new building, also of a low standard, situated at Białostocka Street. This railway station, in an almost unchanged form, existed until implementation of the investment project which is described in this study.

11.2.2. STAGES OF IMPLEMENTATION OF INDIVIDUAL FACILITIES

Stage I:

In order to allow for demolition of the existing station buildings and to prepare the construction site while maintaining railway traffic during the construction period, the first stage consisted of construction of a two-storey building, which served as a station during construction of the Shopping Centre facilities. After completion of the investment project, it was designated for administrative and technical purposes of the railway station service and technical maintenance of the station.

By withdrawing the end part of the station (shortening of the existing platforms) to the height of the temporary station building, a collision-free connection with the platforms was established. At the same time, works were commenced to reconstruct the track layout and the railway infrastructure of the station side tracks and construction of temporary platforms as the extension of the existing ones.

Along with reconstruction of the track layout, a delivery ramp was constructed for the hypermarket, constituting an internal part of the Centre building. During the construction period, the ramp served as the construction site facilities during the 2nd stage of implementation of the investment project.
Stage II:
After construction of the temporary railway station building and demolition of all of the existing facilities, construction of the main Centre building was commenced. Apart from the facilities for the railway station passengers and the railway station hall, it included the entire shopping and services center, encompassing:

- A general store with offices, staff rooms and storage facilities;
- A shopping gallery (3 levels) with shops and restaurants;
- Office space (2 levels); and,
- A three level garage for the clients and employees (in the north-western part).

The programme associated directly with passenger services was moved to the Centre building. Entrances to the railway station hall were designed on the side of Targowa street (through a shopping arcade) and directly on the side of Al. Solidarności.

11.2.3. DESIGN AND CONSTRUCTION SOLUTIONS

The facility constructed is a multi-storey complex, combining the functions of a railway station, a shopping and services centre, office and administrative facilities and a three-level garage.

The functional links in the facilities have been designed to retain the separate interests of individual users, among other things, by establishing individual traffic systems and independent internal supply networks.

Individual storeys of the building are connected by travelators, escalators and elevators.

The hypermarket
The hypermarket hall has been designed at the level of + 7.75 m. Apart from the self-service shopping area, it has some traditional stands, a bakery, a confectionery, a butcher’s shop, a pizza stand, a stand with fresh fish and poultry etc. Adjacent to the hypermarket, there are storage facilities and staff rooms.

The administrative and office facilities of the hypermarket are located at the level of +12,75m.
The shopping gallery (shopping arcades)
The shopping gallery occupies three levels (-0.80, +3.50, +7.75). The traffic
routes between levels consist of travelators and escalators. Additional lighting is
provided by skylights above the traffic routes. Along the shopping arcades,
there are catering facilities and shops for lease, to be arranged individually.
The shopping gallery is accessible from three sides of the facility, from al.
Solidarności, Targowa and Bialostocka Streets.

Office facilities
Office facilities have been designed on the highest floors: +12.75m and
+16.75m. A separate set of elevators has been designated to serve the office
space.

11.3 DESIGN MODIFICATIONS

The facility was designed as a multi-storey building (with an underground
level), according to the monolithic frame system, with varying numbers of
storeys in individual parts.
Initially, the concept of using prefabricated components for construction was
analysed. Later later on, it was rejected upon demand of the consortium of
General Contractors (except for the railway station part). It was decided that the
following risks were too high:
Lack of continuity of works due to dependence upon a single supplier;
Possibility of a failure to comply with the delivery schedule; and,
In the event of substandard quality of prefabricated components, a necessity to
change supplier, and thus a long period of suspension of works.

Moreover, the application of a prefabricated structure would not allow for
optimisation of costs (minimisation of consumption of steel, concrete, decreased
transport expenditures and scope of earthworks).
The consortium of contractor companies Radex S.A.- Warbud S.A., after
getting familiar with the design documentation of the building structure,
decided to engage in its optimisation. To this end, it engaged a design office,
which was to profit exclusively from the savings introduced. As a result of
consultations, the companies decided that the equivalent of 10% of savings in
the costs of concrete and steel would be the exclusive remuneration offered to
the design company.
The works of the design company resulted in numerous modifications of the
design. The most significant of these included:

- Modification of the building foundation from pad/continuous footing to
  a foundation plate. The foundation plate warranted a decreased, more
  even loading of the ground (not exceeding 200kPa), which limited the
  uneven settling. Application of the foundation plate increased the
  building foundation level, thus reducing the excavation volume. A
  ferroconcrete slab of 40cm thickness was installed, thickened locally to
  70 and 100 cm under the base.

- Upon replacement of the prefabricated structure with a monolithic
  poured structure, construction of binding joists was also eliminated,
  which facilitated greatly the building of the frame construction. During
  this period, due to shortage of qualified personnel, in particular
  carpenters, foremen and skilled tradesmen, the need to construct
  binding joists could result in substantial delays in the construction
  process.

- The 8-meter slab and column module was replaced with a 16-meter wall
  and column module in the railway station part. Prefabricated columns
  and floor slabs type TT were used, of module length of 12 and 15m.
  The prefabricated columns were placed on poured bases, installed on
  CFA bored piles. This allowed for shortening of the time of assembly,
  and thus reduction of the period of work concerning the part of the
  facility rendered accessible to railway and pedestrian traffic.

11.4 OBSTACLES AND DIFFICULTIES ENCOUNTERED DURING IMPLEMENTATION OF THE PROJECT

A number of difficulties were encountered during the construction period, which could result in a failure of the entire investment process.
Those included:

1) The main difficulty associated with the construction of Warszawa Wileńska Shopping and Services Centre was the fact that the „technical conditions to be met by buildings and their location” did not take into account the possibility of construction of such facilities in Poland.

2) At the very beginning, the construction works were delayed by about a month due to reasons beyond the control of the investor and the contractors.

3) On the site, there was a plugged drift (along the axes 20 and E,F), which was a remnant of the trial drills for the 1st subway line, conducted in the fifties. The top of the drift was at the foundation level.

4) The construction site was located adjacent to residential buildings, which led to numerous problems, such as:
   - The earthworks conducted posed a threat to safety of the prewar building at 70 Targowa Street. The contractor companies, in consultation with the investor, fearing potential claims due to damaging of the building, ordered stocktaking of the technical condition of the building prior to commencement of works and its constant monitoring during performance of works. For this purpose, premises were leased at the building to hold the appropriate measurement apparatus for constant monitoring of the building structure condition. At the same time, benchmarks were installed on the building walls to determine its stability. Control measurements of settling of the building were conducted throughout the investment implementation period.
   - In the period of 19 months, 10 geodetic measurements were conducted for the benchmarks placed on the walls of the building at 70 Targowa Street, which showed that the works associated with the excavation for construction of C.H.CARREFOUR WILEŃSKA had little impact on ground movement under the building.
   - Even the most substantial ground movement (raising) observed during the period of driving piles in the excavation walls, were within acceptable boundaries, according to the standards for this type of buildings.
   - Taking into account the above, it can be stated that construction of C.H.CARREFOUR WILEŃSKA had little impact on the structure of the building at 70 Targowa Street.
   - The expert additionally stated that, in his opinion, that modification of the technology of construction of the excavation walls by replacing driven piles with bored piles resulted in a substantial reduction of settling of the building.
   - The fact that the construction site was surrounded by buildings resulted in the necessity to locate the technical facilities outside the construction...
site area, at a distance of about 500 m (a yard was leased from a housing cooperative for this purpose).

- Moreover, due to limitation of the construction site area, it was necessary to locate the cranes within the building outline (some cranes were located in elevator shafts, and for others, openings were left in the floors). The crane distribution enabled access to the working zones at any time, regardless of a potential crane failure.
- The construction was subject to protests due to noise emission. Therefore, it was decided that the working time would be limited to the hours between 600 and 2200.
- A protest was also filed against the project of locating the unloading ramp for trucks delivering supplies to CARREFOUR market. Noise level measurements were performed to specify the acoustic spectrum in the surrounding area of a residential building located at a distance of about 12 m from the unloading ramp entrance. The measurements showed that the acceptable noise level was not exceeded.
- Due to escalation of conflicts with the inhabitants of neighbouring buildings, a mediation team was established by the Mayor of Praga-Północ and representatives of BEG company, and the team manager was the President of RADEX S.A. It was decided that if the investor was unable to settle a dispute, within 7-14 days, a meeting with the Mayor would be organised, during which a ready project of the problem solution would be presented (prepared by the leader of the mediation team). In order to minimise the number of future conflicts with the residents, the employees of Radex SA often addressed the local community and they responded to all problems reported (including visits to the apartments of the residents).

5) During earthworks, a military optical fiber cable was discovered. Due to this unusual event, which had to be treated as confidential, it was necessary to amend the technology of works. The belt within the axes mentioned above was temporarily excluded from works, for the purpose of relocation of the light pipe by the appropriate military services. Many months passed before this section could be under construction again. This resulted in the need for immediate modification of the technology and organisation of works for the entire Centre, in order to complete the works and conduct their commissioning within the planned time period, despite the problems encountered. During this period, works on other aspects of the project were intensified.

6) Limitation of working time resulted in a necessity to adapt the organisation and technology of works to a two-shift operation. This, among other things,
led to difficulties associated with construction of the industrial floor, which, due to its characteristics (surface-hardened), required compliance with specific time restrictions. Spreading and floating of the surface hardener on the concrete mix had to be performed during strictly specified work hours. Therefore, a special formula was prepared, taking into account these conditions; thanks to this, the concrete mix allowed for continuation of works on the next working days at the appropriate hour. It should also be noted that, despite numerous problems and thanks to the great commitment of the contractors, 1000 m² of the floor was built per week at the peak of construction works.

7) Another problem was caused by the need to perform some of the ferroconcrete works during the winter. This pertained mainly to floors, which were most exposed to low temperatures. In the technology project for construction works conducted in the winter, additional heating of concrete with heating mats was provided for.

8) Aiming at successful completion of the investment project, the consortium of contractor companies did its best to anticipate problems that could emerge during each stage of construction that could threaten the continuity of works. Among other things, during the prefabrication stage, in order to avoid a problem associated with delivery of prefabricates of insufficient quality for the railway station, the company employees were sent to visit the production plant of the manufacturer. At the plant, the employees verified the production technology, they talked to the employees, they checked the quality of machines, inspections, and the storage site, which allowed them to assess the plant work culture. As a result of the inspections organised, for all deliveries of prefabricated components, these failed to meet the requirements and had to be replaced just three times.

9) During implementation of the investment project, despite the careful monitoring of quality of the works performed, a design error was made. During the construction phase, some of the spandrel beams leaning against columns were destroyed or damaged. This was due to thermal deformation of structural components, which were several times greater than anticipated in the constructor’s calculations and a lack of sufficient expansion joints, which could compensate for movement. The repair process included strengthening of the damaged structural components with carbon fiber tape, and - in the case of damaged supports – their replacement and strengthening with carbon fibre tape.

10) During works associated with construction of the glazed dome, due to an error made by one of the contractors for assembly of the steel support structure, there was a breakdown. The escalator was damaged by a falling girder. The event was due to a flaw in the dome support. The event took
place outside working hours, which largely prevented any threat to life and health of employees.

11) During construction of the railway station part of the building, employees of the state railway (PKP), without consultation with the construction management and the design office, started to assemble the electric traction to the prefabricated floor slabs of TT type. Lack of technical knowledge and incompetence of their managers resulted in threatening of stability of the structure, posing a threat to human life.

12) During the construction period, the consortium of Radex S.A. – Warbud S.A. had to adapt to many changes introduced by the investor, associated with the changing needs of lessees. This resulted in many delays in performance of the works.

13) Three months prior to the planned completion of the investment project, as a result of substantial delays in the progress of works, BEG Ingenierie transferred the coordination of the construction project to the president of Radex S.A.. Due to a substantial number of subcontractors (more than 100), meetings were held separately for each trade. The meetings were often difficult, organised several times a day, and due to the upcoming deadline for completion of the project, the atmosphere was often quite nervous.

14) During construction of the railway station part, a significant issue was to provide access for passengers. It was estimated that about 35,000 passengers entered and left the station every day and it was necessary to make sure they could all use the station safely during the construction period. To this end, a project of technology and organisation of the railway station was established, divided into seven stages. Each stage was associated with a change in the traffic organisation. The passengers were rendered access to specially prepared traffic routes – enclosed, roofed and lighted (voltage of 6V) - to allow them to safely enter and leave the railway station. Additionally, they were supervised by the PKP staff and by a security service company. The objective of these activities was to ensure smooth traffic and avoid any dangerous situations.

15) The investment was hindered not only by pedestrian traffic. The railway station was constantly operating and moving trains constituted a serious threat throughout the entire period of implementation of the project. The above issue was analysed during the division of this part of the project into stages. At first, the train front reached the end of the track, but, gradually, the trains were moved back as the works progressed (towards the railway station entrance). In order to ensure efficient implementation of works, a procedure of acceptance of individual stages by PKP was established, including verification by the railway staff of the proper technology and organisation of works.
16) At this stage of the works, a tunnel was constructed to ensure access to the parking lot, running below the railway tracks. It was constructed as a monolithic structure with expansion joints in 4 stages. It should be underlined that during construction works, trains were constantly operating. For this reason, the planned organisation of works and technological requirements were followed strictly (subsequent stages of the tunnel were not commissioned unless it achieved the planned capacity). Along with construction of the railway station, PKP Infrastruktura company renovated the existing tracks.

17) Another problem requiring preparation of innovative procedures was the fire protection acceptance processes for the subsequent stages of the investment process. Each fire protection decision required a permit for exception to be granted by the Provincial Head of the State Fire Service.

18) Complex construction projects of this kind, implemented in the city urban centre area, are always associated with significant logistic and procurement problems. In this case, those were particularly severe, as there were no storage sites for materials and equipment outside the building outline. In the technology and organisation project, detailed delivery schedules were established. Only the shuttering and reinforcements were stored at the place of installation.

19) Another problem was encountered in association with the delivery of windows. The manufacturer, producing windows for the investment project in Germany, was to deliver these only 3 months prior to the completion date. It was definitely too late from the perspective of the work technology applied. The windows should have been installed first, and the elevation works should follow. It was decided that the elevation works would not be suspended due to delivery of the windows. Instead, temporary wooden frames were installed (of the same size as the window frames) to perform the elevation.

20) Apart from logistic problems, there were organisational issues as well. To implement an extensive project of this kind, it was necessary to hire many subcontractors (around 100). It then became necessary to coordinate their operations so that the order of works would be maintained and safety of all employees would be ensured. This was not an easy task for the services of the Consortium of General Contractors and the Chief Coordinator. It was associated with numerous conflicts, both between the consortium and the subcontractors and between the subcontractors themselves. The intensity of negative emotions sometimes exceeded acceptable levels. For instance, the excess number of subcontractors led to the problem associated with synchronisation of the desmoking system, installed by several companies,
which failed to operate properly for a long time (as many as 11 smoke tests were performed). Finally, this problem was solved, too.

21) At the end of the construction period, the implementing companies faced a serious technical problem. Quite heavy ventilation and air-conditioning units (of the mass of 2-3 tons) had to be placed on the roof. All cranes were located within the building outline and they had to be dismounted to allow for performance of works. The problem was solved by using a helicopter for their assembly. The units were subsequently lifted by a helicopter from a specially prepared location, and then placed on the roof. The solution was quite costly, but it turned out to be very efficient, taking into account the construction conditions.

11.5 SUMMARY AND CONCLUSIONS

The basis for success, which was construction of the Shopping and Services Center and Wileński Railway Station while maintaining full operation of passenger trains, was:
1) Preparation of a detailed project of technology and organisation of works,
2) Appointment by the Mayor of Praga-Północ and representatives of BEG company of a mediation team, led by Engineer Janusz Sobieraj, M. Sc.
3) Signing by the investor of a contract with Radex S.A. for commissioning of the Shopping Centre by the established deadline. The contract warranted a substantial amount as the so-called “Success fee”, and in the case of a failure to achieve the objective established, it left Radex S.A. Corporation without any remuneration.
4) Actual transfer of full scope of executive powers to a single person, who was thus able to manage the investment project effectively and coordinate the works in a manner allowing to eliminate the delays e.g. thanks to additional mobilization of all participants of the investment process (including the facility lessees), as well as introduction of new subcontractors in particularly threatened by delays areas,
5) Radex S.A. company, along with commencement of coordination tasks, prepared a project of organisation and management of commissioning procedures and delivered the commissioning requirements to all participants of the investment process along with a detailed instruction of performance of these and their delivery after conducting the acceptance tests with
positive results (as required by separate legal provisions). At the same time, the possibility of introducing significant changes in the investment project was eliminated. This allowed for preparation of the final version of the as-built documentation and –after it was approved by all bodies and institutions as required by the law – filing it at the District Inspectorate for Building Supervision (PINB). This allowed the PINB representatives to get familiar early with the technical documentation and to prepare for a compulsory inspection of the construction in accordance with art. 59 of the Building Law. Trade-related documentation was also delivered to the appropriate institutions, listed above.

11.6 FINAL CONCLUSIONS

1) A well-prepared project of work technology and organisation, prepared by experienced experts (with many years of experience in implementation of complex projects of similar scale) allowed for effective and efficient implementation of the project, despite the emergence of numerous problems, as described in this case study.

2) The innovative approach towards the final phase of implementation of the investment project allowed for elimination of delays and shortening of the time of getting familiar with the as-built documentation by bodies issuing a permit for building occupancy.

3) The facility obtained the final occupancy permit just four hours prior to the formal opening ceremony.
Fig. 11.1. Warszawa Wilenska Shopping and Service Center
CHAPTER 12

CASE STUDY 7: THE INVESTMENT PROCESS FOR CONSTRUCTION OF HOUSING SETTLEMENTS ASSOCIATED WITH REGENERATION OF HISTORIC BEM’S FORT FACILITIES
(J. SOBIERAJ)

12.1 INTRODUCTION

In this chapter, we present the multifunctional project of revitalization of historic Bem’s Fort facilities along with the associated investment projects in Warsaw, Bemowo. It is located within an area of more than 148 hectares and it has been combined with construction of a modern housing settlement. It is worth noting that the construction project was initiated by public entities: the commune of Warsaw – Bemowo; a state-owned company Wojskowe Zakłady Lotnicze nr 4; and, a private company Radex S.A. The latter two entities (further referred to as “the Initiators”) at the same time shared the perpetual usufruct rights to a part of the investment land.

Another significant aspect, worth recognition, is the decision of the Ministry of Defense, which allowed for engagement of the private sector in management and revitalization of a military area. The aim of the Initiators was activation of the land, designated by the Commune of Bemowo for housing construction, which proved redundant for production needs of the state-owned company WZL-4 and regeneration of the natural environment in a degraded area, which
has been left unmanaged due to the unresolved matter of holding of the disputable area between the local authorities and the military structures. In particular, the status of the historic Bem’s Fort and its surrounding area had to be regulated. Considering the attractive location and residential character of the district of Bemowo, the most effective form of activation was resolved to be construction of a model housing settlement or residential complexes on the basis of the previously designed communal park and sports and recreation areas, combining two features that are seemingly opposite and mutually exclusive in an urban agglomeration i.e. living in the suburbs (peace and quiet, keeping in touch with nature, living close to the woods, preferably at the water shore), and at the same time, proximity to the city centre. Moreover, due to the need to build the entire infrastructure and the associated high financial expenditures, it would be economically and functionally viable to extend the investment process to encompass the entire investment area (of more than 148 hectares), including the land plots owned by other entities, among them the commune of Warsaw – Bemowo. The key initiator of the construction project was the Commune, and then the District of Warsaw – Bemowo. The attitude of its authorities deserves particular recognition. The investment process, prepared and implemented throughout three subsequent terms of office by representatives of various political parties, was never questioned or discontinued, and it was always supported by the authorities.

Implementation of the complex construction project required establishment of an effective structure for management of the entire process. A Team of Coordinators was appointed, consisting of: the Mayor of Warsaw Bemowo Commune; Director of Wojskowe Zakłady Lotnicze nr 4; the President of Radex S.A. company; and, the role of the chief coordinator of the entire construction project was entrusted to a construction expert with extensive experience in implementation of large scale investment projects. The key role in the investment project implementation process was played by the special vehicle company (SPV) „Korporacja Radex-WZL Nieruchomości” Sp. z o.o. (further referred to as „KR-WZLN”), established in year 2000. Its task was to transform the land owned by the private Initiators to establish an area designated for construction investment projects, management of operations of all entities engaged in the investment process, including the future developers, constructing buildings within the area of the land plots of the private Initiators and performance of the coordinator, chief designer and substitute investor functions at the infrastructural investment projects.

After the establishment of the KR-WZLN company, the private Initiators transferred their competences by granting a power of attorney to the president of KR-WZLN.
Other entities cooperating with the Initiators within the framework of the investment process were; PEKAO DEVELOPMENT Sp. z o.o. (now Pirelli); MOSTOSTAL SIEDLCE S.A. (now Mostostal - Polimex); PBM POŁUDNIE and BUDINVEST - PBM POŁUDNIE Sp. z o.o. (now PBM Południe Development Sp. z o.o.); J.W. CONSTRUCTION HOLDING S.A.; MOSTOSTAL INVEST Sp. z o.o., now ACCIONA NIERUCHOMOŚCI Sp. zo.o.; DOM DEVELOPMENT S.A.; Employee Housing Cooperative IDEALNE MIESZKANIE; BEMOWO Sports and Recreation Center; CWKS LEGIA; and, military authorities at all levels, in particular, the Ownership Supervision authorities of the Ministry of Defence. The partners, planning implementation of such complicated construction project, were aware that the key to success would be a complex stakeholder communications strategy. A commitment was given that the construction project would have no negative impact on the local community and the natural environment, contributing to maintenance of order and cleanliness on the site, in the direct vicinity and on the communal streets. The need for creation of an appropriate urban information system (placement of information board) was taken into account, as well as the need to raise funds for local organisations and charitable activities.

12.2 THE SCOPE OF THE PROJECT AND THE STRUCTURE OF MANAGEMENT OF ITS IMPLEMENTATION

The scope of the project was defined as complex activation and regeneration of the target area, providing the sufficient commercial potential to generate investment funds proportional to the scale of the project, as well as appropriate return on investment. The project encompassed; designing and construction of complexes of housing settlements; modernisation of Bemowo Sports and Recreation Centre; moving of high impact production of WZL-4 outside the area of the Commune; cleanup of about 140 hectares of the military area acquired by the Commune, located in the area neighbouring Bem’s Fort; replacing the old, used emergency infrastructure with new systems, matching
parameters sufficient to serve the area; liquidation of the dangerous railway crossing at Księża Bolesława street and construction of an overpass; and, the launch of a municipal transport system, establishing a functional connection between the residential areas of Bemowo District and the sports and recreation area. The above tasks were carried out by KR-WZLN company in co-operation with Radex S.A. company, which, as one of the project initiators, had extensive experience in construction and implementation of investment projects, had at its disposal the qualified staff and its own methods of operation, guaranteeing the successful completion of the investment process concerned.

It should be noted that Polish law does not specify the scope of analyses necessary to establish reasonable grounds for public-private partnerships or the rules of their effective implementation. Thus, it was even more significant to select the appropriate actions, aimed at achievement of the objectives of cooperation and the proper choice of persons managing the process. The methodology applied to successful implementation of the project may thus be applicable to other projects of this kind.

Selection of the project manager was of key significance for successful completion of the construction project. The basic task of the Project Manager was to ensure achievement of the investment process objectives, defined by the Initiators. The scale and complexity of tasks that had to be carried out required not only competences, but also great energy, ability to make decisions and far-reaching consistency of actions. In order to achieve the goals established, the Project Manager had to be experienced in the field of investment and construction in terms of organisation, management and supervision of the complex investment process, knowledge in many fields (economy, finances, law, architecture, urbanism, planning, spatial planning, the rules of functioning of cities, communes, military structures, self-government and state structures) and well-developed negotiation skills. Moreover, the person employed on this position had to show innovative thinking ability.

**Table 12.1. Tasks of the Project Manager**

<table>
<thead>
<tr>
<th>Task function</th>
<th>Task type</th>
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<tr>
<td>Specification of the grid/system of reference for the basic plan</td>
<td>Analysis of the project plan</td>
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<tr>
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<td>Management of the design process</td>
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Communicating with the client on significant project issues

Preparation of sufficient information to make sure the consultants and specialists are able to devise the project solutions, coordinate them and include them in the general plan

Issue of opinions concerning the appointment of other consultants and specialists

Devising the system of transfer of information, checking of system and software compliance

Coordination of work briefing documents

Specification of the project verification and validation system

Specification of the basis for preparation of the cost plan and follow-up

Delivery to contractors of opinions concerning their functions within the framework of OHS regulations

12.3 STAGES OF IMPLEMENTATION OF THE CONSTRUCTION PROJECT

Any private-public partnership construction projects require a very careful process of preparation and implementation of the assumptions made. The construction project analysed, as successfully completed in terms of its public and commercial objectives, may serve as an example of action for local authorities and investors interested in implementation of similar construction projects. Therefore, it is a good idea to analyse the subsequent stages of implementation of the project and the tasks to be carried out by the entities engaged during these stages. After determination of the assumptions of the construction project and assignment of tasks to the project manager, detailed feasibility studies of the project were carried out.
Of key significance was the project feasibility study. First of all, the Initiators prepared an analysis of possibility, reasonability and profitability of the investment (opportunity study), which showed that the investment area and own area of the Clients may be designated mainly for residential developments with many restrictions; however, there was no local spatial development plan and the necessary technical infrastructure (the existing infrastructure had been built before the second world war and its technical condition was very poor). Moreover, it was necessary to meet the requirements and follow the restrictions imposed by the conservator of monuments, demands of protection of green areas, green belts, groundwater as well as areas designated as forests. The feasibility studies conducted for the project (the entire investment process) showed that it was very difficult, but feasible, associated with high risk and at the same time of high financial effectiveness, if it could be conducted simultaneously throughout the entire investment area. Within the framework of the pre-feasibility study, the possibility of devising, approval and enforcement of the local spatial development plan was examined. It was found that its establishment should serve as a starting point for further investment activities. The task was both very difficult and subtle at the same time.

In order to perform this task, the Project Manager proposed a three-stage (effective) way to reach the final stage.

As there was no chance to amend the “arrangements binding to the communes of Warsaw upon preparation of spatial development plans”, in order to introduce the appropriate modifications in the “study”, preparation of the resolution for the fortification system of the 19th century Fortress of Warsaw was used by introducing the appropriate provisions in it, which allowed for location of developments with basic services, of architectural design that would not collide with the historic surroundings, maintaining the zone of isolation from the moat, as well as facilities designated for sports, culture, tourism and green areas. Afterwards (on the basis of proposal by WZL-4 and Radex S.A. Corporation), the spatial development plan, being prepared for the area, was divided into stages, where stage I pertained to the area belonging to WZL-4 and Radex S.A. Corporation. This area, marked on the plans of the capital city of Warsaw with symbol „0-65”, was subject to environmental protection. Then, many urban and architectural concepts, pre-design concept studies, as well as the preliminary, variant-based demand for utilities for the entire area of 140 hectares and for individual investment tasks, were prepared in strict cooperation between with the Commune authorities, the director of the Department for Spatial Planning of the capital City of Warsaw, BPRW and the author of the spatial plan. After consultations with the commissions of the Commune and the capital city of Warsaw, which issued their opinions on the draft plan, and after obtaining approvals of the Commune – the design team working under the
supervision of the former President of Warsaw – St. Wyganowski - in terms of urban and architectural design. A draft of the local spatial development plan was prepared for the area “Bem’s Fort – Stage 1”. At the same time, Wojskowe Zakłady Lotnicze Nr 4 received on June 6th, 2000, the consent of the Minister of Defence and the Minister of the State Treasury to establish a commercial law company and to enter the joint venture agreement with the commercial law company Korporacja Radex S.A. under the name "Korporacja Radex - WZL Nieruchomości” Sp. z o.o.

Compliance with the requirements faced by the communes of Warsaw while preparing the local spatial development plans for the system of fortifications of the 19th century Fortress of Warsaw was confirmed by the Resolution of the Council of the Capital City of Warsaw, passed in May, 2001.

It is worth noting that during the stage discussed, each of the Initiators was assured of compliance with their priorities by the project manager within the framework of joint action. The Initiators also used this period to get familiar with the project details, to confirm their intentions and reliability. At the stage of the pre-feasibility study, negotiations with potential housing construction and infrastructure investors were initiated, as well as investors interested in implementation of sports and recreation projects in the Commune. These negotiations served as a basis for the preliminary determination of the real value of the future investment and the demand for utilities. This was associated with preparation – already at this Stage – of the preliminary concept of division of the real estate property into investment land plots, specification of the size and diversity of tasks and specification of economically viable reserves for unexpected investment expenditures. At this stage of determination of the project assumptions, the preliminary draft of investment tasks to be carried out independently by individual Initiators was prepared. The commune of Warsaw – Bemowo declared to organize a tender for investors for its land and it committed itself to build the two-lane Powązkowska street and the three-lane Górczewska Street, as well as overpasses above the tracks in the area of the planned Wola Shopping Centre to facilitate transport in Bemowo and eliminate future traffic problems, threatening the area after completion of the investment project. WZL-4 committed itself to engage in activity to relocate its principal manufacturing operation outside the District of Bemowo after winning the tender for construction of an engine test house for Boeing and F-16 aircrafts.

All Initiators faced the challenge of cleansing and ordering the area of Bem’s Fort and the adjacent land and of management of sports and recreation facilities and park areas. At the end of this stage, the preliminary scope and cost of the construction projects planned were defined.
Table 12.2. Key components of the project implementation

<table>
<thead>
<tr>
<th>For the purpose of the project implementation, the following were to be prepared/determined:</th>
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</thead>
<tbody>
<tr>
<td>The definition and scope of the project;</td>
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<tr>
<td>A breakdown of objectives;</td>
</tr>
<tr>
<td>A business plan with a forecast of costs, profits and cash flows, including the loan interest and tax amounts;</td>
</tr>
<tr>
<td>Market forecasts and assumptions for profits and profitability;</td>
</tr>
<tr>
<td>Functional scope and appearance;</td>
</tr>
<tr>
<td>Function of the client and limits of competences, also of the project manager;</td>
</tr>
<tr>
<td>Financial procedures and authorizations granted to make orders;</td>
</tr>
<tr>
<td>The development strategy and procurement path;</td>
</tr>
<tr>
<td>Risk assessment;</td>
</tr>
<tr>
<td>Schedule and its implementation stages;</td>
</tr>
<tr>
<td>Scope of the procedure of appointment of each consultant;</td>
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<tr>
<td>Approval of the detailed design and budget;</td>
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<tr>
<td>Detailed design assumptions;</td>
</tr>
<tr>
<td>The project dossier and tender procedures;</td>
</tr>
<tr>
<td>Construction;</td>
</tr>
<tr>
<td>Start-up and commissioning;</td>
</tr>
<tr>
<td>Operation;</td>
</tr>
<tr>
<td>Environmental protection;</td>
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<tr>
<td>OHS issues;</td>
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<tr>
<td>Quality warranty;</td>
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<tr>
<td>As-built assessment.</td>
</tr>
</tbody>
</table>

After securing the viability of implementation of the material scope of the project, economic analysis of its feasibility took place. The decision to engage in the construction project was associated with the necessity to provide substantial funds and to bear the associated risks. In order to make a well thought-out decision, the following were analysed and specified: precise objectives of the construction project; a marketing analysis; realistic estimates/forecasts; risk assessments; and, the construction project implementation plan. It is generally believed that successful completion of a construction project depends on the expenditures preceding the valuation phase approval. Valuation of a construction project consists of putting together the
stages of the investment process, studying, analysis and estimation conducted whilst defining the construction project and the alternative concepts. Economic analysis, conducted on the basis of cash flow analysis for all costs and benefits that could be expressed in monetary units, was of great significance. All alternative concepts and ways to achieve the objectives of the construction project were analysed. The main parameters of the construction project were defined: the duration of the construction project valuation; implementation stages in order to be able to determine the date of works commencement; projects costs; verification of the liabilities associated with the construction project. It was significant to make sure that the financial capacity determines the pace of implementation of the construction project.

An investment risk analysis was conducted, as well as an economic and financial analysis of the project (based on cash flows and determination of the debt coverage ratios, including a multi-variant sensitivity analysis). Moreover, an analysis of reliability of the project participants was concluded, as well as a risk identification and allocation analysis. After the project feasibility analysis was completed, it was time to approve the project implementation plan. The partners decided that the project was feasible only under the condition of full mobilisation of efforts and cooperation between all of the entities concerned. At the same time, a directive plan for implementation of the investment process was prepared. A collective body was appointed, known as the “Council of Investors”, which, at the request of the project manager, approved the key components of the project implementation.

At the same time, external legal advisers were appointed. Activities of the Initiators, initiated at the stage of analysis of the investment process, resulted in increased interest in the purchase of the investment land. Reclamation works were initiated, and the activities of the Clients allowed for opening of the sources of successive inflow of funds from sale of their land.

The commune could start to cleanse and tidy up the Bem’s Fort Park and co-finance two streets of strategic significance for the Commune, Górczewská and Nowoprojektowana. Thanks to the funds obtained, Wojskowe Zakłady Lotnicze nr 4 was able to improve its financial results, which allowed it to win the international bidding contest organized in Central Europe by G.E. (General Electric International), for construction of a modern engine test house. Wojskowe Zakłady Lotnicze nr 4 obtained a facility constructed by Polish contractors in accordance with the highest global quality and operating standards, and the general designer and contractor of the investment was Radex S.A. The engine test house design was proposed by “Miastoprojekt Warszawa”
for the Design of the Year Contest and it was awarded the first prize in accordance with the contest regulations.

12.4 SOURCES OF FINANCING AND ENTITIES ENGAGED IN IMPLEMENTATION

In PPP construction projects, the main issue is to find the appropriate mode and sources of financing. During the implementation of the project described, different variants of financing of the investment project were considered, from share-based financing (issue of stocks) to long-term capital acquisition through loans. Radex S.A. Corporation decided to choose a long-term loan incurred from a foreign counterparty to pay for the land and gather resources for studies, concept and planning projects, land surveys and design works. Another form of financing was offering the developers to engage in investment operation or to acquire perpetual usufruct rights on the basis of the planned division of land plots in a package with the Substitute Investor, General Designer and General Project Consultant services. Finally, the following entities engaged their funds in implementation of the project:

Table 12.3. Entities engaged in implementation of the project

<table>
<thead>
<tr>
<th>Public entities</th>
<th>Private entities</th>
<th>Financial institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The Commune of Bemowo – from the budget of the Commune and funds obtained from sale of land for a housing development at Osmańczyka Street - • The Commune of Bemowo- the Investors co-financed social facilities, outdoor events, balls, concerts, and their supported charity actions initiated by the Management of the Commune of Bemowo</td>
<td>• Radex SA Corporation – Financing of the pre-investment stage and additional works for the part of the infrastructure from own funds and a foreign loan</td>
<td>• Banks cooperating for preparation of the preliminary investment phase: -PBK -Bank Śląski -Kredyt Bank (loan for the engine test house)</td>
</tr>
<tr>
<td>The Technical Institute of Air Force, from its own funds and a compensation obtained from the General Directorate of Roads and Motorways</td>
<td>The consortium of developers, WZL-4 and Radex SA Corporation and the Commune of Bemowo for financing of the infrastructure from own funds, loans and budget funds of the commune</td>
<td>Banks cooperating with individual investors</td>
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<tr>
<td>WZL Nr 4 P.P. - presently WZL Nr 4 SA – own funds acquired from activation of the land or a loan for construction of the engine test house and a compensation due to transfer of land and facilities for route S8, obtained from the District Management for Construction of Roads and Motorways</td>
<td>The consortium of developers, Radex Corporation - WZL Nieruchomości Sp. z o.o.- for construction of a roundabout at Obrónców Tobruku street</td>
<td></td>
</tr>
<tr>
<td>SPECS.A.</td>
<td>The Consortium of Mostostal Invest, Budinvest PBM Południe, Korporacja Radex - WZL Nieruchomości – financing of a multi-level parking for 496 cars</td>
<td></td>
</tr>
<tr>
<td>Sports and Recreation Center – financing of sports fields from the budget funds</td>
<td>Private investors, sponsors and partners for the complete renovation of the hangar, construction of a sports field, a soccer hall and a branch shop of PUMA company and a hotel</td>
<td></td>
</tr>
<tr>
<td>BEMOWO Sports and Recreation Center and Allotment Gardens as beneficiaries (received new utility connections from developers free of charge)</td>
<td>Developers: • MOSTOSTAL INVEST Sp. z o.o., presently ACCIONA NIERUCHOMOŚCI Sp. z o.o. • DOMDEVELOPMENTSA Employee Housing Cooperative IDEALNE MIESZKANIE • BUDINVEST-PBM POŁUDNIE Sp. z o.o. - presently PBM POŁUDNIE DEVELOPMENT • PeKaO Development sp. z o.o. - presently PIRELLI • J.W. Construction Holding SA • Mostostal SIEDLCE SA - presently POUEX-MOSTOSTAL • SIEDLCE SA T.B.S. Warszawa + DOM DEVELOPMENT SA</td>
<td></td>
</tr>
<tr>
<td>• The Parish of St. John – received a chapel at the Parish house after the church at Górczewska street was burned down</td>
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</tr>
</tbody>
</table>
12.5 PREPARATION OF THE PROPERTY – DEVISING THE LOCAL SPATIAL DEVELOPMENT PLAN AND DIVISION OF LAND PLOTS

The preliminary intention of participants of the construction project concerned was to prepare and approve the local spatial development plan for the entire investment area. To this end, in cooperation with KR-WZLN and Radex S.A., amendment of the concept of the rainwater reception basin, the wastewater sewage system, the power supply and the heat supply (gas, central heating) was conducted. Depending on the needs, once or twice a week, on the initiative of the Project Manager, the Mayor of the Commune of Bemowo organised meetings to discuss the main problems and obstacles hindering the effective implementation of the investment process, and the appropriate decisions were made to solve these problems. Nevertheless, it soon turned out that approval of the local spatial development plan for an area exceeding 100 hectares cannot be effectively implemented by the administrative bodies, due to the number of approvals required and the number of entities engaged and concerned by the plan.

On the initiative of Radex S.A., it was possible to exclude the land possessed by the Clients from the scope of the plan, which allowed for approval of the local spatial development plan at least for the area owned by the Initiators. This became possible when the General Coordinator and the Investment Process Designer, in consultation with the Director of the Office for Planning of Development of the Capital City of Warsaw, effectively managed the team coordinating the preparation, approval and enforcement of the local spatial development plan. As the coordinator of these works, he initiated an innovative approach to the preparation of the plan by selecting from among the town-planners three design teams, which, working separately under the supervision of the BPRW and the conservator of monuments and cooperating with the Commune Office Departments, created more than ten plan concepts and several dozen concepts of the land plot development. The multitude of variants, which took into account the requirements of the appropriate bodies and institutions, allowed for selection and presentation of the best version of the plan.
Taking into account the historic surroundings of Bem’s Fort, the main issue during preparation of the local spatial development plan for the land owned by Initiators constituted effective negotiations with the conservator of monuments. For the first time, the arrangements were made at the plan concept preparation stage. All remarks of the conservator were taken into account in the plan concept. A similar approach was applied towards all other entities, which had to approve the plan. As a result, no protests or objections were raised against the local spatial development plan which was prepared. Moreover, the approved plan took into account building law requirements, which facilitated quick and easy design of construction facilities on the basis of this document. It should be underlined that the above innovations required no financial expenditure, as they were based on a creative approach in preparation of the local spatial development plan and ensuring effective coordination of activities of the entities engaged. The local spatial development plan of a separated land plot of the area of 12.6089 hectares was prepared and approved within the period of 11 months, which is a record-breaking achievement in comparison with other plans prepared in Warsaw.

After the approval of the local spatial development plan, the project participants engaged in preparation of a project of division of land owned by the Initiators of the area of 12.6029 hectares into general and construction purpose land plots, which could be sold on the real estate market. Within the area of the planned housing development at Osmańczyka Street, the land plots were divided by the Commune of Bemowo prior to the tender procedure. Division of the area of Bem’s Fort between the Commune of Bemowo and the military structures, including CWKS Legia, was included in the Agreement, concluded with participation – by default – of the Project Manager. Of significance in this regard was the assistance provided by the structures of the Ministry of Defence, which involved the top-level ministry officials, and the effective activity of the Project Coordinator. This concluded the long-term dispute between the army and the local government concerning the Bem’s Fort area. This was a success, which allowed for completion of the task of sense restoring of the facilities of the 19th Century Fortress of Warsaw.
12.6 THE PROCESS OF PREPARATION AND IMPLEMENTATION OF CONSTRUCTION WORKS

The next stage of implementation of the construction project consisted of preparation of the investment process. Of key significance was the proper selection of the design team members, which were to represent various fields of specialisation. A detailed plan, schedule and budget were established for the project. The activities were conducted with the aim of elimination of negative factors, which could lengthen the period of time necessary for successful completion of the project. The team of initiators approved the principles of cost control throughout all stages of the investment process.

The aim of cost control was to manage the project implementation within the frameworks of the budget approved. Cost control was applied to individual investment tasks and to the entire investment process. Particular emphasis was put on monitoring and control of investments shared by all participants of the process. At each stage, the best specialists were engaged in fields generating substantial risks and threats to the implementation of the project. Their opinions were delivered to all project participants, detailed and specific explanations were provided to underline the importance of these for achievement of the goal established and the significance of the topics analyzed for the entire construction project. A quality plan was prepared, specifying the parameters applicable to designers and defining the rules of appointment of contractors. Quality control was within the area of responsibility of the contractor, subcontractors and suppliers, operating within the framework of the approved quality plan. The obligations of the design team and other consultants included specification of goods, materials and services subject to inclusion in the project, using the appropriate standards, codes of conduct and criteria established by the decision-making bodies or the applicable standards in force. Compliance with the standards was supervised by the basic contractor appointed. During interviews with contractors, the project manager made sure that the contractors have quality control procedures introduced to all activities associated with the investment project. As much attention was paid to the issues of environmental protection, which exerted a very significant impact on the project, since the investment area was adjacent to parks and forests, and in the surrounding area, there were illegal waste dumps, as well as waste left by the
army. General responsibility for ensuring compliance with objectives and priorities in terms of environmental protection was assumed by the project manager.

The contractors established their own systems of environmental protection management, while the project manager ensured their proper management and implementation for achievement of all goals. Coordination of design was applied at all levels of the investment process as a whole, as well as for individual investment tasks in the process. The primary duty of the project manager was to make sure that the contractor had established and implemented the appropriate control and monitoring systems. The project manager made sure that these systems warranted the most proper, systematic and timely delivery of information and reports, which could be used by the project manager to monitor and manage the project for the purpose of its successful completion.

The project manager performed audits and inspections of these systems to confirm the reliable forecasts of the final project status.

The contractor systems included management of quality, schedules, quality control and monitoring and management of costs, as well as protection of the natural environment. A separate documentation management system was also implemented. In terms of procedures for settlement of potential disputes, it was decided that all disputes would be settled out of court. Whenever a conflict and a difference of opinions was anticipated, all participants of the investment process or the groups concerned were asked to negotiate and write down agreements, including notarial deeds. When it was necessary, a representative of the Commune participated in the negotiations at the request of the project manager, to play the role of a neutral and objective mediator. It should be underlined that the primary objective of settlement of disputes was the well-understood public interest and success of the investment process and all disputes (and these emerged very rarely) were settled out of court on the basis of mediations.

The low number of disputes, despite the huge scale of the investment process, was attained thanks to a clearly defined strategy of the construction project, prepared at the starting point. Every participant of the process, prior to deciding to join the group of investors, had to confirm very clearly that the assumptions of the investment process were clear, understandable and acceptable. This was confirmed by the notarial deeds prepared for purchase of land and the associated agreements, specifying the detailed obligations of the investors.

The task of the project management was to introduce professionals and specialists into the project team in a manner making it possible to ensure their best and most effective contribution. Specialists provided their knowledge and experience, which exerted impact on the decisions made, specified in the project information, and they greatly influenced the quality of the project. Each stage
in the project process required knowledge and experience. The aim was to attain the best final result possible. The method of inclusion of professionals and specialists having the appropriate knowledge and experience in the design team at the early stages of investment was one of the issues to be decided upon at the Strategy Stage. Each stage was associated with certain Key Decisions. The projects were commenced by the concept-building phase, resulting from the decision of the team, referred to above, suggesting the necessity for implementation of a new project of construction of development.

In general, the Concept-Building Phase consisted of employment of the project manager to implement the subsequent stage – the project feasibility analysis. The Feasibility Analysis Stage was the basic stage, during which professionals and specialists of all fields could be asked to contribute their knowledge and experience to the large-scale assessment of feasibility. The scope of knowledge required was associated with the project objective and it influenced the subsequent stages.

The next stage was the Construction Project Performance Strategy Planning Stage, commenced after the appointment of the project manager to supervise the project team. This stage required specification of the project objectives and the general strategy. Until commencement of the Pre-Construction Stage, several basic activities of key importance were defined and undertaken, i.e. the project assumptions of the client were defined, describing in detail the objectives and completion of the associated executive project. Overall planning of a project is rarely possible. However, the aim should be detailed planning of its subsequent stages in order to create a project outline. All stakeholders were involved in project implementation and their present and future needs were determined. These included all persons involved in work on the project and those who could be concerned by it. Engagement of clients and users was important throughout all stages of the project implementation. Communication with partners was an invaluable tool for introduction of any changes. This prevented many mistakes and errors. Work completion was monitored according to schedules.

A key issue was risk management. A multi-level approach to risk management was applied, where the subsequent stages were treated as control points, in which risk was measured from the perspective of the potential business benefits and costs of the project implementation. The investment process was risky. It was of crucial importance to establish the most risky parts of the project and to engage in activities aimed at limiting or avoiding each risk, or even ensuring protection against it, at the same time, taking into account the potential benefit. Despite the great diligence and care, not everything went smoothly. Problems, which – if neglected – could threaten project completion, emerged frequently. Monitoring of works and forecasts based on the established plans is a technique, which allows people working on the project to anticipate emerging problems.
This is best illustrated by the “project control cycle” concept. The cycle frequency (daily, weekly, biweekly inspections) depended on the project components, the implementation phase, the risk level and whether a given process belonged to the critical path of the project. Monitoring was focused mainly on the future and not on the current achievements. Sole completion of a certain stage of works was not decisive for the further milestones to be attained in the same manner. The task of the project manager was to monitor constantly the plan of works in terms of its compliance with the project objectives and usefulness for achievement of the expected benefits within the established time frames. During the design stage, efforts were concentrated on the key business processes, influencing the financial results of the company and decisive for attaining of maximum benefits from its functioning.

The project manager attached great importance to management of the project value. This service is aimed at maximisation of the project functional value through management of its evolution and development from the concept to implementation, through comparison and audit of all decisions in the context of the system of values, established by the client. Value management is a name given to a process of assessment of the functional benefits of the project in accordance with the client’s system of values.

The main task of the project manager was efficient risk management, forecasting of potential future events and development of preventive actions, which could influence the course of the project. This approach allowed the project teams to manage risks actively and thus increase the probability of successful completion of the project. Risk management is the key area of Project Management and one of its eight components, as presented below. The risk concept was defined, and its aspects were presented to all participants of the investment process. The most significant for implementation of the project were the following:

Table 12.4. Key risks of the investment project

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project risks</td>
<td>Risks within the framework of the project, which influenced the project business result and achievement of the project goals.</td>
</tr>
<tr>
<td>Business risks</td>
<td>These risks influenced the functioning of the business result after the project implementation.</td>
</tr>
<tr>
<td>Environmental risks</td>
<td>Risks external to the project environment, which influenced its objectives.</td>
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<tr>
<td>---------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>External change risks</td>
<td>Risks that are found outside the direct environment of the project, which may nevertheless exert a huge impact on its implementation. In the context of agreements concluded, these include FORCE MAJEURE risks. Risks of external changes, however, go beyond the scope of force majeure, as they could be caused e.g. by replacement of the local government of the Commune of Bemowo, or a change of the official interpretation of legal provisions.</td>
</tr>
</tbody>
</table>

A key to effective risk management was ownership. Every risk (and the associated activity) was assigned ownership, which meant a clear specification of responsibility and the associated activities. An axiom of good risk management was the assumption that risk ownership was allocated to the party, which was “most fit” to control the probability of its emergence and its effects. The project manager was fully responsible for implementation of the project, and thus for risk management. This also meant controlling of risks (and the associated actions) and delivery of the plan so that each party understood its role. The manager was also responsible for reporting of risks and their potential impact on the project (business reasonability or schedule), matching the dependable business strategies and projects (or programmes). If a project is a part of a programme, the programme-level risk is managed by the programme managers.

12.7 CONCLUSION

Infrastructural facilities and large scale buildings were commissioned successively upon completion. The date of enforceability of the first decision concerning the building permit for construction of the rainwater duct for Bem’s Fort Stage I was 06.01.2005. The last decision, which came into force,
concerned a kindergarten in the multi-family house on land plot no. 53/9 (Acciona Nieruchomości Sp. z o.o.) - 28.05.2009. Radex - WZL Nieruchomości Sp. z o.o., as the General Designer, commissioned the preparation of the water supply, sanitary and rainwater sewage systems, power supply systems with regard to the cable networks and transformer stations. In the name of the Investors, it engaged in negotiations with SPEC S.A. Warszawa with regard to construction of a heat supply network, with MOZG Warszawa for supply of gas and construction of gas pipelines and with ASTER with regard to construction of low current mains (RTV, phone, Internet).

During implementation of these tasks, Radex - WZL Nieruchomości Sp. z o.o. as the Substitute Investor controlled the performance, organising weekly working meetings and engaging its trade supervision inspectors from the commencement until completion of the construction works. It conducted the formal commissioning of works, settling these in accordance with the building permit decision obtained and, it prepared notifications of completion, which were sent with the appropriate attachments to the District Inspector for Building Supervision for the capital city of Warsaw. After obtaining the occupancy permit, individual fragments of the investment were settled with the investors. All investments performed within the Parkowe Housing Settlement area were provided with Health and Safety Plans. As a result, throughout the implementation period, there were no serious accidents, and OHS (Operational Health & Safety) issues were treated as equally important with implementation and supervised by the Substitute Investor personnel.

As a result of the model investment process, conducted by the Project Manager, who was supported by Radex S.A. Corporation (in strict cooperation with the Management of the Commune of Bemowo, the Ministry of Defense, the Office for the Capital City of Warsaw, Housing Cooperatives, KR-WZLN) allowed for construction of a complex of housing settlements within an area equipped with full infrastructure and sports facilities. A hangar was used for construction of a full-size soccer field with tribunes, a hotel, a restaurant, a training ground, a sports wear shop. The sports infrastructure includes also a hippodrome and 4 soccer fields with modern equipment, adjacent to Bem’s Fort and Osmańczyka, Obrońców Tobruku and Księcia Bolesława streets. It has an area of 22.6 hectares. Renovation, maintenance and regeneration of Bem’s Fort, the surrounding moat and their adaptation to the current needs of all inhabitants of the District of Bemowo and Warsaw is a measurable effect, which has been proposed for the PZITB Contest „Construction of the Year 2009”. Finally, the investment process encompassed the area of 104 hectares in the district of Bemowo.

In the period of 79 months from obtaining of the first building permit decisions for residential buildings to be located within the land plots owned by the
Initiators, which took place in November 2002, until obtaining of the last permit for occupancy of a residential building on the land plot no. 53/9 in the cadastral district 6-15-01, which took place in May 2009, nine complexes of residential houses were built. In total, 1,637 apartments of total usable area of 118,256 m² were constructed. The internal roads and shared vehicle and pedestrian zones ensuring comfortable movement were established within the area of 19,000 m². An internal park with a playground occupies the area of 28,800 m² and it makes the housing settlements very attractive.

Unfortunately, there was also the negative aspect associated with the Municipal Water Supply and Sewage Company (MPWiK), which lengthened the procedure of purchase of the water supply and sewage system so that it lasted almost 5 years. During such a long time, KR-WZLN was e.g. forced to examine, with auditors, the nature of funds spent by the developers for the construction of the network. Survey studies were prepared making amendments to the land and mortgage register entries with regard to the limited right to use the land plots, which were the location of water supply pipes and ducts. Several changes were introduced in the format and scope of the powers of attorney, serving as a basis for negotiations conducted in the name of developers (the subsequent lawyers, representing the MPWiK, changed the requirements with regard to the form and content of these documents and they amended the agreements, previously signed by the parties). Project Manager was acting as an agent between the MPWiK and the Office for the Capital City of Warsaw e.g. with regard to establishment by the capital city of Warsaw of a limited right of use of “municipal” land plots on behalf of MPWiK, to intervene at the municipal offices to establish the public road status for a municipal street. Thanks to the involvement and consistency of the General Contractor and President of KR-WZLN, in August 2009, KR-WZLN signed, on the basis of the powers of attorney, agreements transferring the ownership of networks subject to the petition from developers to MPWiK. Thanks to these agreements, the developers were able to obtain a partial return of the funds invested (above PLN 1 million), which reduced the costs of implementation of the investment project.

Summing up, it can be stated that rational, reasonable and economic implementation of the investment project allowed the developers to generate their forecast profits. The project also enabled the entities located within the Bem’s Fort area to benefit from the clearing of the area, replacement of the infrastructure and the residents to satisfy their housing needs according to a high standard, for a moderate price. Perfect organisation of the investment process resulted in reduced costs of construction of the infrastructure to a level unmatched on the market of Warsaw, amounting to PLN 49 per 1 m² of usable
space of the apartments built, attaining a low ratio – below 2% - of the cost of design works in relation to the total implementation cost. Appreciation of the effects of model cooperation between the Project Manager, the General Contractor for the Investment, Radex Corporation and Radex – WZL Nieruchomości with the Commune of Bemowo, as well as the developers during the investment process, has been reflected by numerous prizes awarded to individual buildings and complexes. The low cost of implementation of the housing settlements, combined with high attractiveness of the location, have brought very high demand for apartments. In a short period of time, the developers sold all the available apartments and service facilities. The investment process, planned and conducted in a textbook fashion, encompassing many entities, characterised by large territorial range, was implemented above the expectations with regard to all technical, economic, functional and usability aspects. The investment process carried out had a very positive impact on the natural environment and its protection. Illegal waste dumps, hostels and waste in the moat of the Bem’s Fort was removed, land was cleaned, forests were thinned. New trees and bushes were planted within the housing settlement area, as well as within the area of WZL Nr 4 and the Technical Institute of Air Force. These now serve as model facilities of the Ministry of Defence. During the development of the sanitary infrastructure, the connection of the adjacent allotment gardens to the water supply network, delivered a positive impact on the environment. Thanks to very good cooperation with the authorities of the Commune of Bemowo (and the then District of Bemowo of the capital city of Warsaw) more than 144 hectares of land, previously forgotten and degraded, along with its historic fortification, was cleaned, regenerated and brought into productive use.
Fig. 12.1. Housing settlements
CHAPTER 13

REFERENCES


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