SWP 11/91 MAPPING THE APPLICATIONS PORTFOLIO ONTO THE PROJECTS PORTFOLIO

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This paper explores at a high level how the applications portfolio derived from the IS Strategy process should be converted into a portfolio of projects. The criteria used for this mapping are crucial to the success of the strategy implementation. The paper suggests one approach.

INTRODUCTION

Examples abound of inadequate mapping leading to implementation problems. The process does not simply involve creating a project for each new application. Applications may be better dealt with as several projects. Several small and related applications may be better dealt with as a single project. Additionally infrastructure projects must be broken out. Unless the foundations of infrastructure are laid then the applications cannot be created. The project portfolio therefore should consist of both applications projects and infrastructure projects. Once created, portfolio management techniques can be applied to ensure that the project portfolio is viable.

No definitive methodology exists for this process and most IS Strategy methodologies assume that applications are projects and that the applications portfolio will, by some miracle of insight on the part of the senior managers involved, contain all the infrastructure applications required which it obviously will not. The approach described in this paper takes a high level view of the mapping process as a whole. It is only one approach to mapping. What is possible is heavily dependent upon the sophistication of the information the IS planner has available and the resources deployed to implementation planning.

THE APPLICATIONS PORTFOLIO - THE STARTING POINT

The starting point is the applications portfolio. This is a prioritised listing of existing and planned "applications" expressed in business terms rather than technology terms. Within the Cranfield framework these would be categorised according to their business contribution into the four types of :

TURNAROUND	-	Low current contribution but high potential/future contribution.
STRATEGIC	-	High current contribution and high potential/future contribution.
FACTORY	-	High current contribution but low potential/future contribution.
SUPPORT	-	Low current contribution and low potential/future contribution.

Additionally the Cranfield framework will have assigned to each application some indications as to how it should be managed. The most important of these is the generic IS strategy. Based on the work of Parsons this assigns one of five management approaches to each application according to its business contribution which is derived from its place in the Strategic Grid. The five approaches are:

- Scarce Resource
- Monopoly
- Centrally Planned
- Leading Edge
- Free Market

Other attributes would also be associated with each application. These would include an indication of the application's priority, when it was required, and what benefits it was supposed to deliver. These would all relate to the business objective from which the application was derived. This business objective is of supreme importance. It is the origin of the application that is the justification for creating the application. It is important that the original reason for the application is not lost sight of as the work to create it and eventually use it is delegated down through the organisation.

Another important characteristic of the applications portfolio is that it will contain applications at different stages of development. Some will be in existence, some will be under development, some will be future developments.

So how do projects arise?

Applications are a product which the organisation will use. Their use will be part of the day to day operations of the organisation. Projects are the group of activities which create the applications.

Clearly projects will always arise from new applications. However projects could also arise from an existing application where it needs enhancement or modification. This might be because the application's business context has changed, because it is moving around the Strategic Grid or simply that it has always been deficient.

AN OVERVIEW OF MAPPING ISSUES

How are applications mapped onto project?

The mapping from application to project will not always be a unitary, one to one mapping with one application generating one development project. The mapping will take one of three forms:

1. One to one, where an application can be created and should be created by a single project.

2. One to many, where an application can only sensibly be created by executing a number of projects.

3. Many to one, where several applications can be dealt with sensibly in a single project.

This begs the question how should this mapping be determined?

There are two major criteria:

1. TECHNICAL IMPERATIVES. Technical considerations may mean that it makes sense to bring applications together into combined projects or split an application into several projects.

2. STRATEGIC DILUTION. Strategic dilution refers to the fact that, as strategies are broken down, the original strategic objective gets diluted and very often lost. In the absence of the original strategic objective, local or individual goals, particularly politically motivated goals, can be easily substituted. This is an argument for keeping the mapping as simple as possible, or rather as simple as the technical imperatives will allow.

It is unusual for organisations to determine projects on any basis other than technical grounds or organisational expediency. In small organisations this is not a problem but in large organisations this quickly leads to the project team losing sight of what the project is all about.

STRATEGIC DILUTION

The issue of strategic dilution, or rather how to avoid it is crucial. This is a phenomenon which does not just apply to the implementation of IS Strategies it applies to all strategic implementation in large companies. Whilst the senior management may understand the strategic importance of the application, it is not senior management that carries out the detailed tasks to achieve the application. As strategy gets converted into discrete, narrowly focussed, lower level tasks the strategic importance is lost. The lower level operator is not aware of the contribution his or her small operation is having. He/she is simply unaware of the strategic objectives of the project or sub-project. In the absence of the strategic reasons for the task the operator assigns local or personal objectives to the task. When decisions are made, as they will need to be, about the task they will be made according to the local or personal objectives that the operator has assigned to the task rather than according to the much more important strategic objectives that the project or sub-project is ultimately supporting. To say that this sort of communication problem is inevitable in large organisations, is not good enough. Large organisations are a fact of business life and are the norm and will be for the foreseeable future. It is necessary to find mechanisms to prevent the organisation from losing sight of the business objectives as strategic plans are broken down into tactical and operational plans or projects.

THE FIRST STAGE IN MAPPING - IDENTIFYING ONE TO MANY MAPPINGS.

The implementation of the IS Strategy requires only that the applications needing development or enhancement are mapped onto projects which are in due course carried out and the resultant applications delivered. So for the purposes of mapping, existing applications needing no enhancement can be left for operational usage and maintenance.

The first step is therefore to select from the applications portfolio the projects requiring development to create the "applications development portfolio". Within this new portfolio there will be applications of different sizes. The one to many mapping stage is concerned with the very large applications. The problem with very large applications is that the organisation often has to invest a lot of time, effort and resources before any benefits appear. Often the organisation loses heart and wonders when the effort will start to bear a return. Modern business is becoming increasingly short term. This problem can often be overcome by dividing the application up into smaller applications. In order to do this there

must be some meaningful and valuable deliverables part way to the completion of the full application. An example would be the installation of MRPII at Max Factor. A huge application with a projected 3-5 year implementation. The application was broken into modules and the modules implemented in sequence. The earliest module, stock control delivered improved stock records, fewer unexpected out of stocks, higher service levels, etc, the second module bill of materials (BOM) delivering improved BOMs, easier maintenance of existing BOMs, and so on.

The decomposed parts will be referred to as "application elements". After this stage has been completed the applications development portfolio contains both applications to be developed as total applications (one to one mappings) and application elements of large applications which have been broken into a more manageable size (one to many mappings).

This breaking down of large applications into application elements does incur some strategic dilution since the application element is one level further removed from the business objective it is to support. However a simple link exists back to the objective.

THE SECOND STAGE IN MAPPING - IDENTIFYING MANY TO ONE MAPPINGS

A second problem exists where it makes technical or business sense to combine two or more applications together into one project. This involves many applications mapping onto one project. An example might be the 1987 applications portfolio for J B Ivey & Company, a $300m (1987 figures) turnover retail subsidiary of BAT, where the prioritised applications portfolio contained merchandise processing, merchandise planning and merchandise reporting and analysis. If a package existed which met Ivey's needs on all three applications then it could have been handled as a single project. Another example was experienced by Cranfield's Andy Bytheway where he consulted for a medium sized engineering company which wanted to upgrade and integrate all its business systems when they were about to be denied access to the computer its existing antiquated systems were running on. This multiple application portfolio was achieved by the purchase of a large package which was successfully installed in one hit as a single project.

Again many to one mappings create strategic dilution since a single project can support several objectives. There may well be problems with priorities. Where a high priority application is combined with lower priority applications into a single project then other high priority applications are in danger of being deferred.

Clearly from the above discussion breaking down applications into application elements or combining applications into multiple application projects should only occur where there are benefits that far outway the problems. The simpler the mapping is kept the better.

The above discussion has covered the creation of application specific projects from the applications portfolio. However applications cannot usually exist without the computer, communications, data and skills base which supports them. This infrastructure needs to be put in place ahead of the applications that need to use it. So what about the infrastructure projects?

THE THIRD STAGE - IDENTIFYING INFRASTRUCTURE PROJECTS

Infrastructure projects can arise from sources other than the support of applications required for the applications portfolio. These would be infrastructure to support end user computing and turnaround projects to explore infrastructural improvements. However the most important source of infrastructure projects for most organisations is that required to support the applications and applications projects. Both need infrastructural support.

How can these infrastructure projects be determined?

One approach would be to look at each of the projects and identify the components which relate to each of the five infrastructure elements, namely:

1. Technology (Computers and Communications)
2. Data
3. Methods
4. People/Skills
5. Organisational Factors

This clearly can only be carried out at a high level since if this analysis is undertaken in too much detail then analysis paralysis could result or it could take too long. Additionally the identification of the likely infrastructure needs of an application is not simple. Significant IS experience is required. It is also necessary to take into account the infrastructure already in place and its capacity compared with the additional demands that the applications development portfolio will place on it in due course. In most instances infrastructure projects will be supporting several applications.

For infrastructure projects and the infrastructure that they create strategic dilution is high. Not only are they further removed from the ultimate business objectives, they will usually support several applications and therefore by supporting many objectives the strategic significance of infrastructure projects becomes blurred.

The combination of the application specific projects and the infrastructure projects combine to create the project portfolio.

The above process is summarised diagramatically in figure 1 on the next page.

STRATEGIC INHERITANCE

A third question is how are the priorities, timing, business contribution, etc associated with the applications in the applications portfolio brought through into the projects portfolio?

This would be achieved during the mapping process by mapping not just the application onto projects but by also bringing across other characteristics of the Strategic Grid. This might be achieved using a concept I will call "strategic inheritance".

The most important characteristic of the Strategic Grid to bring across is business contribution. This can be viewed as falling into the familiar typology of Turnaround, Strategic, Factory and Support. From the perspective of the project it experiences two main types of mapping:

1. UNITARY MAPPING (one to one). Where it maps back to only one application in the strategic grid.

2. MULTIPLE MAPPING (one to many). Where it maps back to several applications in the strategic grid.

The unitary mapping situation is the most straightforward. It simply inherits the business contribution of its parent application. If its parent was a Turnaround application then the project is a Turnaround project. If its parent was a Strategic application then it is a Strategic project and so on for Factory and Support.

In the case of unitary mapping, strategic dilution is potentially minimal.

The multiple mapping situation is more complex. In this situation each project has several parents back in the applications portfolio. This will be particularly the case for infrastructure projects.

One approach is to extend the concept of strategic inheritance to encompass the idea of "dominant gene".

Under this idea the project inherits the business contribution type (ie. Turnaround, Strategic, etc) of its most dominant parent. In this case dominance has two dimensions:

1. STRATEGIC CONTRIBUTION, where a strategic gene takes priority over all other genes, a factory gene dominates in the absence of a strategic gene and a support gene only dominates if all the parent applications for a project are in the support box.

2. SIZE CONTRIBUTION, where, if in a multiple mapping, the sizes of the parent applications are different (in business terms), as they usually will be, this may affect the inheritance of the project from its parents' genes.

In this way, using strategic inheritance we should be able to derive a **business contribution type** for each project.

Similarly strategic inheritance could be used to bring across the priorities, timings and benefits associated with the applications portfolio into the project portfolio.

STRATEGIC DILUTION AND THE STRATEGIC ADDRESS

Clearly with the case of multiple mapping the amount of strategic dilution is greater. It is probably greatest in the case of the infrastructure element projects since not only will they have multiple parents but they are removed from the strategic grid by an extra stage.

To minimise the loss of focus on business contribution a "Strategic Address" could be used, linking each project back to it's parent in the applications portfolio and back through to the business objective it is in existence to support. This strategic address could be extended as projects are broken into sub-projects by project management. In this way the strategic contribution can always be identified from the strategic address.

However, the aim must be to minimise strategic dilution as much as is practicable during the mapping from applications portfolio to project portfolio.

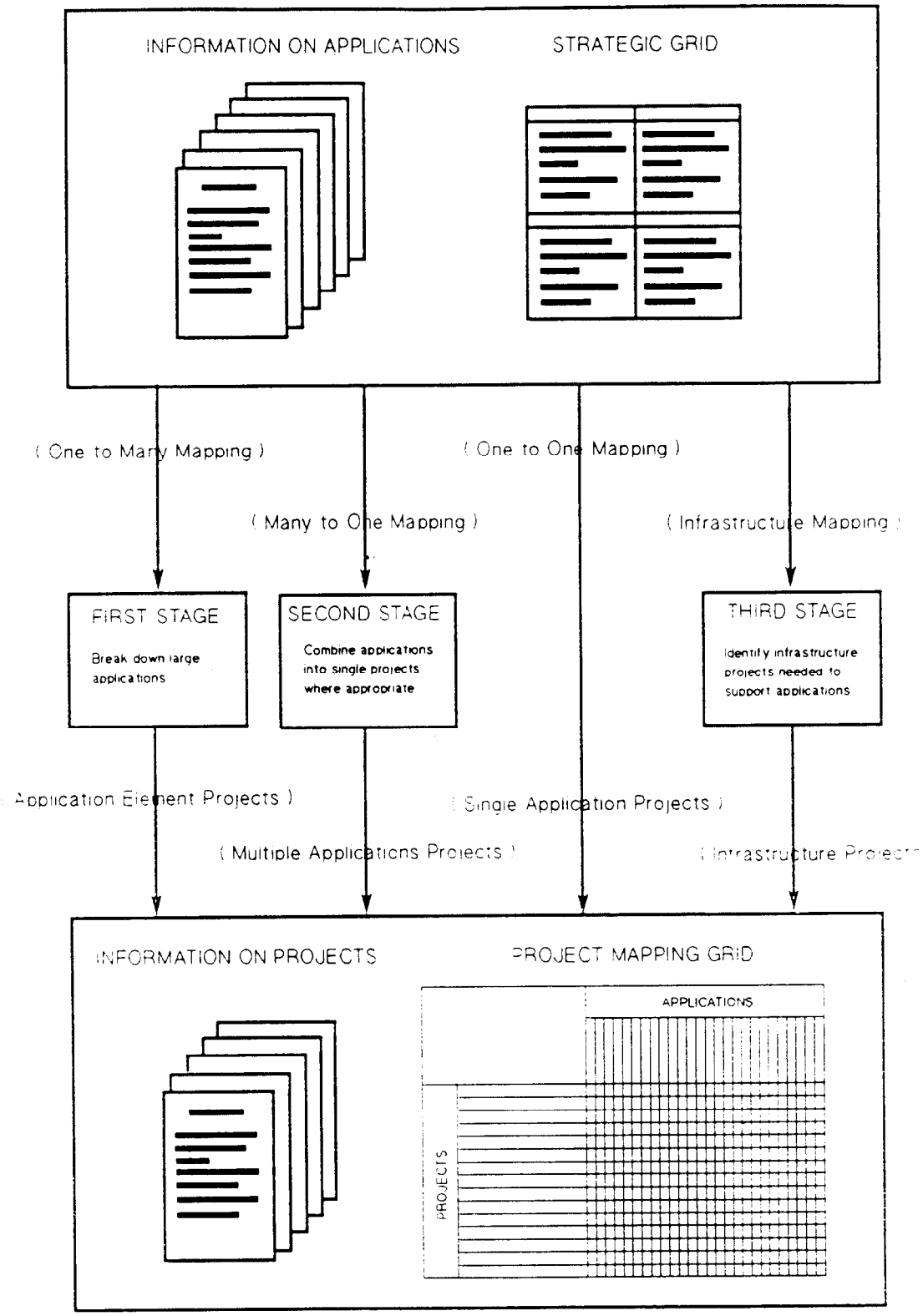


Figure 1 - Diagramatic Summary of the Mapping Process

One of the most important reasons for this is that it is well established from research both in the USA and UK that the single largest problem encountered during IS Strategy implementation is the problem of obtaining senior and middle management commitment to the implementation process. Gaining commitment to the IS Strategy itself does not seem to be such a problem, however when it comes to implementing it there is a major problem. Being able to link individual projects back to their strategic objective and from that have a clear view of the resultant strategic contribution of the project will help to overcome this problem. This is particularly true of infrastructure projects.

THE PROJECT MAPPING GRID

Figure 1 above shows two outputs from the mapping process. The first is high level information on the projects mapped out. Some of this information is derived from the applications using the strategic inheritance ideas above. Other information will be derived as part of the process of deciding which projects are needed, particularly for infrastructure.

The second output is the project mapping grid which shows how applications have been mapped onto projects. The projects can best be initially viewed by dividing them into application specific projects and infrastructure.

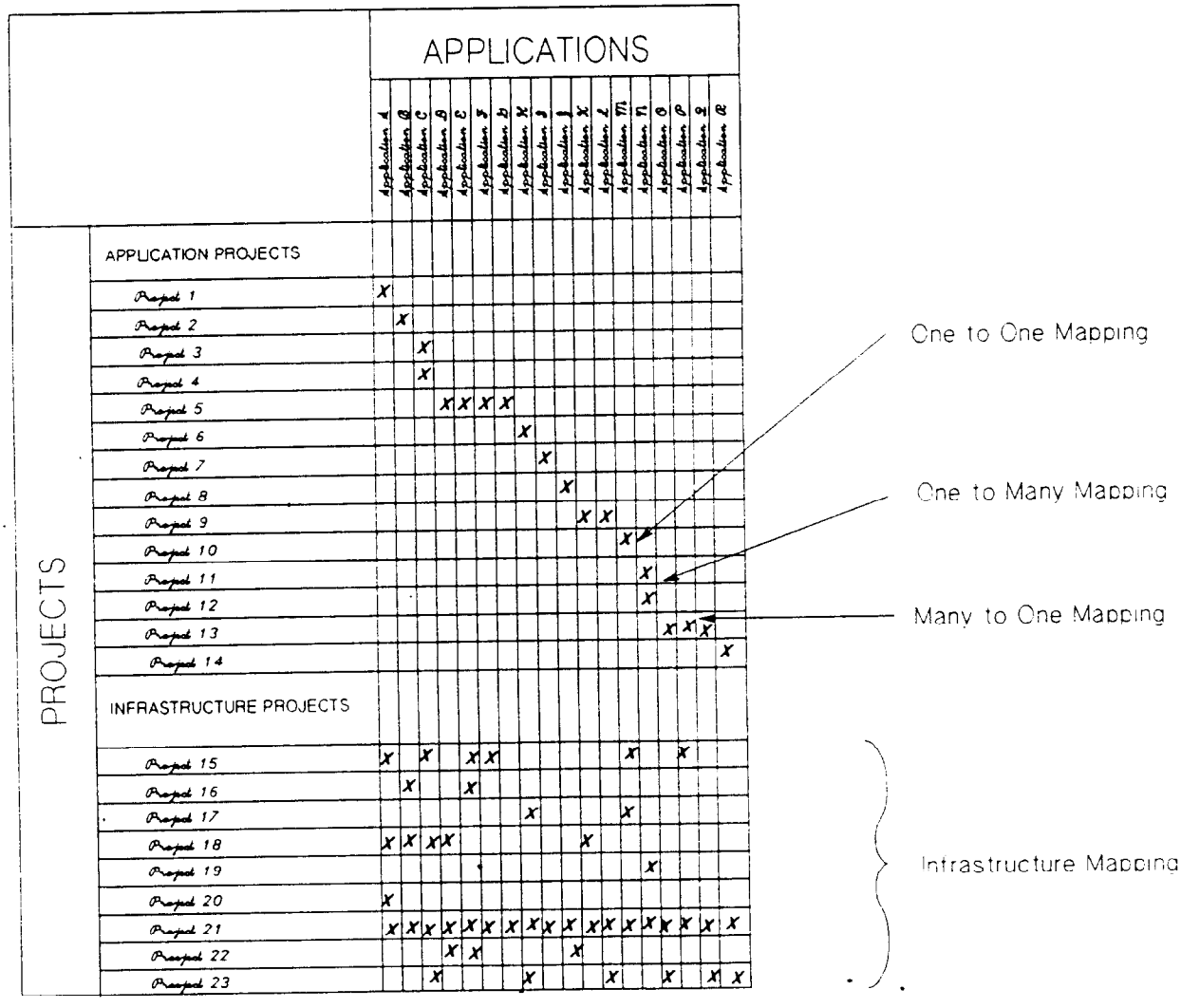


Figure 2 above illustrates diagramatically the Mapping Grid in more detail. The various types of mapping are also illustrated. Such a grid would not be of enormous size. A typical large strategic business unit would have generated 20 to 40 applications from the IS Strategy process, so the mapping grid would be 20 to 40 columns by 30 to 60 rows. Not large by planning standards in other professional areas. Large enough, however, to benefit from software support from such tools as matrix manipulators.

THE FOURTH STAGE - PROJECT PORTFOLIO MANAGEMENT

The project portfolio should now have the same management principles and approaches applied to it as were applied to the applications portfolio in the DISS framework. The aim must be to check that the portfolio is feasible and acceptable from several views. These would include views based on :

- Business Contribution
- Technical Characteristics
- Resource Requirements

BUSINESS CONTRIBUTION

Each of the projects resulting from mapping have inherited a business contribution type from their parent applications. In the Cranfield framework this would be one of the four types of Turnaround, Strategic, Factory or Support. One view of the project portfolio therefore is to view it in the same way as the Strategic Grid.

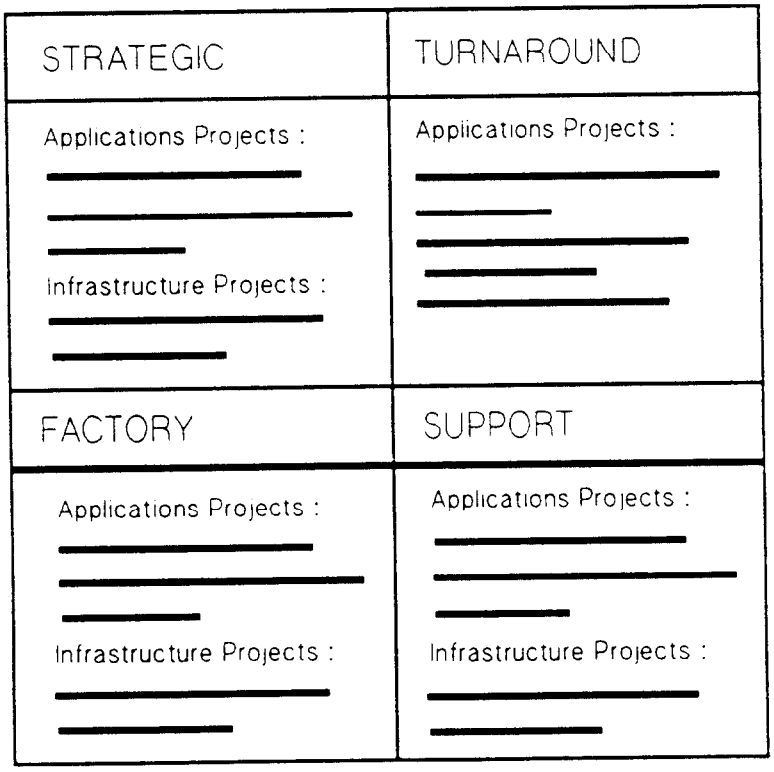


Figure 3 - A Business Contribution View of the Project Portfolio

This view of the Project Portfolio differs significantly from the view of the Strategic Grid. The contents are projects (processes) not applications (products). The contents include infrastructure projects. These have a business contribution type based on strategic inheritance. This is an important concept because it is too easy to regard infrastructure as support.

An infrastructure project which is putting in place infrastructure to enable strategic applications to be created must be a strategic infrastructure project. To treat it as a technical support project and deploy "caretaker" or "technical" project management is a mistake. The project requires project management with strategic perspectives and skills. Such a project needs to be able to deliver a flexible resultant infrastructure element. Or certainly one with more flexibility than would be required by an infrastructure element that was enabling factory or support applications to be created. The importance of infrastructure is usually understated, mapping allows the foundations of its importance to be clearly understood and communicated to business managers.

Many attributes of the projects will vary around the grid.

The Generic IS Strategies could be applied afresh to the project portfolio according to the business contribution type as it was applied to the applications portfolio back in the IS Strategy process.

(i.e as follows :

SUPPORT projects	-	SCARCE RESOURCE Generic IS Strategy
FACTORY projects	-	MONOPOLY Generic IS Strategy
STRATEGIC projects	-	CENTRALLY PLANNED Generic IS Strategy
TURNAROUND projects	-	LEADING EDGE or FREE MARKET Generic IS Strategies)

The budgeting of resources for projects will vary. For support projects the aim must be to budget the minimum possible, for factory projects reasonable estimates are possible so firm budgets can be allocated, for strategic projects less precision must be expected in resource estimates and so some eventual deviance from forecast resource estimates must be expected. Turnaround would be treated as R & D and a fixed level of resources made available.

The type of Project Management required, the tendency to use packages, facilities management, external consultants, prototyping approaches, etc will all vary around the quadrants of the grid.

However the business contribution types are inherited from the Strategic Grid and there is little scope therefore for balancing the portfolio. The balancing decisions would have been undertaking by business management during the IS Strategy Study. However knowing the balance is important because it has an impact on risk and resource profiles below.

TECHNICAL CHARACTERISTICS

It is essential that the technical feasibility of the projects portfolio as a whole is considered, albeit at a high level, within IS Strategy implementation planning. Leaving aside resources, which are discussed below, two key attributes of the portfolio must be managed :

- Technical Risk
- Project Interdependencies

It is important that the technical risk of the project portfolio is evaluated. Technical risk has three key components :

- Size
- Complexity
- Innovation

A matrix such as that illustrated in figure 4 below might be used to determine the technical risk of the project portfolio :

		RISK ELEMENT		
		SIZE	COMPLEXITY	INNOVATION
PROJECTS	APPLICATION PROJECTS			
	Project 1			
	Project 2			
	Project 3			
	Project 4			
	Project 5			
	Project 6			
	Project 7			
	Project 8			
	Project 9			
	Project 10			
	Project 11			
	Project 12			
	Project 13			
	Project 14			
	INFRASTRUCTURE PROJECTS			
	Project 15			
	Project 16			
	Project 17			
	Project 18			
	Project 19			
	Project 20			
	Project 21			
	Project 22			
	Project 23			

Figure 4 - Project Portfolio Risk Management Matrix

It is not possible to prescribe the ideal balance of these elements of technical risk. The danger is that a portfolio could be optimally balanced from a business contribution perspective but if it was mainly comprised of large, complex and innovative projects then the risk of implementation failure is high. The aim must be to adjust the portfolio to reduce technical risk to a level where implementation of most of the portfolio is highly likely.

The ways technical risk might be managed are as follows :

SIZE

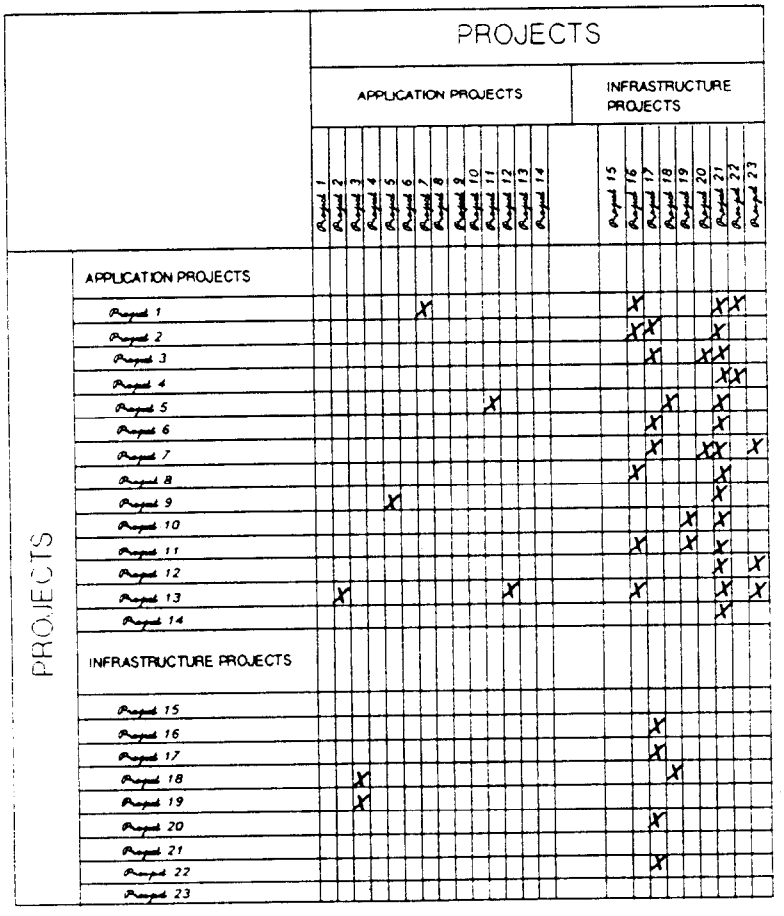
Large projects can be broken down into smaller projects. This will reduce technical risk from the problems of co-ordinating large projects. Decomposing a large project into smaller projects must be considered carefully. Making the parts fit together may be difficult in some circumstances. Also another level is introduced between the project and its parent application, increasing strategic dilution.

COMPLEXITY

Complex projects may also be broken down into smaller projects to reduce risk of technical failure. Again decomposition problems and strategic dilution must be considered. Introducing a prototyping project to precede the main project may be one way of exploring the complexity and reducing it.

INNOVATION

The risks from innovation may be reduced by introducing a prototyping project to explore the problems. Alternatively an older technology might be used with a lower inherent risk.



[NB Rows Depend Upon Columns in this Grid]

PROJECT INTERDEPENDENCIES

Knowing the extent and nature of project interdependencies is important. When decisions are made concerning one project, the impact on the rest of the project portfolio must be known. The most numerous interdependencies will exist between infrastructure projects and the applications that they are to support.

One way of viewing these interdependencies is using a matrix such as the Project Dependency Matrix illustrated in Figure 5 above:

Time is also critical in viewing project interdependencies. PERT (Programme Evaluation & Review Techniques) tools such as Critical Path Analysis for can be used to get a time phased view on these interdependencies.

RESOURCE REQUIREMENTS

Having achieved a project portfolio that is well balanced from both a business and technical perspective, it is necessary to ensure that the resources required are going to be available.

At the strategy formulation stage, the resources available should have been taken into account. However this would have been at a very high level and by business managers who may not have had a clear view on all the resources required to implement an IS Strategy. Additionally resource requirements will have been affected by the inclusion of infrastructure projects and possibly also by actions taken to manage technical risk.

Tabular or graphical profiles of the resources needed by the projects over the life of the IS Strategy need to be prepared.

Profiles for support, factory and turnaround projects should be able to be specified with reasonable certainty. However strategic projects will contain significant uncertainty. This probably means that resource requirements will have to be specified as the most likely profile plus a band representing a spread from worst case scenario to best case. Resource profiles will therefore not be known with certainty.

As the plan extends forward in time so uncertainty will rise. This is partly because there is always uncertainty concerning the future. More importantly some of the projects will be under way. These will be the projects scheduled early in the plan period. For those projects, resource estimates will be available from the project managers and should be used.

The resource profiles needed by the project portfolio should be examined. Where resources required exceed those which are available then action needs to be taken. Initially the aim must be to find ways of achieving the applications within the resource constraints. However if this is not possible, then the options must be fed back up to the business managers who wanted the applications. At the extremes they will have to make decisions about whether additional resources should be made available or whether the applications portfolio should be constrained. To help make such decisions it is probably also necessary to have available benefit profiles, where possible.

The resource profiles that need to be created need be only those which are in short supply in the organisation. For example an organisation that has plenty of spare office space need not prepare resource profiles for the office space that is needed.

The two crucial resources are usually people and finance. Manpower profiles are necessary to show the level of manning required by the project portfolio, broken down into skills profiles and profiles by organisational function. It is not only IS manpower requirements that must be calculated it is also the requirements in the business areas and the management resources required.

The research is clear that one of the major problems encountered in IS Strategy implementation is that of skill shortages. Where skills are identified as being deficient then acquiring the necessary skills or developing them from existing personnel may become a part of some of the projects already within the portfolio or may become an infrastructure project in its own right.

The resource profiles need to be checked also for avoidable peaks in resource requirements. Some peaks and troughs are inevitable but where they can be planned out they should be.

The resources available must be realistically estimated. In particular IS planners must not lose sight of the fact that a sizable part of the IS resources will already be accounted for to support end user computing and to carry out maintenance, both of which are crucial.

The aim therefore is to achieve not just a project portfolio that faithfully represents the needs of the applications portfolio, but a project portfolio that has been checked and adjusted to ensure that it is implementable as far as can reasonably be determined from high level analysis. Figure 6 below illustrates the portfolio management stage :

MULTIPLE OPERATING UNITS

The mapping and portfolio management stages become more complex for organisations that have several operating units or divisions. This is not uncommon and is found particularly in multi-national or global enterprises.

IS Strategy formulation and implementation planning needs to be undertaken at the level of the strategic business unit. This is the level where an organisation faces a distinct market for its products or services.

The role of group management in the case of an enterprise with multiple SBUs is to co-ordinate those elements of its subordinate SBUs' IS Strategies that can benefit synergistically from combining the activities of SBUs in the group. This is particularly the case for infrastructure, where there are usually benefits from a compatible communications network around the group, or where SBUs might share resources such as computer facilities or scarce technical or managerial skills. Group management should, of course, also create an IS Strategy and implementation plan for the Group's own operations.

However another complication exists where an SBU has several operating units. This adds another dimension to the mapping and portfolio management stages. In many cases different operating units will be at different stages in the development of their IS resource. This lack of alignment must be taken into account for implementation planning.

Conceptually this entails breaking down the projects by division and understanding the links between division level activities.

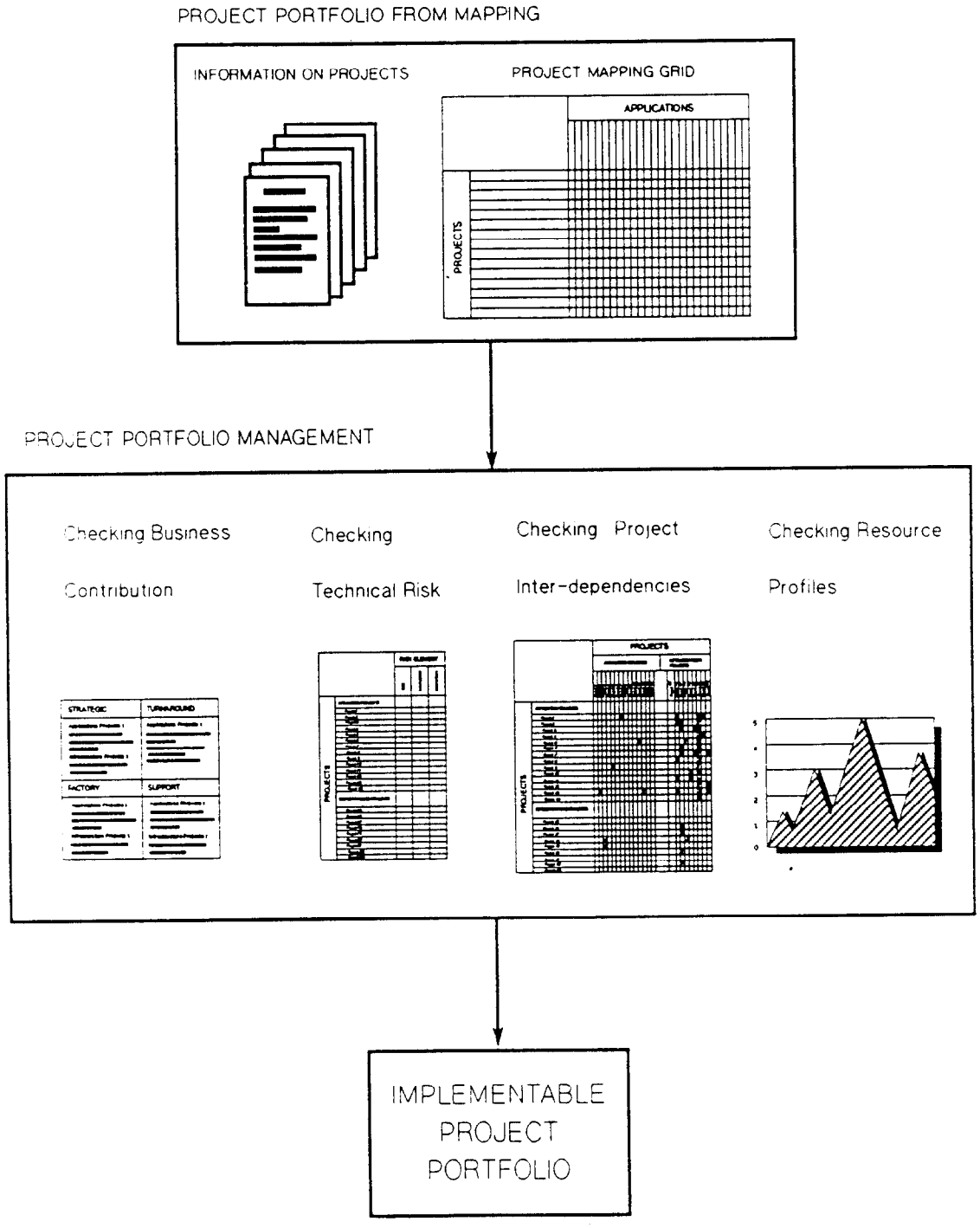


Figure 6 - The Portfolio Management Stage of Mapping

CASE EXAMPLES OF PROBLEMS IN THE MAPPING PROCESS

The discussion above highlighted the issues surrounding the planning of infrastructure. Citibank ran into problems in Brazil with its strategy to reshape the business around easy company-wide access to data in order to create a more rapidly responding organisation. However they ignored the human infrastructure and the skills base in particular was ignored. The skills necessary to make use of this access to information simply did not exist and their creation was missed by implementation planning.

Research by the Index Group into the implementation of strategic IS applications in 200 large US companies showed that 87% failed to deliver their expected benefits and in all cases it was due to failure to plan changes in the human and organisational infrastructure.

A medium sized UK engineering company ran into problems with its IS Strategy. One senior manager summed up five main reasons for the problems. Three were in the area of this paper :

> "The resources required to implement the strategy were not fully analysed before projects were initiated. Consequently the shortage of systems specialists both internally and externally has caused progress to be much slower than is desirable. The cost of implementing the strategy was much greater than envisaged and compromises were made to avoid having to write off a nearly new mainframe.....
>
> It is apparent that inadequate resources have been allocated to the planning process itself. It is not possible for a committee, meeting perhaps twice a month, to co-ordinate the planning of IS projects. Considerable resources are allocated to the financial planning and budgeting process yet it is no more difficult, in fact the processes have many similarities.....
>
> Management of the change process has not been planned. In addition to the planning of the IS projects the changes brought about by these projects should also be planned. By that I mean that the impact of every IS project on each individual's job, each group and the organisation as a whole should be assessed and these changes managed....."

Professor Tom Wilson of Sheffield University has just completed a major study on IS Strategies in Times 500 companies [1]. One of the areas he looked at was barriers to the implementation of IS Strategies. When discussing his findings on the ranked importance of barriers to IS strategy implementation he comments,

> ".....From these various rankings, the difficulty in recruiting appropriate staff, the lack of resources to engage in user education, the nature of the business and the difficulties of measuring benefits, emerge as the key features of IT strategies that are likely to cause problems for companies....."

The listing of cases and research could go on. However the conclusion are always clear. A good IS Strategy plan needs considerable effort put into implementation planning.

SUMMARY AND CONCLUSIONS

The above discussion has focussed on the area of converting the portfolio of applications into a portfolio of projects. Whilst the emphasis has been on the sort of applications portfolio that would emerge from a Cranfield IS Strategy study, the principles, in the main, will apply to other frameworks and methodologies.

The stages described are not necessarily sequential. Additionally the processes will need to be more involved in some situations. The approach, in its detail, is by no means the only approach that could be taken. It is proposed as one approach to an increasingly important and often complex part of IS management.

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April 1990.

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