THE DEVELOPMENT OF A POLICY ON INFORMATION SYSTEMS

Technology and Organizational Change in Counterpoint

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Preface

> If your business has anything to do with information,
> you're in deep trouble.
>
> Bill Gates
> *Microsoft*

The book presents a detailed account of the process of policy development in information systems. It looks at the implications of the emergence of the information society, it discusses the consequent need for change — both organizational and technological — and the *rôle* of information systems in that change: leading it or following it. Ultimately, this process results in the development of an information systems plan which has a good chance of successful implementation; successful in the sense that the anticipated benefits will, in fact, be achieved.

This is not, however, an academic text. It does not pretend to present a definitive methodology for the development of information systems policy. Nor does it purport to be a reference text containing a comprehensive comparative analysis of all possible approaches to information systems planning. It is intended to be instead a short, engaging, and instructive story which is based on real-life experience in developing an information systems strategy in a large organization.[1] This story is woven from a number of strands.

The first strand is a straightforward narrative on the process of developing a policy on information systems and it sets out the main problems which arise in such a process together with their solutions.

The second strand, which is followed through a set of side-bars, gives (sometimes anecdotal) examples of how this process was applied in a large organization.

There is a third strand. Since the development and execution of a policy on information systems is, as we will see, focussed more on the human issues rather than on technological issues, the third strand presents the perspectives of three fictitious people (caracatures, really) who have different roles in the organization. These perspectives are encapsulated in anecdotal interviews.

This book is targetted at high-level managers and busy professionals who are inevitably going to be confronted by the problems of developing a policy in information systems in their organization. These people need to be aware of

[1] An annotated bibliography is also included which provides topic-by-topic pointers for further reading.

the issues involved so that, at the very least, they can ask searching questions of those practitioners who are ultimately charged with this onerous task, the result of which will have a profound impact on the future of their organization. Equally, practitioners will also find a considerable amount of useful material in these pages, not in the least because all three strands – process, practice, and perspective – are grounded in hands-on experience.

All three strands have something different to offer the reader and I invite you to dip in and out as you see fit.

David Vernon,
January 1996

Foreword

> There is a tide in the affairs of men
> Which taken at the flood leads on to fortune;
> Omitted, all the voyage of their life
> Is bound in shallows and in miseries.
> On such a full sea are we now afloat,
> And we must take the current when it serves,
> Or lose our ventures.
>
> William Shakespeare
> *Julius Caesar*

This is a book about opportunities. It is a book about the challenges and rewards that accompany the Information Revolution, and it tells the story about how one institute attempted to deal with these challenges.

When the Board of Trinity College, Dublin, launched an initiative in 1993 to undertake a root and branch review of information technology throughout the University, it took a very courageous step. Information technology touches so many aspects of our lives — often in ways which we don't even realize — that it could have been opening a veritable Pandora's box from which would spill forth a multitude of technological and organizational ills. The time, the effort, and the commitment which would be required of those enlisted to sort through the resultant *mêlée* might have been significantly greater than the College had anticipated.

And so it proved.

Over one hundred and thirty people committed an estimated 31,000 hours of work to the endeavour over a period of twelve months; every aspect of College life was combed for activities which might be relevant to, and which might benefit from, information technology. Thirteen groups considered the implications of information technology for every department and office in the University.

In the process, something unusual happened. The focus of attention shifted from technology to people; from information technology (IT) to information systems (IS). As we examined the *rôle* of information in the university, we were again and again returned to the *raison d'être* of information: the people that use it. And, in this shift, the endeavour became a quest to find what people in College needed to help them in their work and in their life in Trinity. As the focus sharpened, another group became clear: the people who cater for these information needs. These people are the staff of the University's IT department

– The Computer Laboratory – and they play a very central *rôle* for, without the service providers, one will achieve nothing, no matter how nobly stated are the needs of the users.

These dual concerns — the identification of user needs and attendant service provision — are the hallmarks of Trinity's Information Systems Policy Development exercise, one aspect of which is the policy and plan which are summarized toward the end of this book. The other aspect concerns the attainment of benefits which can be derived from information systems and this is the real story which is told in the pages of this book. These benefits are achieved by people in the way in which they carry out their work and in the way in which they interact with one another. Consequently, it is necessary to view information systems as being embedded in an organizational context and to realize that a deep understanding of the interdependence between the technological and the organizational domains is essential for the attainment of the required benefits. Consequently, this book concentrates on the process by which the policy and plan were achieved, *a process which needs to be continued in the commissioning of the plan.*

This process deals explicitly with the organizational and technological interdependence and it requires the direct engagement of everyone in the organization, especially those who are directing policy; it is simply insufficient for an institute's senior managers and directors simply to accept or reject the recommendations of the policy group — much more by way of direct commitment is needed if the organizational and cultural changes which must accompany the successful deployment of information systems are to be effected.

Let me conclude by striking three notes, which together make a somewhat dissonant chord:

1. The many benefits which arise from the deployment of information technology are leveraged not in the domain of technology but in the organizational domain, through the improvement of present workpractices and through the introduction of innovative new workpractices.

2. The emergence of the information society demands that organizations rethink the manner in which they define their public and the mechanisms whereby they reach that public; there are 40,000,000 people using the international information superhighway: how many of them are potential customers. Organizations must position themselves to reach these potential customers and to make them clients, because if they don't, others will.

3. Nothing is going to remain the same in the future; the only certainty is change.

The goal of organizations must be to exploit this change.

Acknowledgements

The material in this book is based on my experiences as the Information Systems Project Officer, leading, with others, the development of an Information Systems policy in Trinity College Dublin from 1993 to 1995. On many occasions throughout this exercise, I likened the process to that of arduous hill walking. The metaphor is, I feel, an appropriate one: there is the sense of excitement as you contemplate the challenge ahead; the quiet progress as you make all of the necessary routine preparations; the sense of well-being as you embark on the gentle slopes of the foothills; the resolution as the going gets hard, and then that sinking feeling as you reach in mist what you suppose is the summit only to discover that you have merely rounded a knoll and there is much yet to be done before gaining the top. Finally, there is the exhaustion as you push yourself beyond your limits in that last scramble, an exhaustion which is followed closely by the sense of elation that accompanies success. Looking around, relief rises with the realization that, with a descent in the offing, you are at least treading known territory. You have the great benefit of now being able to scan the topography from a great height and you know where lie the dead-ends, the cliffs, the bogs, and the snow-drifts.

If I can push the metaphor a little further, I would like very much to acknowledge the contributions of some special people who have made this a successful expedition, although some of them may not know in what way they have, in fact, contributed.

Brendan Tangney, Department of Computer Science, for spotting that the IS hill, though innocuous from a distance, was tough enough to merit a well-organized assault;

David Algeo, Department of Computer Science, who taught us all how to climb;

Frances Ruane, variously Bursar, Chair of the Computer Management Committee, and Chair of the Information Systems Policy Development Group, for organizing our sponsorship, deftly managing our base camps, and for making sure we never strayed far from our course;

Estelle Feldman, in the Department of Business Studies, for wondering if this was not a hill at all, but a volcano with a nasty hole at the top into which we might all fall;

David Talbot, Rainer Zimmerman, and many friends in the European Commission who gave me some invaluable lessons in map-reading and compass work;

Dermot Furlong, in the Department of Microlectronics and Electrical Engineering, for pointing out that steepest ascent is not always the best way forward — some detours are good for the soul;

Sean Corish, Dean of Research, for reminding us at the outset that talking about climbing is no substitute for climbing itself;

Brian Thornburgh, Staff Secretary, for refusing on many occasions to let us get side-tracked into gullies and over cliffs, no matter how fine the view might have been;

Marcella Senior, for providing the water bottles and good cheer, just when they were needed;

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Salters Sterling, Academic Secretary, for pondering, with inspiring detachment, the *rôle* of mountains in the grander scheme of things;

and, especially:

Keelin Vernon, Friend and Wife, for listening to interminable tall tales of far-off hills, smiling, and turning the map the right way up.

Finally, to all those who made the climb, those one hundred and seventeen other individuals who contributed so much over such a long period, for no reason other than they believed that this was a summit worth gaining, my heartfelt thanks.

Desideratum

Information is not everything. When T. S. Eliot asks[2]

> *Where is the wisdom we have lost in knowledge?*
> *Where is the knowledge we have lost in information?*

he touches a raw nerve. Information is nothing if it is not used, knowledge is sterile if it does not serve society, and wisdom can emerge only from participation in that service.

The exchange of information is as important as the information itself, for it is through critical debate in the pursuit of truth and knowledge that a university achieves its goal as a seat of learning: through discourse, through dialogue, through informed social interaction.

Consequently, the emphasis in this initiative on the formulation of a long-term policy on information systems in Trinity College was on allowing the College body to participate fully in the workings of the University as an organic part of the national and international community, allowing unimpeded access to appropriate information, and facilitating the subsequent use of that information in whatever manner the people involved see fit. In providing the College community, whatever that might be in the future, with a usable infrastucture whereby they will have access to the information they need, as and when they need it, we will be helping them — staff and students alike — to participate fully in College life, understanding the limits of their own knowledge, seeking the information they lack, and being able to find it. This is our wish.

[2]T.S. Eliot, *Choruses from 'The Rock'*

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Part I

The Story of Information Policy Development

Chapter 1

The Information Revolution

> Unless knowledge can be brought into a coherent system, we shall either have to abandon the hope of finding man's place in the universe or else to accept, with pious resignation, dogmas that disregard the lessons of natural science, and acquiesce in the continuing divorce of fact from value that has been the chief cause of our present bewilderment.
>
> J.G. Bennett
> *The Dramatic Universe*

1.1 The Information Age

Knowledge is power. It has always been so. Whether it was prehistoric knowledge of how to create fire or the ancient Chinese knowledge of how to manufacture gun-powder; whether it was the power of mediaeval religious bodies which was predicated upon the ignorance of the masses or whether it was the power of modern societies borne of their knowledge of nuclear physics. What is significant about these examples, however, is neither the power nor the knowledge but, rather, that the empowering was achieved because the knowledge was held by a relatively *small* number of people. What made countries great during the industrial revolution was not that they had great natural resources but that a small number of people knew how to process them and exploit them (and, often, exploit the sources of the natural resources).

The age in which we are now living or, rather, the age which we are presently entering — the information age — is quite different from this. There is occuring a fundamental reversal in the order of things. Now, information — and access to information — is the province of everyone, at least in the so-called western world. Information is the natural resource of the new industries; it is the raw material of wealth creation in the developed world and it is beginning to supplant, if it has not already supplanted, the traditional resources which once made empires great (or, at least, wealthy). This is good, given that information is a resource which is potentially the product of any human mind, and thus knowledge, that which information begets, is potentially capable of empowering

vast numbers of people worldwide. And that brings with it the possibility, although not necessarily the certainty, of a much more egalitarian society. This emancipation through accessible information also brings with it some dangers, for the coming of the information age is not borne of an *evolution* of technical capability but, instead, of a *revolution* in technological prowess. And it carries with it, as have all technological and scientific revolutions, the potential for a fundamental shift in social patterns and social organization.

1.2 Evolution and Revolution

There are, of course, problems with revolutions. The first of these is to know that a revolution is taking place. Quite often, the changes happen so fast and we have so much social, cultural, and intellectual inertia that we fail to spot the early signs. In the present instance concerning the information revolution, the signs have not been easy to see because the increasing pervasiveness of information and the increasing predominance of knowledge-oriented industries seemed to be much less a revolution and much more a natural evolution of the industrial, manufacturing, age. Such an evolution requires no more than a change in raw materials: from natural resources to human knowledge. On the face of it, this is quite the case. If it were not for one key feature: communications. We now have the capability to exchange vast amounts of information between individuals anywhere in the world and, more significantly, there is nothing in principle which stops anyone from engaging in this exchange. In the western world at least, man as an information hunter-gatherer has come of age.

It isn't easy to comprehend what this means. It is not just a question of speeding up existing ways of doing things — such as the telegraph did for written communication — it is the sheer scale of the communication infra-structure and the public accessibility of that infra-stucture which is really significant. Worldwide, there are in excess of 40 million people in 100 countries using the so-called information super-highway, *e.g.* the Internet, and that number is more than doubling every year. That means that well before the end of the century, the worldwide user-base could be equivalent to the total population of Europe.

There are other signs which might alert us to the fact that this is a revolutionary process and not an evolutionary one: the types of people who are enabled by the changes are totally different to what we have been accustomed. Instead of it being the Chief Executive Officers, the policy formers, the managers, the entrepreneurs, the so-called captains of industry — even the educators — we are now seeing children and young adults exploit this new resource and, arguably, making it their own.

For example, classes of girls and boys at a national school in Bilbao now communicate and collaborate on a daily basis with their peers in a school in Dortmund using the Internet and, increasingly, students entering university will have already been exposed to information networks in their schools. The Cafeterias around the Berkeley campus at the University of California have seen their video games being supplanted by coin-operated workstations which allow student access to the Internet for fifty cents for so many minutes. Instead of

space invaders, it's real-life cyberspace; instead of games junkies, we have 'info-surfers'. And, if you want more signs of 'revolution not evolution', read any major newspaper. Every week, they carry supplements which are devoted to information technology and information systems, often written in the strange and somewhat idiosyncratic language which is springing up to reflect this new reality.

Make no mistake, it is a revolution and the revolution is underway. But, if it's often difficult to recognize that a revolution has started, it's even harder to say what point it has reached when you are caught up in it. Has it just begun? Is it nearly over? Without the benefit of historical hindsight, *i.e.* until it's over, it is impossible to be certain. However, given that revolution leaves societies in a very different state to that which prevailed before it started, with different ways of doing things, different attitudes, different values, in essence, a different world view, it is likely that this revolution is just beginning. We have seen much change in the last ten years but it is nothing, absolutely nothing, to the changes which inevitably will come. And therein lies the rub: whilst you can anticipate with some confidence the nature of events in an evolutionary scenario, if for no other reason than you can control the changes, it is extraordinarily difficult, if not impossible, to control the process of change in a revolution, and it is certainly impossible to predict the social and technological outcome of that process.

So what should we do? Sitting tight and waiting for the revolution to end would *not* be a sensible strategy for dealing with these circumstances. It is much better, indeed it is essential, to participate in that revolution so that we can help shape it and be shaped by it as it proceeds. To do otherwise would be a great folly for, as Winston Churchill sagely remarked, 'First we shape our structures, and afterward they shape us.' Organizations in the public sector and in the private sector need to participate actively in this shaping if they are to stand any chance of exploiting the opportunities which will arise. To do this effectively, we need to look a little more closely at the disturbances and improvements which revolution brings to our lives and our work.

1.3 Consequences of Revolution

The beer mats in a pub in Munich proclaim that *Change Will Happen By Itself.* It isn't clear whether or not this message is intended to test the sobriety of its patrons (the more confounded you are, the more sober you must be). It is, however, an extraordinarily deep statement which runs counter to all our normal preconceptions of cause and effect that change is caused by some identifiable external source. In this instance, no external cause is being attributed: the process of change is spontaneous and, thus, uncontrollable. The changes which attend revolutionary processes are often equally emergent and the distinction between cause and effect can become very blurred. Significantly, the causes, the effects, and the changes all feed off each other in an unpredictable manner. This, of course, is one of the primary reasons why change becomes so pervasive and profound: revolutions tend to be self-catalysing processes.

There are two inevitable consequences of this type of change: it is, or can be, very disruptive and it can give rise to a great deal of fear among those involved in the change.

Change is disruptive because the established *modus operandi* is no longer applicable and one has to learn new ways of doings things. This takes effort and effort is *not* something that happens unprompted. Change may well happen by itself but effort most certainly doesn't.

Fear takes root for many reasons. There is the irrational (but very strong) fear of the unknown, the changes which are breaking on your shore signal deep uncharted waters beyond and the more you contemplate the increasingly swift currents, the more that fear grows strong. In the context of the information revolution, this fear is best captured by the term *information angst* — the terror of being left behind, of being unable to deal with the deluge of new technology, new interfaces, new repositories, new networks, new communication media, and — most threatening of all — the new language which inevitably accompanies the changes.

And, lest you think yourself above such irrationality, complacency is no guard: information angst can strike anyone, even those who think they are up there with the best. In circumstances of accelerating change, there will always be occasions when you will be confronted with the stark truth that you haven't heard of the latest system or this new term and you have no option, if you are being honest, but to profess ignorance. Ignorance, of itself, is, of course, nothing to worry about. Paradoxically, in the information world with its oceans of data, ignorance is something we will increasingly have to come to deal with. It is the ability to navigate that ignorance that counts. However, admission of ignorance is something that is not inculcated in western society and people are very uncomfortable with it. This is sad because it is so unnecessary and perhaps the information revolution may serve to help remedy this intellectual malaise.

There are more rational fears, as well. As Machiavelli so aptly put it

> *There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain of success than to take a lead in the introduction of a new order of things, because innovation has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under new.*

People have a very legitimate fear of any process which may degrade their status or well-being. Dealing with this fear is an essential part of successfully participating in the revolution.

1.4 The Problem with Change

Change, of itself, is not a problem and there are many benefits which change can bring in its wake. Change can, of course, give rise to difficulties as we saw above, but none of these are insurmountable if one is aware that they can occur and if one is well-prepared to handle them. The problems really arise because

different systems evolve and change at different rates: they have innately different time-constants and it takes a certain amount of time for a system to respond to a stimulus (from within or from without) and to alter its way of doing things. When you have complex heterogeneous systems comprising two or more interdependent sub-systems each of which has different time constants and each of which is changing simultaneously, problems inevitably occur as the two sub-systems get out of step. Nowhere is this more evident than in information systems which combine two very different sorts of components or sub-systems: the human organization and the technological infrastructure. Human systems change, quite naturally, at a much slower rate than does technology and thus we have two ill-matched sides to a single coin. This is a nice metaphor and it is easy to think of information systems in such a simple two-sided manner. But, as is always the case, reality is not so simple. There is more to the human aspects than just the organizational issues. Peoples' attitudes play an important part, as does the organizational culture which manifests itself in the collective attitudes of the group; both of these have their own, respectively bigger, time constants. The societies which embody and manifest these cultures, yet again, change even more slowly.

In a situation where there is slow evolutionary change in technology, the human or organizational systems can keep pace by periodically adjusting itself or re-synchronizing itself so that new services which might have been enabled by the new technology can be adapted and the organization can restructure itself if necessary to support these services.

In a situation where the rate of technological change is rapid, this divergence between the technological capabilities and the organization occurs much more profoundly and more quickly. In these circumstances, incremental reactive changes in the organization are insufficient to narrow the emerging gap and much more fundamental re-organization, re-learning, and re-skilling in the service provider is necessary. There is also often a need for re-education of the user-base since the availability of new tools and information allows and creates opportunities for new ways of working. *In truth, it is these new work-practices which bring the real benefits of significant change.*

So far, we have couched what has been said about the information revolution in societal language referring, in the main, to the impact which this revolution will have on society at large. We have looked briefly at the manner in which people can be empowered and we have discussed the natural fear which arises in the face of the inevitable change which accompanies such empowerment. It is perhaps too easy to talk in these terms, for there is a certain safety in discussing phenomena which, by virtue of their scale if nothing else, are at one remove from our personal experience. This safety is an illusion. The changes and the fear are manifest not only at this macroscopic level but also at the microscopic level of the individual and the organization. It is in this context that the information revolution assumes a frightening immediacy, an immediacy which is brought home by the pithy remark of Microsoft's Bill Gates: 'If your business has anything to do with information, you're in deep trouble.' Throughout this book, we will be developing ways of dealing with this information revolution. Their success can be of crucial importance to organizations and they have an

equal relevance on the microscopic and the macroscopic level. Before we proceed to look at these issues, let's stand back a moment and take a cold look at what has been said so far.

1.5 The Impact of Information

Returning to the issue of information as it impacts on our work, consider briefly all the types and sources of information in a typical organization, in this case, a university. These include, *inter alia*, on-line books, periodicals, and magazines from a large number of publishers (including other universities and research institutes), student applications from the Central Applications Office, calls for research and development proposals from the European Commission, requests for information from prospective students and prospective employers, reports and accounts to and from the Higher Education Authority, casual dialogue with colleagues in other universities worldwide. And this is just a sample of the information which is sourced *externally* to the university. If we consider the amount of information generated and exchanged *internally* — publications, departmental accounts, class lists, student records, timetables, booking forms, letters, memoranda, newsletters, reports to funding agencies, research proposals, the ubiquitous questionnaire — it is clearly the case that we would not be overstating anything in asserting that the volume of information being traded is very significant. The volume itself is not a problem. Rather, the problem only arises when we wish to make sensible use of the information, when we wish to take advantage of the information instead of having it as a millstone around our necks making it more and more difficult for us to do our work effectively, efficiently, and enjoyably. Unless people manage the nature and flow of information, *it will remain just that: information; it will be inherently incapable of being transformed to useful knowledge (useful in the sense that it facilitates the achievement of the organization's goals) and it will inhibit rather then empower.* The achievement of a solution to this problem is one of the major goals which is addressed in this book.

This, of course, requires that we understand how information impinges on the life of people in the organization as they carry out all their daily activities: in administration, in marketing, in production, in management, in strategic planning. The solution may well exploit technology to some greater or lesser extent to achieve the organization's goals but it must be founded upon the human aspects of information: the solution must take it as axiomatic that information systems are driven by human and organizational needs and capabilities rather than by the availability technological tools.

One the One Hand: The Limitations of Information

Are we in danger of overstating the case for the revolutionary nature of the information age? Clearly, in the accompanying pages, we have presented a scenario in which information is the new resource which fuels the technological and social changes endemic in revolutionary processes. We do need to be cautious, however, in assuming that information is sufficient unto itself in this process. It isn't: it is *information in context* which is. To see this, let us spend a little time on a short, and necessarily a somewhat philosophical, discussion on the difference between 'knowledge' and 'information'.

Let us begin with knowledge. All knowledge is known. That is, it is known by a knower: it is of necessity grounded in the experience of a knower. There is an inalienable human aspect to knowledge. If we remove this human knower, we reduce knowledge to mere information: a collection of ungrounded – but perhaps valid – data.

Why is this distinction important? In the context of the future nature of education and universities as organs of education, there is a substantial risk of mistaking hyperbole, or hype, for reasonable discussion.

Much of the present discussion assumes the identity of information and knowledge and, given this assumption, we might consider it entirely practicable to abolish universities (or schools) and replace them with a world-wide database of all known information on every topic, a database to which every individual would have easy and intelligible access. There are those who entertain such ideas. Any family that has ever been the object of the sales pitch of an encylopedia sales representative will know how beguiling this type of proposition or argument can be. It is, of course, a fallacious argument, for knowledge and information are not identical, as becomes patently evident three months after the offending encyclopedias are delivered and the household has become information-laden and knowledge-poor (and financially poor!)

For example, if you were to take a text-book on engineering mathematics, you could make all of the information in this book — figures, diagrams, equations, and lucid explanations — available world-wide by network. This would not necessarily enable a network user to achieve any substantial knowledge of the subject matter of engineering mathematics. That requires both dialogue and practice, things which may not necessarily be achievable in a straightforward manner over a network. It is not merely a question of content: it is a question of process and of context. Information, of itself, may well be a necessary and an increasingly inevitable part of life, but it is insufficient for the achievement of substantive goals. You also require people. This might seem like a rather trite statement but failure to recognize its importance has been the downfall of many endeavours.

But On the Other Hand ...

The chief executive of the largest software corporation in the world, MicroHard, is sitting at his desk contemplating the future of his company. Despite being a billionaire, he has this insatiable urge to vent his creative energies in business and to follow success with success. He asks himself: 'What is the one commodity which everyone in the world seems to want and which has minimal transportation costs, low development costs, almost endless reusability, and is an up-market product for which people will pay great sums of money'. He ponders awhile and a thought strikes him. Information! Almost as soon as the thought strikes, he dismisses it. Information repositories are ten-a-penny. He ponders again. What is the bill that most people in the USA most concerned about? That's where the money would be: in providing a substitute product. Let's see: the car, the mortgage, the school fees, ... education! Everyone wants to be educated. Here is a service which is expensive but which is relatively cheap to develop, reusable, and has 'quality' stickers all over it. The problem with education is that people are educated in universities and schools. Now, if he could only replace the universities.

In an amazing coincidence, the president of an Ivy League college, Haahvid University, is pondering the future and wondering what threats she might have to deal with in the coming year. Budget cuts? Not really a problem. Falling standards in the freshman years? No difficulties there either. It seems like everything in the garden is rosy, especially if you're in the top one percent (although she knew it was not so simple for other, equally good, but less established universities). Her telephone rings and Mr. G. Bates from MicroHard engages her in a long conversation.

Six months later, MicroHard announces accredited Haahvid degrees in fifty disciplines, including their prestigious M.B.A., on their global interactive network. For $1,000 you get enrolled into a full degree programme, sitting at home in front of your interactive television which is hooked up to the SuperNet via you TV cable; most classes are pre-recorded and you simply watch them on interactive video, on demand. Course work involves you in a trawl through the Natural History Museum's archives, the Smithsonian, or even a browse though the facsimile of the Book of Kells in Trinity College to check on the pigmentation of ancient books. Regular tutorials are held in tele-conferencing mode.

Haahvid's student numbers now stand at 5,000,000 and 200 universities in the USA are filing bankruptcy. They couldn't compete with Haahvid when it was just a physical university - but they didn't have to, most people couldn't afford to go there. But now, everyone could afford it and worst of all, Haahvid had an exclusive strategic alliance with the biggest corporation in telecommunications and multi-media entertainment in the world. Things did not look good; for everyone except MicroHard and Haahvid, that is.

Chapter 2

Dealing with Change

> 'A slow sort of country!' said the Queen. 'Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!'
>
> Lewis Carroll
> *Through The Looking Glass*

The key message in the previous chapter was that change is an inevitable consequence of the present developments in information technology. We argued that, because these developments are revolutionary rather than evolutionary, and thus are inherently difficult to control, the changes we have begun to witness now and which we will inevitably witness in the future will be of a very fundamental nature, affecting us as individuals and as a society. In this chapter, we will bring this matter forward and we will distinguish between the various forums in which change happens. This will allow us to identify the areas which require our particular attention and, more to the point, to see what are the appropriate ways of dealing with these different types of change. Note, however, that it is not intended to present a comprehensive in-depth treatment the many aspects of change; as the cliché goes: that would be well beyond the scope of this book. Nonetheless, there is a great deal to be gained from a thumbnail sketch of each of the issues.

To begin with, let us distinguish between four different types of change or, more accurately, four different areas which are the object of change:

1. Change in Technology
2. Change in Workpractices
3. Change in Organizations
4. Change in Culture

Let us begin with Technology.

2.1 Technology Change

Of all the four areas of change, it is without question that technology changes the fastest. Despite the prognostications of the technology watchers over the past thirty years or so, computer technology has consistently failed to heed those that would say that there are limits to growth. Computer processing power continues to double every few years, and this trend shows no sign of abating. From the microprocessor of 1971 to the microprocessor of 1995, we have seen increases in power in the order of between two and three orders of magnitude, from processors which can execute under one million instructions per second to those which can execute over one hundred million instructions per second. Before the end of the decade, it is expected that semiconductor technology will allow the production of relatively cheap processors with the ability to execute one thousand million instructions per second.

But processing speed is only a small part of the technological frontier. Power consumption is perhaps equally important. It is the feature which allows us to process information as we travel home on the train, in the bus, or, for those of us who are incurably addicted to work, in the car as we tour Scotland. Significantly, both the reduction in power consumption of microprocessors, memories, and displays, and the increase in capacity of batteries are necessary to achieve true portability. And both have advanced greatly over the past ten years.

Memory capacity is also a fundamental cornerstone of the information revolution. We have gone from microprocessor systems which would have been deemed to have 'a lot' of memory if they had 16kbytes of memory (equivalently 16,000 characters of information) in 1979 to personal computers where having less than 8Mbytes (well over 8 million characters or thirteen 200-page Ph.D. theses) is considered a disadvantage. Permanent storage on hard disk has gone through an equally dramatic change: from desktop systems which would have been considered advanced if they had 10 MBytes of non-volatile storage to PC-based Compact Disk systems which measure their storage in gigabytes (or the equivent of one thousand Ph.D. theses). Sadly, the quality of the information in these gigabytes often falls far short of that of even a single Ph.D.

All of these developments are dramatic and they show no strong signs of abating. But all these technological changes, the processing power, the portability, the storage capacity, even taken together, are not revolutionary. That is to say, despite their extraordinary rate of change, they don't of themselves alter the way in which we do things. They may allow us to do what we did before, and do it faster, even better, but it is still what we did before. In a strong sense, more powerful computers are no more than faster pencils. For the revolutionary aspect, we have to look elsewhere. We find it in networking.

Perhaps the most significant development in recent times has been the integration of communication facilities into personal and desktop computers and the exponential increase in connectivity of these computers. As we noted in the previous chapter, over 40 million people in 100 countries are now connected together on the Internet, and this number is more than doubling every year. Because of information and communication technology, we have edged closer and closer to the global village, a journey which it seems we have no choice

but to complete. The integration of cellular telephony and satellite relays into personal computer systems now means that the incurable workaholic can not only write books as he tours Scotland, but he can also read his e-mail and send and receive faxes. Perhaps not progress, but certainly it represents fundamental technological change. And, if this is not enough, the data-carrying capacity of these networks of communicating computers has increased from a modest 10Mbits/second just ten years ago to 100Mbits/second today, and an anticipated 600Mbits/second in the next two years.

The significance of these developments are that, instead of simply doing what we always did, but better, the interconnectivity of computers and information systems allows us to do something new. Perhaps the clearest example of this is cooperative working (or inter-working as it is sometimes known) wherein several people cooperate interactively, without ever having to see each other, on a common project, developing new syntheses by virtue of their shared experiences. Obviously, people have been working in teams for millenia, but it is only in the last few years that they have been able to work together *irrespective of their physical location.* It is the ability to work together in a virtual environment which is revolutionary.

Paradoxically, despite the fact that the rate of change in technology is the fastest of the four areas (technology, workpractices, organizations, and cultures) which we will look at, it is the easiest to deal with as long as we remain current with developments. That said, two principal difficulties, or dangers, arise.

The first difficulty — technological obsolescence — occurs when we don't remain current, *i.e.* when we as individuals or as organizations become blind to the changes which are occuring. In these instances, the organization is in danger of becoming 'out of step' with the standards which have established themselves in other organizations. While this may not seem to be a major problem on the face of it, since the individual or organization can still do the work which the system enables them to do, it can face very significant problems either when the system fails and must be repaired or maintained (often such repair or maintenance is unavailable or prohibitively expensive) or when the individual or organization in question seeks to exchange its work with other individuals or organizations. These so-called 'legacy' systems can be very expensive both to maintain and to replace and the individual or organization is presented with a very undesirable Hobson's choice.

The second danger — technology addiction — arises when an individual becomes over-committed to having every new release or upgrade *irrespective of whether or not the upgrade brings obvious benefits.* In many instances, the need to move to the newest model of personal computer simply cannot be justified on the grounds of functionality or efficiency; it is just a question of being up to date. Sometimes, this technological addiction can be very hard to resist. Consider the case of Version 6 of Microsoft's wordprocessing package 'Word for Windows'. This version gives the user many very useful additional features and it is hard to argue against upgrading. Until you discover that most installed '386 machines, and many '486 machines, simply don't have the power or memory capacity to allow the package to work properly. If you commit to upgrading Word, you are, like it or not, commiting to upgrading your hardware also. This

may well be a sensible course of action, but it is not something you embark on in an ill-considered manner.

Clearly, dealing with technological change requires you to strike a good balance between technological obsolescence and technological addictions, a balance which can often be hard to attain, especially if you don't know that there is a balancing act in process.

2.2 Workpractice Change

From the previous section, we can see that the benefits of technological change are not derived directly from technological developments themselves, but from the way we use the technology and, in particular, from the new ways we use the technology. It is this emphasis on the usage of technology, and the workpractices which enshrine these usages, which allow the benefits of change to accrue. This can't be overstated: technology, in and of itself, is almost irrelevant. *The benefits, and the perils, lie in the manner in which we modify our behaviours in our use of that technology.* To coin a phrase, 'technology enables, workpractices deliver.'

These observations, once stated, seem obvious. Perhaps this is the reason they are so often overlooked in organizations. The norm in the industry has been to invest in information technology — the computer systems, the printers, the local area networks, the databases, the spreadsheets, the desk-top publishing — and to sit back and watch the benefits accrue. Sometimes, it's a long wait. Without due care and attention to the context in which the information technology finds itself, *i.e.* to the manner in which the technology is to be used and the function it is to fulfil, no benefits accrue. Quite often, it is the opposite: great costs are incurred.

Consider, for a moment, the emerging technology of document image processing or DIP. DIP was, and is, heralded as the progenitor of the paperless office. You simply install a fast scanner to convert all incoming documents to images, index them (no trivial matter), and archive them. Henceforth, all information is accessible at the touch of a button and you will never have a lost letter or file again. The reality has, quite often, been somewhat different. What many hopeful customers of DIP have failed to realize is that the use of DIP requires a totally different way of organizing the office practices. The most obvious mistake that is made is to allow papers to circulate freely at the same time as the image-based documents. It is not clear then which is the master copy and which is the most valid document. This tends to undermine people's faith in the new technology and, slowly, it falls into disuse. More significantly, but less obviously, the successful use of DIP requires a very detailed assessment of the flow of documents in a given office. This assessment is used to model the information flow and to create a DIP system which reflects this model. Often, in the modelling process, improvements can be made in the manner in which information is handled and communicated and improved office effectiveness and office efficiency results. This is where the true benefits lie and, because the simple installation of the equipment doesn't address this information flow, the

benefits are not gleaned.

How do you deal with workpractice change? Acknowledging that it is an important issue in the first place (if not *the* most important issue) is a major step. If you don't realize that the issue must be dealt with, then you have no hope of addressing it. But obviously that's not enough. We can see from the DIP example that there are a number of key steps in dealing with changes in workpractice and in getting the benefits that these changes can facilitate. A list of steps might be:

- Carry out a thorough assessment of the functional needs of the office or department.
- Conduct a complete analysis of all information needs (either computer-based or paper-based).
- Document the flow of all information (computer-based and paper-based).
- Identify the best way of achieving the functional goals of the office or department (this may *or may not* involve the use of IT).
- Specify the IT needs accordingly (if appropriate).
- Commission the system.
- Provide extensive training to all those which will come into contact with the new procedures (and system).
- Conduct frequent and rigorous reviews of both the system and the procedures, measuring satisfaction levels of all users.
- Alter workpractices and IT as appropriate.

Above all, make sure that all the people who will be most affected by these new workpractice changes — the users and/or the clients — are involved in every one of the above steps: they won't use the system or adhere to procedures if they don't feel a sense of ownership.

2.3 Organizational Change

Much of what we said in the previous section on workpractice change applies equally to organizational change. In a strong sense, the organizational practices are global reflections of the individual or departmental workpractices. It is tempting to think of it as being the other way around, with individual and departmental workpractices being derived from the organizational norms but this is not always the case. For example, in a university environment which holds individual and departmental autonomy so dear, it is certainly not the case. But even in more autocratic and rigid organizations, it is dangerous to assume that individuals and departments will automatically adopt the received wisdom of the senior administrators and officers on organizational practices for

such an assumption disregards the essential lesson of ownership which we noted above. In this light, it is clear that to deal with organizational change, you need to have a very solid hold on the individual and departmental workpractice changes. More to the point, if you wish to inculcate organizational changes, an approach which is predicated upon *first* developing the appropriate individual and departmental changes is more likely to lead to long term success. Conversely, there are many instances of profound failure where the administrators and officers attempt to achieve organizational change by decree.

There is, however, one issue which is peculiar to organizational change: the creation of appropriate structures to facilitate the new workpractices which arise from the deployment of information systems or simply from a rationalization of procedures or communications channels. In specifying the organization of any entity it is necessary to set out the following:

- The components of the organization.
- The roles and functions of each component, including job descriptions.
- The interaction between the components: the connections and the mechanisms for communication.
- The interaction between the components and external bodies, specifying the connections and the mechanisms for communication.

All of the above four issues must be fully developed before you can say that you have a satisfactory plan for the organization of the IS Service. These in themselves are still insufficient for there is a need also to set out the process by which the new organization will be implemented and the auxilliary activities (such as human resource development and training) that need to be effected in order to support this implementation.

2.4 Cultural Change

If organizational change is, to a large extent, an emergent property of individual and departmental workpractice changes, then culture and cultural changes are even more so emergent aspects of the often-unwritten organizational ethos. This makes it very difficult to assess and monitor organizational culture, much less actively change it. It is not an intractable problem, however. Let us see how progressive cultural change can be actively promoted and achieved.

First, we must recognize that the concept of culture is something of an umbrella term which is used to cover three key organizational attributes. These are:

1. Common patterns of behaviour: the manner in which people conduct themselves in the organization.
2. Procedural norms: the rules (implicit or explicit) which they perceive as being relevant in governing their activities.

Organic	*Dirigiste*
Democratic	Despotic
Involved	Imposed
Transparent	Opaque
Consensus	Enforced beliefs
Emergence	Prescription
Success	Failure

Table 2.1: Organic *versus Dirigiste* Approaches to Culture Change

3. Accepted values: the, often subliminal, metrics which people use when assessing whether some form of behaviour is good or bad, right or wrong.

Once this has been taken on board, we can see that to engender a 'new' culture, *i.e.* to establish a cultural change, we must change the accepted values, demonstrating in the process the utility of the new value system, and we must create new patterns of behaviour. This can be most effectively accomplished, not *ex cathedra* by dictum or dogma, but by having those people who are leading the change process in the organization — the so-called *change agents* — adopt these values and behavioural patterns. These new values and behaviour should then be exhibited at every turn in every new development in the organization. Those people who are involved in these developments will then get to view these new approaches first hand and, most importantly, they can then assess for themselves the virtures and benefits (or otherwise) of these changes. This point can't be over-emphasized: *organizational cultural change, from which all good things will flow, is a process of growth and organic development which ultimately depends on the individual's psychological disposition toward the effects of that change.* It is clearly essential that, at every turn, the benefits of that change be made unequivocally clear and, preferably, that they be made clear by action rather than empty rhetoric, as is so often the case.

These are general guidelines and we will return to the matter in much more detail in later chapters when we come to discuss the process whereby a long-lasting policy on information systems — a policy to which people wish to subscribe — is developed. For the present, it may be worth noting that the approach which is being espoused, the organic approach, if you will, contrasts strongly with other, more classical, rigid, *dirigiste*, mechanistic approaches. Perhaps the best way of encapsulating the differences between these approaches is to set out a table of 'opposites' in which the organic mechanisms are contrasted with those of the *dirigiste*; see Table 2.1.

With these essentials established, we can now proceed to address the central issue of deploying information systems to the long-term benefit of the organization.

Chapter 3

Grasping the IS Nettle — How to Make Progress

> Only the very wisest and the very stupidest never change.
>
> Confucius
> *Analects*

3.1 Exploitation of Information Technology and Information Systems

There is really only one good reason to exploit information technology and information systems. It is to secure benefits for individuals in the achievement of organizational goals. Expenditure on information systems is only justified to the extent that it enables (directly or indirectly) worthwhile improvements in the manner in which the goals of the organization are achieved. As we saw in the previous chapter, more often than not, this will require some element of change in the IT infrastructure, in the present workpractices, in the organization and its structures, and in the organizational culture. Exceptions are very rare. These changes can arise from two distinct causes: because of changes in the any of these areas which are imposed by external circumstances (*e.g.* because the auditors declare that the accounting system is inadequate to satisfy their requirements or because it becomes impossible to design certain components without adequately powerful computers for simulation) or because they arise internally and reflect a more efficient or effective way of pursuing the organizational goals (*e.g.* through sharing information and databases on marketing statistics among several offices or business units). In both cases, we are seeking opportunities for change: change imposed from without and change which arises from within.

In this chapter, we will develop this theme of exploitation of information technology and information systems in securing benefits for individuals in the achievement of organizational goals. Specifically, we will develop it with a view to seeking opportunities for beneficial change in each of the four domains of: IT, workpractices, structures and organizations, and cultures in the particular

context of a university. We will look at the various processes which must be launched to achieve a satisfactory end and we will discuss the many perils which can diminish the likelihood of achievement of real success. This then will serve as the launching pad from which we can proceed to set out all of the steps which are required to develop a comprehensive policy on information systems, embracing the creation of a long-term IS plan (detailing all of the services and systems which are to be deployed over a five year period, say) and the creation of a matching blueprint for the organization which is to provide these services. We first turn our attention to finding out what people want.

3.2 Identification of Requirements

3.2.1 The Requirements Generation Process

The process of requirements generation is a very poorly understood one. More often than not, people believe it to be simply a process of documentation: you approach people to see what they want, write it down, *et voilá*: the requirements. Unfortunately, it doesn't work that way. In general, people have a particularly poor notion of what they want, much less what they need. They don't have a particularly well developed model of what it is they do and, consequently, it isn't obvious to them what would be the result of a change in their actions, behaviours, or procedures. This misunderstanding of the difficulty of eliciting requirements is often re-inforced when people use the phrase 'requirements specification', a phase which is entirely redolent of the quasi-passive process of documenting the requirements that are supposed to exist. The phrase 'requirements generation' is at least indicative of the fact that they don't necessarily exist *a priori*, to be plucked and packaged, but that they need to be generated, developed, and, quite often, extracted from uncooperative parties. The process of requirements generation is a non-trivial one which requires perhaps more than anything else an investigative ethos: to discover what it is the individual, department, or office does. Better still, requirements generation is done with even greater effect if the ultimate end-users, the people who will have the greatest amount of contact with the final product of this requirements generation exercise, are directly involved and if they generate the requirements for themselves. In this case, the investigative ethos is paralleled by a self-educational ethos. Not unsurprisingsly, there are many benefits from adopting this approach: the articulated requirements are more likely to reflect the true needs of the users, and the users gain a better understanding of their workpractices. Quite often, workpractice changes which require nothing at all from IT result from this type of exercise.

Make no mistake, however, this is not a straightforward process and it is one which requires a great deal of effort on the part of those who are responsible for the process. It also requires a large amount of guidance, in the guise of IS experts who can shepherd, but not drive, the users in the discovery and generation of their requirements and in the guise of supporting documentation which sets out all of the issues which need to be addressed in the completion of the process. These are issues to which we will return in detail in Chapter 5

when we will set out the guidelines and parameters for the requirements generation process. In this context, we also need to recogize the need to ensure that the total set of individual requirements are brought together in a systematic and consistent manner, establishing efficient coordination internally in the organization and externally with other organizations. In the meantime, it is also worth noting that the nature of the organization itself also has an influence on the requirements generations process in that a common organizational goal (or mission) — and, more importantly, a commonly-held understanding of that goal — can often smooth the way for the requirements generation process (see the sidebar *Achievement of Goals in an Academic Environment*).

Before concluding this section, we need to remark that, sometimes, the conclusion of an exercise in IS requirements generations is the realization that an information system is not required at all. Given that the emphasis in requirements generation is on the workpractices and the operational needs of an individual, department, or office, this should not surprise us since the benefits we seek in the endeavour are greater efficiency and effectiveness in our work and, although it may not be fashionable, it is essential to realize that information systems are not always the best way to achieve this end.

In the specification of the solution, two very important issues must be addressed in detail. These are the benefits and the costs. The significance of enumerating all the benefits of introducing a new service is not so much a question of validating your decision to proceed in this way as much as it is concerned with setting out in detail the metrics by which the success — or failure — of the system will be judged once it has been commissioned. On-going assessment and review of the system and its use are mandatory; open-ended commissioning is a recipe for disaster. At the same time, it is very common for the cost of commissioning an information system to be grossly underestimated. This is usually not willful: it is simply that the costs are legion (see Figure 3.1) and often unappreciated. Happily, there are often significant monetary benefits which will arise from the commissioning and these should also be addressed. In Chapter 5 we will develop in-depth guidelines for detailing the requirements, the specifications, the benefits (monetary and non-monetary), and the costs of information systems.

Achievement of Goals in an Academic Environment

Trinity College, Dublin is a university comprising some seventy academic departments, schools, units, and centres; forty-nine offices; the Library; and the Computer Laboratory. Inevitably, it is a very heterogeneous environment with a strong ethos of individual autonomy. Whilst this is not a problem for the requirements generation process, *per se*, in that it is quite practicable to assess the needs of individual departments and offices and to identify their requirements, it does raise some problems when it comes to achieving overall cohesion of the resultant IS strategy. One might be tempted to 'legislate' for this type of situation, and sometimes this is necessary. But, given the discussion in the previous chapter on the relative merits and demerits of the organic approach *vs.* that of the *dirigiste*, this should be avoided if at all possible. The goal should be to protect the (often jealously-guarded) autonomy of departments and offices whilst ensuring that they do embrace the more global organizational values. This is a concrete example of how a well-developed (and rightly-developed) culture can influence for the good the actions and perceptions of the individual office. So how is this accomplished? The comments in the previous chapter notwithstanding, perhaps the most powerful force for achieving this is a common understanding (and embracing) of the goals of the organization, in this case the role of a university. If this can be achieved, then you have an excellent relief against which to set the requirements and, more importantly, against which to judge the quality of the service you are contemplating and against which to measure the benefits which will accrue from providing that service (and installing that system). This is an issue to which we will return in Chapter 5.

3.3 Creating the Plan — The Importance of Strategy

In an ideal world, the aggregation of all of the appropriately-coordinated requirements and specifications, with all of the well-articulated benefits and costs, would comprise the perfect plan. Sadly, it is not so; there is no Utopian IS environment. The real-world imposes constraints on what is and is not practicable. Often, these constraints are of a financial nature and finite financial resources dictate that not everything which is desired is achievable. We are all familiar with this problem. There are, however, other constraints. For example, there are also limitations on the amount of effort which the service providers can devote to the development programme in any given year; this imposes a constraint on the scheduling of IS services. Equally, there is only so much disruption which an organization can withstand before degrading, often ungracefully.

So, if we cannot commission all of the specified systems immediately, it is clear that we need some strategy for allocating priorities to different projects and, if this prioritization scheme is not to be very divisive organizationally, it must be constructed in a very transparent manner with the full backing (and participation) of the people who are engaged in the requirements generation and system specification. This matter is dealt with in detail in Chapters 7 and 8 when we come to deal with the evaluation of proposals for information systems and services (effectively the IS requirements and specifications) and with the creation of the strategic plan. The result of this strategic planning is the creation of a portfolio of systems and services, ensuring that all critical activities are covered, and the production of a number of scenarios which require incrementally more investment and offer incrementally more benefits.

3.4 Strategic Planning *vs.* Strategic Management

Comprehensive planning — strategic or otherwise — is, of itself, insufficient. Once you have formulated the policy, agreed the strategy, and built the plan, only one thing remains: its implementation. However, implementation is not trivial. To quote one eminent strategist in the area: '.... it is no trick to formulate a strategy, the problem is to make it work'[1]. And make it work, one must; if for no other reason than it can be very detrimental to the morale of an organization when a process to which many many people have contributed, and of which they feel a strong sense of ownership, fails.

For a number of reasons, the implementation of strategic planning has always been problematic. Here are three particularly relevant dangers in strategic planning.

Paralysis by Analysis. This is the condition which occurs when a stream of strategic plans produces little by way of concrete results and benefits to the users, in this case, the organization's community or work-force.

[1] I. Ansoff, *Corporate Strategy*, Penguin Books (1987)

Organizational Resistance to the Introduction of Strategic Planning. This arises when the organization suffers from the very natural fear of change which we discussed in Chapter 1. Even if one is fortunate enough to have a very supportive body of staff, it would be folly indeed to assume that this support is unconditional and it must be fostered at all levels and at all times.

The Rubber Band Phenomenon. Ansoff puts it thus: 'Ejection of strategic planning ... as soon as erstwhile forceful support for planning by top management [is] withdrawn or relaxed'. Sometimes this ejection is spontaneous; sometimes it is premeditated. It is almost always damaging.

The crux of all of these potential difficulties is the inherently insufficient nature of strategic planning. It is but one component in the successful formulation and enactment of a policy. Three other processes (at least) must receive adequate attention:

1. Planning for, and enabling, the capabilities of the organization and its managment. Simply stated, this means that if we wish to have a progressive policy on information systems, we must inculcate both aggressive — entrepreneurial — behaviour and advanced organizational cultures and management competences.

2. Management of the overall process of strategic change. Resistance to change is inevitable. To deny this is to ignore both human nature and a large body of evidence. This is a crucial point for it says clearly that no new policy or strategy will be implemented un-aided or un-monitored: policy implementation does not follow automatically from policy fomulation. It is critical that this be recognized and acted upon. In this context, it is worth noting that the sequential and independent execution of formulation and implementation is an artificial one: there are many reasons why aspects of these two processes should proceed concurrently.

3. Continuous engagement of the organization (*i.e.* the community of users) in the total process of policy development, planning, and implementation is essential. Securing the long-term backing and commitment of the organization's management at all levels — Board of Governors, Board of Directors, top and middle management — is a key element of this.

3.5 Self-starting *vs.* External Actuation

In the previous section, we identified three processes which must be invoked in the execution of a successful policy development exercise. One of these concerned the management of the overall process of strategic change. Typically, you have a choice of doing it yourself or of engaging consultants to do it for you. This is a decision not to be taken lightly, for the success of the endeavour will depend heavily on whether or not the change management works effectively. In many organizations, the decision is often to engage consultants and there

are several advantages in doing this. In the first place, consultants have no axe to grind: given the parameters of the work to be done, they can develop a plan which will accomplish the desired end in the most effective manner. Consultants also come with a battery of tools and techniques to manage this change and they come, sometimes, with a successful track record. There are down-sides too, though. Generally speaking, consultants speak a particular type of language: this may not always be the language of change management (and, in most instances, it shouldn't be) but just as often their language is the language of business. This may well be very appropriate for change management in a business environment, but it would be wholly inappropriate for change management in, for example, an academic environment or in a not-for-profit organization where 'the bottom-line' is often anathema to the implicit cultural values of the work-force. As we will see in Chapters 5 and 7, *it is essential to couch all material to do with the process in the language of the native user.* For someone unused to the particular organizational environment, this is no easy task. Nonetheless, it is an essential one.

This issue of language leads us to another, closely-related, difficulty in choosing an external consultant to manage or lead the change or planning process. In every organizational culture, there are the explicit values associated with that culture. Typically, a consultant will have no difficulty in getting to grips with this system of values and either working within them or in setting about changing them. In some organizations there is also another set of unwritten or implicit values which are concerned with what people feel to be right and appropriate or wrong and inappropriate for that institution or organization. The emphasis here is on the word 'feel'; for this value system is often based on an irrational — but no less real — instinct. It often takes an outsider years to recognize and to learn this code. It is almost never articulated and, instead, it is usually communicated by subliminal signalling. Make no mistake: these signals and these values are real and it is because people have had an insufficient grasp of them that otherwise excellent strategic planning exercises have failed. There is more than one example of a strategic plan being shelved because it asked too much of the community or organization at which it was directed; the changes which were being proposed were more threatening than the beneficial (or so it would appear to the organization). These plans, though principled and theoretically excellent, are worse than useless for they involve great effort on the part of everyone and never get implemented. It shouldn't be so much a question of 'getting the turkey to vote for Christmas' as it should be a question of getting the farmyard to promote vegetarianism.

The answer to the difficult question 'internal or external management of strategic change?' seems then to be, if possible, 'internal'. But care is required here, too. Whilst the internal change agent may well have all of the requisite antennae which are required to communicate effectively with her or his peers, it is essential that they be also seen to be disposable. Like the consultant, they should have no axe to grind and it is crucial that they cannot be seen to be empire building. It must be quite clear to everyone that the person or persons managing the strategic change have nothing to gain personally from participating in the process.

3.6 Avoiding Alienation

There is an old adage that something only becomes valuable when you can't have it. This is certainly true of information. And when the information is concerned about the process of change and planning, which people will quite naturally feel somewhat nervous about, its value when with-held is doubled. Consequently, it is essential that all information be made freely available and even given to people when they don't want it. This, together with a strong ethos of encouraging them into the process in the first place, goes a long way toward minimizing the alienation which can so easily occur and which will inevitably reduce the chances of achieving a successful result. In the process of developing the policy on information systems, all meetings should be minuted and these minutes should be sent, preferably by e-mail, to everyone involved in the overall process. Thus, everyone can be given a complete summary of every activity on an on-going basis. Frequent liaison meetings are also valuable, especially with groups of people who were not directly involved in the policy development process. We will return to this issue of alienation again in Chapter 6.

3.7 The Process *vs.* the Plan

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Clearly, the policy development and the planning process are essential for the creation of a subsequent plan. However, as we noted in Chapter 2, the changes which are essential to the successful deployment of information systems, (*i.e.* the workpractice changes, the organizational and structural changes, and the cultural changes) can only be brought about by involving people and exposing them to the new norms, patterns of behaviour, and the new value sets. This exposure must begin with the planning process itself. Arguably, this process is more important than the final plan as it is the activity which effects the cultural change and/or organizational changes which are necessary to bring about the benefits from the introduction of information systems. This is a point worthy of great emphasis.

3.8 Implementation of Interim Systems

The creation of a comprehensive policy on information systems is a major task and it takes time.[2] In the meantime, existing services need to be provided and, indeed, one must accept that there is a need to facilitate the appropriate development of the information systems infrastructure in the organization pending the outcome of the planning exercise. It might seem that such developments can only be preemptive of this planning exercise but this can be contained if their specification and commissioning is vetted by the policy development group. In addition, there are a number of very useful benefits which one can glean from

[2]In the case of the policy development exercise in Trinity College, Dublin, the effort required some 31,000 hours of dedicated work by in excess of 130 people over an eighteen month period.

promoting useful interim developments. For example, a well-chosen — and successful — new system can be used to engender support for the overall process: it allows the user community to see that the policy development process is not simply a 'talking shop' and that useful results can be achieved, even in the short term.

In this way, it is possible to set up a 'positive-feedback' loop in the policy development process whereby the (interim) results of the process fuel the enthusiasm for what is inevitably an onerous task.

3.9 The Policy Development Process

Collecting all that has been said so far, we are now in a position to set out the components of the policy development process. These components include the following (the chapters which deal with each of these issues are noted in parentheses):

- Creation of the Policy Development Framework (Chapter 4).
- Generating requirements and addressing critical success factors (Chapter 5).
- Achieving ownership of the process and the solutions (Chapter 6).
- Evaluating recommendations and proposals for systems and generating scenarios (Chapter 7).
- Creating the plan (Chapter 8).
- Re-organizing the IS services (Chapter 9).
- Developing policies (Chapter 10).

This process is summarized in figure 3.2.

Figure 3.1: The Costs and Monetary Benefits Associated with Commissioning an Information System

Figure 3.2: The Policy Development Process

Chapter 4

Creation of the Policy Development Framework

> The reasonable man adapts himself to the world, the unreasonable man adapts the world to him. All progress depends on the unreasonable man.
>
> G.B. Shaw

> Reasonable people do not do reasonable things.
>
> I. Ansoff
> *Corporate Strategy*

In this chapter, we will address the issues surrounding the creation of a framework for the development of a policy on information systems, a policy which might well include a 5-year plan for the commissioning of services as well as a blue-print for an IS organization which can effectively and efficiently deliver those services. We will do this by employing the material we discussed in the previous three chapters.

We must begin by addressing the goals of the organization, for these goals are what will allow us to bring out the values which underpin the organizational culture which, in turn, provides that essential relief against which to assess the benefits — or otherwise — of deploying information systems in the organization. The best way, and perhaps the only way, to discuss organizational goals in any meaningful and non-abstract manner is to do so with direct reference to a specific organization. Consequently, we will depend heavily on the examples set out in the side-bars and we will use these to draw some reasonably general conclusions. However, the approach which is being advocated is simply *one* approach and there are others.

The *Rôle* of a University

A University is many things to many people. It is also a concept that has often evaded a popular consensus, especially in the evolving political climate, with its changing educational philosophies, in which we have found ourselves over the past thirty-five years. But if we can take it as an axiom that a university exists not to serve itself but to serve the society of which it is a part, then perhaps we can make progress toward a useful definition of its *rôle*. It seems universally acceptable that the *rôle* of a university is to provide a place, an enduring forum, where knowledge and values (both intellectual and moral) are developed and imparted. But, more importantly, it is a forum where the ability to seek, to find, and to assess such knowledge and values is fostered and developed.

A university then must be dynamic: dynamic in its pursuit of knowledge and truth, dynamic in its transmission of this knowledge, and dynamic in its questioning of all extant knowledge. This dynamism is utterly dependent on the people who embody that university: the staff, the students, and it must benefit the society which hosts and supports the institute. The dynamism is equally, if implicitly, dependent on the mutual exhange of information — and the ability to effect this exchange — at every level of university life and both within the university and between the university and the community at large.

It is worth quoting at length from a statement which was made by the Provost of Trinity College[5] for it forms an foundation upon which one can erect, among other things, the information-based infrastructure to service the activities of all areas of the College.

> The function of a university is not merely to conserve and organise and transmit existing knowledge, but to test and question and search for new perceptions, new systems, new understanding and new knowledge. It is this level of intellectual enquiry at the frontiers of the various disciplines that creates the vibrant intellectual ambience that brings new breakthroughs in the applied sciences and lays the foundations for future breakthroughs, that adds to our understanding of ourseleves and of our society and of our cultural and intellectual inheritance, that keeps our international standing high, that enables us to attract the best students and the best staff and that enables us to deliver the best form of education.

That said, the one described has been used successfully and its success is due to the emphasis it placed on the need to foster a strong sense of ownership in the organization of the resultant policy.

4.1 The Organizational Culture

No policy should be developed without making strong and substantial reference to the goals of the organization in question. Indeed, a policy which is not firmly grounded upon the organization's mission is an irrelevant policy. For, unless you have a clear idea of what you are trying to accomplish in an organization and, perhaps more importantly, why you are trying to accomplish it, the deployment of information systems will add nothing to your endeavours. Indeed, it may actively disrupt them. As a pithy wit once observed, the only thing which emerges from the computerization of an ill-defined activity is an automated mess!

Consider, for example, the mission statement in the side-bar entitled *The* Rôle *of a University* If one thing shines through above all else in this example, it is that a university is concerned first and foremost with people: people in the university — under-graduate students, post-graduate students, visiting students, academic staff, administrative staff, service staff — and people in the host society. Significantly, this is true of almost all other types of organization but particularly in not-for-profit organizations such as hospitals and the civil service (ideally!). People are the centre around which all of an organization's activities turn: in service, in design, in production, in marketing, in management. Once this is recognized, it becomes clear that a key aspect of any information systems policy development exercise is to put in place an infra-structure which will accord the people who constitute the organization their primary place and which will facilitate the activities required for the fulfillment of organization's mission. This is the key message of this book. Since the organization's mission-critical activities are, as we have noted, likely to be concerned with the exchange of information, the deployment of a comprehensive and people-centred organization-wide information system may well be essential to the promotion and achievement of organization's mission.

It must be emphasized that support services, that is, those people whose activities are not directly concerned with the achievment of the organization's goal, also play a vital *rôle* in the organization even though they don't work 'at the coal face'. Often, and as circumstances increasingly demand ever-higher standards of professional support and administration, it becomes essential to put in place adequate and appropriate tools for managing the information which feeds all the organization's activities.

4.2 Principles Governing the Development of Policy

The previous section set out the motivation for the development and adoption of a policy on information systems in an organization: empowering people to achieve the organization's goals. In order to fulfil these goals, there are usu-

ally several fundamental issues which must be addressed particularly well in order to realize the organization's mission, *i.e.*, to ensure the success of the organization in fulfilling its *rôle*. Typically, these issues are encapsulated in the so-called *operational goals* of the organization. Operational goals differ from *non-operational goals* in that it is self-evident how to measure the organization's success in achieving these goals. Non-operational goals (which tend to be much more common) are normally concerned with generic statements of the general objectives of the organization. For example, the non-operational goal of a hospital might be articulated as the preventative and remedial treatment of members of the local community and the improvement of the general health of its citizens. An operational goal, on the other hand, might be the successful[1] treatment of patients with a particular airment in the minimum amount of time from referral by a general practitioner. Equally, the statement that 'the function of a university is to test and question the search for new perceptions, new systems, new understanding, and new knowledge' is a non-operational goal (albeit a very significant one) whilst the objective of educating one hundred industrially-qualified software engineers every year is obviously an operational goal which can be measured by counting the number of industrial placements of the institution's graduates.

The difference between these two examples of operational and non-operational goals is immediately evident and the difficulty in measuring success in achieving them notwithstanding, non-operational goals are just as important for an organization as are the operational goals. Nonetheless, our purpose here *is* measurement and so our focus in developing an information systems policy must be the operational goals. Quite often, the operational goals can be abstracted into a number of so-called *critical success factors*, each of which identifies the critical activities which must be carried out to meet the organization's operational goals. These issues are often referred to as the organization's critical success factors. In the case of a university, the primary critical success factor is clearly excellence in scholarly research and teaching.

This, then, provides us with the first principle which must guide the development of information systems policy: *that, at all points and at all times, reference must be made to the organization's operational goals or critical success factors* so that the policy developed supports the successful fulfilment ot the activities which they encompass. In a sense, this is the base-line principle for it is the one which links the mission of organization with the development of information systems policy, in the support of the former.

There are other principles of a more pragmatic nature which are key to the creation of a useful and valid policy. The first of these concerns the role of the

[1]One of the emerging issues in hospitals concerns the manner in which this success is measured. Traditionally, it would have been assessed in a discrete case-by-case – or episodic – basis, treating each visit to the hospital as a distinct episode which contributes on its own to the success statistics. More recently, hospitals are extending the time-frame, and the number of episodes, over which success is judged. Consequently, a patient who is 'successfully treated' according to the former criteria on any one visit but who returns to the hospital recurrently with the same ailment would *not* now be deemed to have been successfully treated. Clearly, careful thought is required when developing metrics to see how well an organization meets it operational goals.

user in the organization, *i.e.*, the people 'at the receiving end' who will have to use the product of the policy. It is taken as given that *users' requirements are paramount* and that all policy must be dictated by these requirements. At the same time, it must be acknowledged that, quite often, users in an organization may not be well-equipped to specify their requirements and, indeed, their requirements may change as they become more and more familiar with the possibilities which are provided by advanced, useful, and usable information systems. Thus, an important aspect of the development of the policy is to ensure that users are made aware of these possibilities and that they are helped and encouraged to embrace new aids, tools, and services to assist in the execution of their work. These new services should promote more effective execution of current tasks and responsibilities and they should facilitate people in fulfilling unanticipated and ever more challenging roles in the organization.

Equally, you must guard against permitting unrealistic requirements for consequently unfeasible systems to emerge. However, you do need to be careful to ensure that the issue of realism is not allowed to excessively constrain the adventurous nature which any long-term policy must reflect. You must always be conscious that today's unrealistic requirements often turn out to be tomorrow's *de facto* standards. What is crucial, of course, is to ensure that the plan for putting this policy into effect takes cognizance of the relative 'adventurousness' of the attendant tasks. Often, the true benefit which accrues from the successful launch of an innovative and adventurous policy on information systems is the multiplier effect which arises when a critical mass of people collaborate in the workplace, communicating and sharing information using compatible, efficient, and effective systems.

There is a second pragmatic principle to which any policy must adhere. This concerns the implementation of any new system or service. In essence, it is mandatory that its launch and use should be as transparent as possible to the user. Specifically:

- Where possible, the users should 'see' just a single point of entry, *i.e.*, a user should have to identify himself or herself just once to the system, no matter how many facilities are being used (to an extent, this is aspirational in the current circumstances).

- Distributed information should, where possible, appear to be localized, *i.e.* the user should not necessarily need know that the data are physically distributed.

- All facilities and applications should be offered using a consistent and friendly user-interface while, at the same time, facilitating, where desired, access to the innately diverse and heterogeneous structure of the resultant organization-wide information system.

Finally, there is a third guiding principle which must be invoked: on-line electronic and human help must be available at all times. No new system, no matter how good, is going to gain adequate currency if users of all levels of sophistication are not helped to learn and to develop. And it is important to

appreciate that so-called 'naive users' have at least as much of a contribution to make to the organization as do the more sophisticated users of information systems.

4.3 The Information Systems Policy Development Group (ISPDG)

We now come to the point where we have to pass from general principles to specific action if we are going to make any concrete progress in the development of a policy. Almost inevitably, there is going to have to be a committee! Let us refer to this 'committee' as the *Information Systems Policy Development Group (ISPDG)*. The ISPDG should be created to prepare a policy on information systems which will identify the information systems requirements of the organization and which will recommend how these can best be met, taking into account those systems which are already in place. These requirements should be derived from a thorough analysis of the roles and responsibilities of all of the relevant aspects of the organization, in the context of the organization's mission or goals. The ISPDG might (and probably should) also be charged with creating a blue-print for an Information Systems Service or department which would be capable of efficiently and effectively providing the required systems and services to the organization's community.

The constitution of this 'committee' represents one of the first potentially hazardous phases of the policy development exercise and the most significant aspect to notice about the ISPDG title is the use of the word *Group* rather than *Committee*. From the outset, this forum should be set up with the specific intention that it would *not* be a committee but, rather, a group of altruistically-minded people who would not allow personal or local interests to cloud their global perspectives when creating the policy on information systems for the organization. In particular, representation should be disallowed and no member of the Group should be there to represent particular interests. Otherwise, it is almost inevitable that, as the likelihood of action following the agreement of policy increases, these people's behaviour will degenerate into protecting (or building) their own personal power-base. Instead, the membership of the ISPDG should be drawn from all quarters of the organization and the members of the group should be chosen (indeed they should be hand-picked) to *reflect* the particular requirements and perspectives of these various quarters rather than to *represent* special interests or, indeed, vested interests.

It is important that the member's perspectives reflect both the *vertical* orientation and the *horizontal* orientation. The vertical orientation corresponds to the individual functional units of the organization such as Design, Marketing, Accounts, Administration, Management, and so on, each of which have their own special requirements for information systems. The horizontal orientation is concerned more with the systems view of affairs and with the global organizational perspective.

Every group, altruistically-minded or not, requires a chairman[2] and, at the

[2]I use the term 'chairman' without prejudice to refer to both male and female occupants

same time, the person who is going to manage the strategic policy development (the change agent we discussed in Section 3.5) must also be a member of the group and will naturally have a major part to play in its operation. The question which naturally arises is: Should these be one and the same person? This is not a trivial question for the choice will have a strong influence on subsequent group dynamics and on the successful working of the group. To answer the question, let us review the roles of the 'policy manager / change agent', if we can use that term, and the chairman.

As we noted in Section 3.5, the policy manager must be a champion of the IS policy development exercise, but should have no personal agenda and should not stand to gain in an personal or positional manner from involvement in the exercise. In short, the policy manager must be 'disposable' and should not be seen to be empire building. Otherwise, the essential trust which he or she will need to foster in order to reconcile the sometimes conflicting requirements of each section of the organization will not be forthcoming. This person will also have a great deal of work to do in coordinating the activities of the working groups, in acting as a liaison officer with all interested parties, with minuting the work of the ISPDG, with drawing up and consolidating policy proposals, and with the dissemination of all decisions and news from the IS Policy Development Group.

The *role* of the chairman of the group, on the other hand, is to moderate the discussion of the group and to provide a strong linkage with the senior management of the organization (that is, with those members of senior management who are not directly involved in the policy development exercise).

In the light of this, the answer to the question 'Can both *roles* be played by the same person' would seem to be 'Yes', as long as an appropriate individual can be found.[3]

Since the ISPDG is the pivotal group in the entire exercise, they will be in charge of all of the information concerning the policy. Bearing in mind the importance of achieving ownership of the policy in the organization as a whole, and the importance of the availability of information in fostering this ownership process, it is crucial that this group exhibit the greatest transparency in all its dealings. Nothing, if at all possible, should be confidential and certainly all of its meetings should be summarized and these summaries should be distributed by e-mail (practising what one preaches) to every person who is involved in the overall process.

In summary then, the responsibilities of the ISPDG are probably threefold:

1. To create an IS plan

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of the position.

[3]In the case of the policy development exercise in Trinity College Dublin, it was decided at the outset not to have the policy manager act as chairman since it was felt that it would be inappropriate for the proponent of change (and proposer of change) to be in charge of moderating the discussion of these proposals. In the event, this argument was invalid since the responsibility for requirements generation and change proposal was subsequently devolved to the working groups, for all the reasons to do with ownership by users as previously outlined. As it happened, this division of *roles* worked well but required very frequent, almost daily, contact between the chairman and the policy manager.

2. To create a blueprint for a matching IS Service

3. To formulate policy on a number of issues, including the *rôles* and responsibilities of the IS Service and the devolution of IS responsibilities to offices and departments.

The Trinity Information Systems Policy Development Group (ISPDG)

In June 1994, The Board of Trinity College approved a proposal by the College's Computer Management Committee:

> 'A specialist working group, with technical and user expertise, should be established to implement the detailed planning of an IT architecture for College, both hardware and software. This group, which would report to the IT Committee [CMC], would: ..... draw up an IT plan and advise during the next academic year on, *inter alia*, the implementation of the plan and the appropriate organisation of IT services within College, (including the level of centralisation and decentralisation, the future role and re-organisation of the Computer Laboratory, etc.).'

In effect, these became the terms of reference of the Information Systems Policy Development Group (ISPDG). At the outset, this forum was set up:

- as a group of fifteen altruistically-minded people who would not allow personal or local interests to cloud their global perspectives;
- so that its membership was drawn from all quarters of College, from the academic, the administrative, the executive, and from all relevant support services;
- by hand-picking the members to *reflect* the particular requirements and perspectives of these various quarters rather than to *represent* special interests;
- with some members perspectives reflecting 'vertical' orientations, *i.e.*, they correspond well to the individual classes within the global classification of College activity into functional units (Administration, Research, Education and Teaching, and Library Services), each of which have their own special requirements for information systems; and
- with other members reflecting a 'horizontal' orientation in that they are concerned more with the systems view of affairs and with the global College perspective.

The ISPDG was chaired by the Bursar and it reported directly to the Computer Management Committee.
Three members of the ISPDG were also members of the Computer Management Committee. These were the Bursar, the Information Systems Project Officer, and a senior member of the Department of Computer Science who had a strong commercial background in developing IS strategy. The relationship between these three people was pivotal to the success of the endeavour. In effect, each adopted the role of senior proponent, change agent and work-horse, and honest broker, respectively.

The ISPDG met twenty-nine times and each of these meetings was summarized. These often very long summaries were distributed by e-mail to every person who was involved in the overall process (*i.e.* approximately one hundred and thirty people).

Whilst the ISPDG is the core group charged with the development of the policy on information systems, there will probably be several other groups and committees which have an important *rôle* to play in this process. For example, in Trinity, these include (see Figure 4.1) the Computer Management Committee, the Academic Computer Users' Committee, the Administrative Computer Users' Committee, the Faculties in College, and the Computer Laboratory; and we will discuss the value (indeed, the necessity) of on-going liaison of the ISPDG with these groups in Chapter 6.

However, there is one other set of groups which play a central part in the exercise. These are the ISPDG Working Groups.

Figure 4.1: Relationships between various committees and working groups

4.4 The ISPDG Working Groups

No individual nor even a small group such as the ISPDG can possibly embrace all of the skills required to suggest and to assess the appropriate actions to achieve a truly successful outcome. Consequently, it may be necessary to form a number of Working Groups to take responsibility for specific technical aspects of the policy development and, in particular, for the task of requirements generation.

As with the membership of the ISPDG, these Working Groups should comprise two classes, or types of member: the 'vertical' which represent the functional units of the organization, and the 'horizontal' which represent the technological perspective necessary for the formulation of a realistic policy and implementation plan, *e.g.* User Support and Training, Networking and Architectures.

All of the Working Groups should be charged with making recommendations or proposals for information systems or services. We will discuss the manner in which these proposals and recommendations can be made, their subsequent

evaluation, and their incorporation into a cohesive strategy, in Chapters 5, 7, and 8, respectively.

Each working group will have a slightly different job to do, reflecting the needs of the area they represent, and, as such, their terms of reference will vary accordingly. However, as a number of essential issues are common to all Groups, it may be useful to look briefly at a typical brief here so that we can get a flavour of the scope and depth of the work which typically will be required of them: see side-bar *Administration (Finance) Working Group Terms of Reference* .

You can't simply hand a working group its terms of reference and expect it to start working unaided: not only does it need its terms of reference, it also needs a context in which to work and a set of commonly-held goals. This is particularly important if the work of the individual groups is to be capable of merged into a coherent strategy. It is also necessary if you are to achieve the essential goal of ownership of the strategy by the ultimate users. Recognizing this, it may be useful to hold one or more briefing seminars at the very beginning for all those involved in the information systems planning exercise.

The ISPDG Working Groups in Trinity College

The Trinity College ISPDG formed eleven working groups:

1. Research
2. Education and Teaching
3. Student Affairs
4. Library
5. High Performance Computing
6. Networking and Architectures
7. User Support and Training
8. Administration (Steering)
9. Administration (Finance)
10. Administration (Senior Lecturer)
11. Administration (General and Infrastructure)

Each of the groups met, typically, on weekly or fortnightly basis and reported to the ISPDG through its chairperson, who was usually also a member of the ISPDG. As with the ISPDG, each working group meeting was summarized and these summaries were distributed by e-mail to every person who was involved in the overall process. Thus, every individual was kept fully informed of the work of every group and, implicitly, they had a benchmark against which to judge their own progress.

The membership of each Working Group was very carefully engineered to ensure that members were drawn from all areas of College. At least one member of each working group, who was not the chairperson, had an information systems background.

The purpose of this seminar should be to help develop a common understanding amongst the members of the various Working Groups of what the planning exercise hoped to accomplish, of the principal tasks involved, and of the work which is likely to be required. Implicitly, this is the first occasion on which the new values and patterns of behaviour were articulated in public and, as such, it represents a milestone in the overall change process.

There are many issues which can usefully be covered in a seminar such as this. For example, the dynamics of information technology costs are often mis-understood and there is consequent need to manage capital expenditure very tightly. Two issues arise in this context: (a) capital expenditure tacitly mortgages the future and severely restricts future options, and (b) the benefits do not necessarily accrue in direct proportion to expenditure (for all of reasons to do with organizational, cultural, and work-practice change we mentioned previously.) Addressing these issues should lead naturally to a discussion of the reasons for spending money on information technology, a discussion which clearly impinges on the assignment of priorities for expenditure.

The planning process itself should also addressed: the inputs to and outputs from the planning process, the definition of the requirements, and the imperative to move the organization's thinking beyond 'What is' to 'What might be'. The methods which are typically used to define requirements place an emphasis on the principal deliverables. These should include functional decomposition diagrams, entity relationship models, critical success factors *etc.* However, it is also useful to look at the elapsed time, value-added time and costs of various activities. This data can be the key to transforming administrative activities in ways which reduce costs and improve service quality significantly. One of the key goals of this part of the seminar is to create an unambiguous awareness of the importance of producing tangible deliverables which result from solid fact-finding and analysis activities, in a form which facilitates consolidation with the requirements of other working groups.

Some other aspects of planning and policy development might also be discussed: the problems (and possible solutions) associated with justifying expenditure on infrastructure; issues involved in the scoping of and justification of office systems. *Above all, it should be emphasized that the policy development exercise is more about people than about technology and that, to obtain benefits from information systems, one must concentrate on the human issues.*

Finally, the seminar should consider the generation of recommendations or proposals on the part of the working groups for information systems and the subsequent evaluation of these proposals. It is these two issues to which we now turn our attention. All of the other issues mentioned above will be dealt with in subsequent chapters.

Terms of Reference of the Administration (Finance) Working Group in TCD

Overall Goal

The brief of the Administration (Finance) Working Group is to determine the information systems needs for financial administration in College for the five year period commencing October 1994 and to determine the most appropriate and cost-effective manner in which to provide the resources that are required to meet these needs. The term financial administration is to be interpreted in the widest sense, embracing all financially-related aspects of management information systems.

Comments

1. There are in total four Administration Working Groups: The Administration (Finance), Administration (Senior Lecturer), Administation (General and College Infra-structure), and Administation (Steering) Working Groups. The brief of these Groups is to address the exploitation of information systems in all areas of administrative support in College.

2. It is anticipated that each of the Administrative Working Groups will be responsible for information repositories and data-bases which will be required for the successful operation of more than one area of administration. In the light this, it is extremely important that each Group specify clearly — in form and content — which repositories and data-bases are their responsibility. It is equally important that the Groups identify their requirements for access to repositories and data-bases which are the responsibility of other Groups. Each Group should refer to the Administration (Steering) Working Group for guidance on this matter.

3. Many of the deliverables require diagrammatic documentation. Whilst a CASE tool would normally be used in such circumstances, a simple PC- or Mac-based drawing tool will be sufficient in this instance for the level of detail required. Both existing physical and proposed logical systems need to be specified in the documentation.

4. As many options as are feasible are to be examined by the Working Group. The criteria used to evaluate options shall include the following:

   (i) Five year cost of ownership.

   (ii) Ease of use. This is particularly important when assessing options for meeting the office system requirements. It is also important that the systems should be easily managed so as to minimise central IS staffing requirements.

   (iii) Service levels.

   (iv) Maturity of principal components of recommended architectures.

   (v) Ability to sustain evolutionary development and to minimise the risk of premature obsolescence and its associated organisational costs.

   Guidance should be sought from the ISPDG as to the relative importance of each criteria.

5. The development of an IS plan for College is being undertaken by a number of working groups. It is most important that the work of these groups is co-ordinated in a manner which avoids College personnel having to provide the

same information to a number of working groups and which minimises the number of meetings which take place.

Terms of Reference of the Administration (Finance) Working Group in TCD (ctd.)

With this in mind the secretary of the Administration (Finance) Working Group should discuss with the Information Systems Project Officer all requirements for data required by this group. The sources of data are, in order of preference:

(i) Data obtained in previous meetings by other working groups and data which does not involve meeting with College personnel who are not secretaries of other working groups;

(ii) Data which is required primarily by another working group but which would also be of benefit to the Administration (Finance) Working Group and which has not yet become available. In this situation, if at all possible, the Administration (Finance) Working Group should make a working assumption until such time as the required data becomes available;

(iii) Meetings with College personnel who are not secretaries of other working groups.

6. It is envisaged that the Administration (Finance) Working Group will have an on-going role in reviewing:

(i) Detailed specifications of requirements and request for tender documents;

(ii) Tender evaluations;

(iii) The commissioning and installation of systems;

and, most importantly, in ensuring that the anticipated benefits are realised within the cost estimates provided by the Administration (Finance) Working Group.

Principal Tasks

1. Establish the College requirements for financial administration and the information systems resources and facilities which are required to support this administration.
2. Identify and evaluate architectural options for meeting the identified requirements.
3. Specify, in content and in form, the information resources and data-bases (i.e. the data architecture) which are required for the operation of each option; identify those resources and data-bases which are the responsibility of the other working groups and which are the responsibility of this Group. For those that are the responsibility of other groups, specify the required access rights and mechanisms.
4. Identify the benefits which could be realised using the recommended facilities and how those benefits can be realised, making provision for the continually changing statutory and non-statutory reporting requirements.
5. Identify control, risk and security issues and recommend appropriate arrangements for addressing these issues.
6. Identify legal and ergonomic requirements and recommend appropriate arrangements for complying with any such requirements as may be identified.
7. Prepare an estimate of the five year cost of ownership of the required facilities making provision for:

Terms of Reference of the Administration (Finance) Working Group in TCD (ctd.)

(i) Capital costs including implementation costs;

(ii) Ongoing operating costs including staff costs;

(iii) Training costs, both direct and indirect.

8. Establish three implementation options:

   (i) The minimal solution being that which maintains the present level of service.

   (ii) An intermediate solution being that which provides a worthwhile improvement in service whilst at the same time failing to meet a significant set of requirements.

   (ii) The ideal solution being that which the Administration (Finance) Working Group considers best meets the requirements consistent with the need to derive value from IS expenditures.

   In each case, comment on the costs and benefits associated with each option. To the extent that is feasible, order the implementation sequence of projects within an option in order of decreasing benefit to cost ratios.

   These three options are required by the ISPDG because of the possibility that there will be insufficient funds available to implement the ideal solution.

9. Establish the organisational and procedural developments which need to take place in the Finance Office in order to fully realise the potential of the required systems.

10. Prepare a plan for the phased implementation of the recommended facilities at a rate which minimises the gap between facilities being installed and the realisation of benefits. The plan should identify all resources required for its successful implementation.

    A detailed implementation plan should not be prepared until guidance has been obtained from the ISPDG as to which is the implementation option which it is most likely to prefer. Guidance will be required from the other working groups as to when it is envisaged certain parts of the infrastructure will be required to support the systems they have identified as being necessary.

11. Advise on specific proposals which the ISPDG consider merit implementation prior to the completion of the IS plan.

    It is regarded as most important that the preparation of an IS plan for College should not result in short term problems because of the inevitable uncertainty created by the project. To avoid such problems it is the intention of the ISPDG to take decisions on urgent capital projects using the best information available at the time that the decision has to be taken.

Terms of Reference of the Administration (Finance) Working Group in TCD (ctd.)

Principal Deliverables

It is envisaged that most of the deliverables of the Administration (Finance) Working Group will be in the form of working papers. The final report is likely to be relatively brief and take the form of an executive summary. The detail will be contained in the working papers which should be attached as appendices to the final report.

It is likely that a working paper will be the deliverable produced by each of the principal tasks identified earlier in the terms of reference.

In every case or option proposed, the system specifications which are produced are to include the following:

Entitity Relationship Diagrams. The entity definitions will be entered into the Oracle CASE dictionary. An SSADM style of entity relationship diagram to be used and may be produced using, *e.g.*, a PC- or Mac-based drawing package.

Functional Hierarchy. The activities should not be specified below two or three levels. The report is in the form of an indented activity list with activities enclosed in boxes. It can be produced using an Oracle CASE report tool. Both manual and computer-based activities are to be incorporated in the report.

Data Flow Diagrams. Data flow diagrams are to use SSADM conventions and and may be produced using, *e.g.,* a PC- or Mac-based drawing package.

Entity Function Matrices. This can be produced using an Oracle CASE report tool.

Performance Goals. As a result of document flow analyses, written targets are to be produced for streamlining document handling, reducing the elapsed processing time, and improving the quality of service provided

Required Changes. The procedural, organisational and computerisation changes needed to achieve the desired benefits are to be described in written form.

Each of these documents must be to sufficiently detailed to allow reasonable cost estimates. The projects should be costed on a 5-year basis, including a full share of infra-structure cost.

The ultimate deliverable is to ensure that the anticipated benefits are realised within the cost estimates provided by the Administration (Finance) Working Group. Whilst outside the terms of reference of this project it is envisaged that the Administration (Finance) Working Group will be asked in due course to extend its terms of reference to include this most important deliverable.

Milestones

1. Working papers to be submitted to the Information Systems Project Officer in accordance with a schedule to be agreed after the Administration (Finance) Working Group prepare a plan for their work.
2. Interim reports indicating progress to date, issues arising and matters requiring guidance from the ISPDG.
3. Final report.

Chapter 5

Requirements Generation

> For particulars, as everyone knows, make for virtue and happiness; generalities are intellectually necessary evils.
>
> Aldous Huxley
> *Brave New World*

In a sense, the Working Group Terms of Reference which we set out in the previous chapter (*e.g.* the creation of functional specifications, data flow diagrams, entity-function matrices, performance goals, procedural, organisational and IT changes) identified many of the aspects of the requirements generation process and these terms of reference are certainly essential in bounding the work of the various working groups. From a brief look at them, one would not be surprised to find that the working groups would be very concerned about the extent and detail of the work to be done. In many cases, there is often a feeling, especially among the user community, that they should be able (or allowed) simply to state what they wanted and let the IS personnel get on with it. Of course, therein lies the rub. In information systems, it is rarely the case that any user or client (or anyone, for that matter) can dash down an accurate and complete specification of requirements. As we noted in Chapter 3, there is far more to requirements generation than simply articulating what you think you want or need. In this chapter, we will look at one specific and detailed approach to requirements generation. We will do this in the context of the example terms of reference in the previous chapter, setting out the general processes which need to be invoked, and using a set of critical success factors to tease out the likelihood that these requirements, and the service they embody, will actually achieve the required organizational operational goals. Note well, however, that the critical success factors we will use are concerned primarily with the successful commissioning of information systems so that they enhance the manner in which the operational goals of the organization are achieved; necessarily, they are a subset of the critical success factors which pertain to the overall achievement of the organization's goals. Equally, you should realize that the use of the critical success factors are simply an aid which is used to make explicit the issues which are key to the successful achievement of the organi-

zation's operational goals. Their main advantage is this explicitness and that, to an extent, they allow you to decouple these issues. Remember, too, though that it is difficult to identify and decouple all of the pertinent issues and the examples that follow don't pretend to be a comprehensive blueprint for all organizations. As in everything in this book, if you decide to adopt the approach described, you *will* have to modify the details to suit your organization.

5.1 Requirements Generation

Given that a properly constructed set of requirements represents a complete and comprehensive articulation of given needs, one requires a way of finding out exactly what those needs are (as opposed to the perceptions of the needs) and for determining the implications for satisfying those needs. Recall that in Chapter 4 we noted that, in defining requirements, one must go beyond thinking about the way things are and address also the way things might be, *i.e.* on should attempt to transcend the *status quo* and transform the workpractices to something new. Recognizing this, and bearing in mind that we are concerned quite often with the usage and sharing of information, we can see that there are three issues which we need to address in generating requirements. These are:

1. Regularization of current workpractices.
2. Regularization of information repositories.
3. Improvement of current workpractices or introduction of new workpractices.

This helps, but it is not yet enough. To make progress, we also need a mechanism which allows us to see areas which need regularization or improvement. There are, in turn, a number of ways to accomplish this. One such set includes:

1. Generation of functional decompositions
2. Generation of function-entity relationships
3. Brainstorming

Let us look briefly at each of these.

The generation of *functional decompositions* is no more that a detailed step-by-step analysis and breakdown of every function and operation which is involved in accomplishing a given task. This is achieved in a hierarchical manner, typically beginning at a high-level in an organizational framework, sub-dividing the functions incrementally until you are left with trivial functions. At this point you should also be able to identify what information each (elemental) function must operate on in order to achieve its goal. These operations will typically be concerned with creating, updating, deleting, or simply reading the information. This relationship between elemental functions and the associated

information is known as a *function/entity relationship* and its diagrammatic rendition is called a *function/entity diagram*. Figure 5.1 depicts a very informal set of guidelines for developing this functional decomposition and for annotating the function/entity relationships. At the risk of being excessively redundant, we will summarize the essentials of the functional decomposition and function entity relationships here.

Figure 5.1: Guidelines for the creation of a functional decomposition and function/entity diagram

- In creating a functional decomposition diagram, each task or function is represented by a box. We might adopt the convention that these tasks are represented as rectangular boxes.
- Each task is sub-divided into its several component tasks or function.
- Lines are drawn between a task and its component task.
- Each task or function, at every level of decomposition, should be annotated. An annotation will typically comprise:

  (i) A description of the task.

  (ii) Identification of what information or data (*i.e.* entities) it takes as input, *i.e.* those entities that it uses.

  (iii) Identification of what information or data (*i.e.* entities) it gives as output, *i.e.* those entities that it produces or updates.

  (iv) A note indicating whether or not the task is presently performed manually or whether it is computer-based.

  (v) A note as to whether or not the task could be computer-based.

- Each information repository or resource (*i.e.* each entity) is indicated by a rounded boxes.
- Each entity should be annotated. An annotation will typically comprise:

  (i) A description of the entity.
  (ii) A note indicating whether it is a copy of information held elsewhere.
  (iii) A note indicating who is presently responsible for maintaining the information.
  (iv) A note indicating whether or not the entity is presently paper-based or whether it is computer-based.
  (v) A note as to whether or not the entity could be computer-based.

Once the functional decomposition is complete, and the function/entity relationships have been established (see figures 5.2 and 5.3 for a partial example), they can be used very straightforwardly to identify areas where work is duplicated and where information is duplicated. This enables you to see what rationalizations might be in order and, more importantly, to see what will be the implications for such rationalization. The power of this approach is that it is centred on the work to be done, *i.e.* on the workpractices, and to an extent on the information, rather than on the information technology. Sometimes, and paradoxically, the result of this analysis will yield a rationalization *which does not need an information-technology solution.*

The use of the functional decompositions and function/entity relationships are indispensible for rationalization and for incremental improvements but, by themselves, they are insufficient. This is because they concentrate on the manner in which things are done at present. If you wish to anticipate future issues and identify completely new approaches, there is no substitute for a brainstorming session. Many books have been written on the subject of brainstorming and it would not be wise to try to treat the subject in detail here. Nonetheless, some guidelines might be useful to help identify the parameters of the process.

To begin with, a brainstorming session is an interactive encounter between people: it depends for its success on the spontaneity of the interaction. Consequently, it must be run as a group event. Secondly, it aims to unearth innovative of ideas and concepts and, as a result, you need to promote a very free flowing discourse. This will not occur if people feel that others in the group will pour scorn on their suggestions and it is essential that everyone understands that *all* contributions are valid. The best way of ensuring this is to disallow any disagreement whatsoever. Anyone who says, in response to an idea, 'I don't like that' or 'I disagree' might well be removed from the brainstorming group. Finally, preparation for the brainstorm session should be *discouraged*: it upsets the spontaneity of the encounter.

5.2 Critical Success Factors

Once the needs — rationalizations and innovations alike — have been identified, you must then proceed *to validate them*; that is, to ensure that the changes

being suggested will in fact contribute to the achievement of the operational organizational or departmental goals. Essentially, you need to ensure that the commissioning of the service or system will actually be a success. As we have argued, one of the most useful ways of maximizing the likelihood that this will be the case is to ensure that the requirements definition addresses the key factors which upon which success depends. These are termed *critical success factors* and, rather than attempt the probably fruitless task of identifying generic critical success factors for the commissioning of information systems, we will draw upon those that were identified in the case of Trinity College. It should be reasonably clear to see which of these will have to be adapted to the specific conditions of other organization and those that can be employed directly.

Ten Critical Success Factors for the Deployment of IS in TCD

Direct Achievement of Organizational Goals. The first critical success factor concerns the manner in which the proposed system directly contributes to the achievement of the goals of College as a seat of learning, *i.e.,* in teaching and in research, and the contribution to society, however marginal, which would result from the implementation of the system or service.

Projection of the Organization's Presence at a National and International Level. Bearing in mind that Trinity College is a seat of learning and that it is important that it be seen to be fulfilling this role, this factor addresses the enhancement of the likelihood of College being perceived in a positive light. Relevant areas include public (and internal) understanding of the *rôle* and quality of teaching and research, the nature of collaboration with other institutes or companies, the public perception of College as a resource, and internal collaboration amongst the staff (academic and administrative, alike) in College.

Urgency and Timeliness of the Proposal. The third critical success factor, urgency and timeliness of the service of system, embraces any impact of postponement of commissioning the service. In generating and validating requirements, one should identify, and substantiate, whether or not there will be any damage to the reputation of College as a whole or to strategically important services arising from any postponement of implementation or failure to implement. If possible, one should try to quantify how this damage will vary (increase or decrease) with time.

Provision of Information. Since the provision of information in a timely and appropriate manner is central to the effective and efficient operation of the university, care should be taken to detail the information, if any, which the service or system makes available to staff and students in College in support of their roles or functions in College. If appropriate, the manner and extent to which people would have access to this information should be noted.

Organizational Risk. It is important that any risk to the effective operation of any area in College arising from the commissioning of a service or system be minimised. This risk may arise from an inability of the organization, for whatever reason, to embrace and utilize the anticipated systems or services, or it may arise from inadequate or inappropriate definition of the systems or service. In general, the more exhaustive the definition of the system, the better and the less likely there are to be risks. However, sometimes risk is unavoidable and, in such case, these risks should be clearly identified and plans should be put forward for containing this risk. Any risks (or lack of risk) should be addressed and, if appropriate, an outline plan for risk containment should be described.

Ten Critical Success Factors for the Deployment of IS in TCD

Establishment of a Strong Information Systems Infrastructure. One of the primary goals of the Information Systems Policy Development exercise is to establish a cohesive and comprehensive College-wide information system wherein staff and students (and appropriate members of the public) have timely access to the information they need. This critical success factor is intended to embrace the manner, if any, in which the system will contribute to both the comprehensiveness of this information infrastructure and the cohesiveness (through, *e.g.,* coordination with other systems, projects, or information repositories) of this infrastructure. If possible, the nature and magnitude of the benefits which will arise from the implementation of the system or service (in terms of the level of service provided to staff, students, and others) should also be set out in the requirements generation document.

Maturity and Soundness of the Requirements. Well-documented and complete requirements are essential to the success of a project. It is beneficial if these requirements anticipate as far as possible issues which might arise in the future. Equally, the system which is anticipated will satisfy these needs must, in turn, be well-specified; it should be shown that these specifications match the requirements and that both requirements and specifications have been approved, even if only informally, by users. With the best will in the world, it is almost inevitable that requirements will change or that the identified requirements will be found wanting in some way. To cater for this, some simple review procedures can be useful and contingency plans should be identified.

Minimization of Technical Risk. Just as the maturity and soundness of the requirements specification influence the success of an information system project, so too do a number of other issues impinge on the risk of technical failure. These include, for example, whether or not the technical and project management staff have the requisite skills, whether or not the requisite hardware has been validated in similar circumstances, whether the requisite software exists 'off-the-shelf' or whether it has to be developed or customised in some way, and whether or not the vendors or suppliers have an established — and verifiable — track-record. Again, and if appropriate, the requirements generation document should discuss each of these issues.

Minimization of Risk to Information Systems Infrastructure. In some instances, a new system or service will require some change to the existing information systems infrastructure or it will require increased loading of this infrastucture. These changes or loadings should be noted in the requirements document, together with some description of the estimated investment, in terms of capital and human resources, which will be required to cater for such changes or loading. If possible, it should be noted clearly if there a likelihood that other projects or systems will benefit from the necessary infrastructureal changes.

Ten Critical Success Factors for the Deployment of IS in TCD

Financial Issues. Several issues need be addressed in this area. First, the five-year cost of ownership should be set out in detail, identifying the financial benefits and the financial costs. In Chapter 3, we introduced the several types of costs and benefits. The financial benefits might include, among other things:

- Cost savings due to redeployment of staff away from the associated function to other functions.
- Reduction in notional[1] monetary costs arising from reduction in requirements for other services (*e.g.* on-going upgrading and maintenance arising from a presently inadequate service or system.)
- Any other cost saving or revenue arising from the commissioning of the proposed project.

The financial costs of ownership must include:

- Cost of training staff, some of which may be notional.
- Organisational costs associated with the creation, adoption, and usage of new procedures arising from the commissioning of the system or service.
- All capital costs (hardware and software).
- Maintenance costs, some of which may be notional.
- Commissioning costs, some of which may be notional.
- Costs of anticipated upgrades dealing with bug fixes or mismatches of requirements and implementation, some of which costs may be notional.

Refer to Figure 3.1 for an example of the types of monetary costs and monetary benefits of commissioning a given information system.

The second item to be addressed under this critical success factor heading concerns the cost-per-user profile: the total five-year cost, the estimated number of users at the present level of usage, and the estimated number of users at future projected levels of usage should all be specified in the proposal.

Finally, the sources of finance which might be used to support or offset the costs which have been detailed in this section are to be identified.

[1]Notional monetary cost: the estimated cost of the service in the case where this service is provided by the Computer Laboratory but not charged to the particular department or office in question.

5.3 Guidelines for the Preparation of Proposals

In the previous section we looked at the critical success factors which need to be addressed when generating a complete and comprehensive requirements specification. It will probably be necessary to assist the various Working Groups in creating these requirements documents and, in particular, by providing them with a set of guidelines. Better still, it can be very helpful to the Working Group to be provided with a *proforma* to ensure that each of the requirements specifications — which will be evaluated to assess their merits — addresses the issues which are deemed to be important, *i.e.* the factors set out in the previous section. These proformas should endeavour to strike a balance between the need to allow each proposal the freedom to express its merits and the need to enforce a degree of standardization so that disparate recommendations can be compared on an equal footing. There is, of course, the additional need to keep the recommendations or proposals as brief as possible. In this section, we will describe one possible structure for such a proforma.

Essentially, proformas deal with two issues: the first is concerned with the description of the proposal, *per se*, whilst the second asks the proposers to address explicitly each of the ten factors set out in the previous section. Every proposal must set out the five year cost of ownership of the proposed project or service. These proformas are accompanied by a set of guidelines to assist the Working Groups in preparing their submission. A sample copy of these guidelines and the proformas is included for information in Appendix I. Here we will simply provide a short summary of the main headings under which information is to be provided.

The proformas comprise three sections:

1. A summary.
2. The details of recommendation or proposal, (*i.e.* the statement of requirements and the proposed approach to the solution).
3. Validation of the system or service according to the criteria by which the Recommendation or Proposal will be judged, *i.e.* the Critical Success Factors.

Let us briefly review each of these in turn.

5.3.1 Section 1: The Summary

The summary section comprises the title of the recommendation or proposal, the identity of the working group making the submission, an indication stating whether or not there are any other interdependent proposals, and a summary of the main functions and benefits of the recommendation or proposal. The summary comprises three short parts: the first setting out the functions and benefits of the minimal service being proposed, the second and the third setting out the additional functions and benefits of the useful and desirable services, respectively. This concept of three options is included to allow the users to

scope the requirements generation process and to identify the core needs and the additional functionality in an orderly fashion (see the example terms of reference in Chapter 4).

5.3.2 Section 2: Details of Recommendation or Proposal

There are five distinct parts in Section 2. The first part is intended to allow a Working Group to set out the background to the recommendation or proposal, the motivation for providing the proposed service, and the rationale for the proposed approach. Under the heading of *Rationale*, one should note the alternative approaches which were considered (if any) and the reason for adopting the particular approach being put forward in the submission. Parts 2, 3, and 4 correspond to the three options in the recommendations or proposal addressing minimal, useful, and desirable services. Part 5 addresses the impact of the recommendation or proposal, in general.

In more detail, Parts 2, 3, and 4 are similar in structure: each requires the Working Group to set out the following.

- A functional description of the service proposed.
- A specification of the hardware which is required to facilitate the service. This hardware might include:
  (a) A new computer platform. Care must be taken to ensure that if a new computer platform is required then it should be adequate to provide an appropriate level of service to the anticipated audience.
  (b) Network and/or network interfaces. Again, care must be taken to ensure that whatever new network interfaces or network infrastructures are required to support the proposed service are adequate to satisfy anticipated needs.
  (c) Other issues. These might include a requirement to exploit an existing service and, in such a case, it is important to set out the anticipated demand for these resources in terms of time, processing power, volume of data, and flow of data. If there are specialist hardware requirements, *e.g.*, printers, cameras, door-locks, card-readers, these should also be noted in the space provided.

  Note that details of specific products are not necessary; generic descriptions and/or names of a small selection of products which are likely to meet the required needs would suffice.
- A specification of the software which is required to facilitate the service. This software might include:
  (a) Application Software. The recommendation may involve the acquisition or development of software which gives effect to the required service; it is this software which is termed application software.

(b) User-Interfaces. The provision of the service may require additional software to enable a consistent (likeable and useable) user interface to be offered; such software should be identified under this heading.

(c) Licence Implications. Quite often, the provision of a new service may assume access to, or use of, existing software. Consequently, there may be implications for existing licence agreements; these should be enumerated here.

(d) Other Issues. If there are any other areas of a general software nature which impinge of the provision of the recommended service, they should be detailed in this section.

Note again that details of specific products are not necessary; generic descriptions and/or names of a small selection of products which are likely to meet the required needs would suffice.

- A specification of the human resources which are required to facilitate the service.

  Both the resources required of the IS Service and of the Department or Office in which the proposed service will reside should be specified. For the sake of clarity, these resources can be categorized according to whether they are incurred during:

  (a) The development and/or commissioning phases. In essence, these are temporary requirements for human resources.

  (b) The operational phase of the service. These represent permanent requirements for human resources and might include, for example, support, maintenance, recurrent training, and decommissioning, once the service is no longer of value.

Although Parts 2, 3, and 4 of Section 2 are similar in structure, it should be noted that both Part 3 and 4 differ from Part 2 in one important way. Specifically, Part 2, identifying the requirements for the minimal service, stands alone; parts 3 and 4 list only those items or issues which are required for the useful and desirable services, respecectively, in addition to those specified for the minimal service. Thus, Parts 3 and 4 enumerate the incremental requirements of the useful and desirable services.

The fifth and final part of Section 2 asks the working group to address the impact of the recommendation or proposal, in general, on:

1. Existing services. The recommendation in question may have an effect on existing services (either beneficial or detrimental). If this is the case, you should specify under this heading the services which will be affected, the nature of the impact (beneficial or detrimental), and the extent of the impact.

2. The existing organization. The recommendation or proposal may also have an effect on existing services and, again, this may be either beneficial

or detrimental. If this is the case, the Working Group should specify under this heading the nature and extent of this impact.

3. Existing workpractices. In this instance, you need to set out the changes, if any, in current workpractice which are required to achieve the maximum benefits from the proposed system or service.

5.3.3 Section 3: Validation of the System or Service Against the Ten Critical Success Factors

The final section of the proforma requires the working group to address each of the ten critical success factors which govern the success of the system in delivering the required benefits for the organization or the individual. In a sense, this constitutes an attempt to get each working group to validate their requirements in a reasonably meaningful way. This validation serves the dual purpose of (a) getting the user community to think through how their proposals will actually produce concrete benefits and (b) improving the likelihood that the proposal's services are what they need.

Figure 5.2: A partially complete example of a functional decomposition diagram (top level).

Figure 5.3: A partially complete example of a functional decomposition and function/entity diagram (next level). Note that the function/entity relationships can also be depicted in matrix form.

Chapter 6

Achieving Ownership

> No man is an *Iland*, intire of it selfe; every man is a peece of the *Continent*, a part of the *maine*; if a *Clod* bee washed away by the Sea, *Europe* is the lesse, as well as if a *Promontorie* were, as well as if a *Mannor* of thy *friends* or of *thine owne* were; any mans *death* diminishes *me*, because I am involved in *Mankinde*; And therefore never send to know for whom the *bell* tolls; it tolls for *thee*.
>
> John Donne

The planning and policy development process is now in full swing. The working groups are coming to terms with their arduous brief, analysing functions, creating function/entity diagrams, brainstorming, and generally scrutinizing their respective domains for those areas which will truly benefit from information systems. The policy development group, having ensured that the working groups have gotten off to a good start, and having kept a weather eye on developments which need immediate attention, are now about to address a number of key policy decisions (such as the *rôle* and responsibilities of the central IS Service). The organization's IT department is probably swamped with work: contributing to the policy development process *and* continuing to provide the organization's information services. Everyone is busily working away on the exercise.

With all this frenetic activity, it would be easy to assume that all must necessarily be well. Why wouldn't it be?

Recall the comments that we made in Chapter 1 concerning the nature of change and the reaction of people to change. Change begets anxiety, and anxiety can quickly lead to fear. Fear in turn can result in rejection, a rejection which is usually not grounded in rational understanding. All of the current activity is serving to emphasise the impression of change and, paradoxically, it may also be increasing the dangers of failure to bring forth a policy and plan which can be implemented.

The best (and, arguably, the only) way to deal with this situation is to ensure that everyone knows what is going on and, most importantly, that they feel that they are a part of the process and that the process really belongs to them. Clearly, making the large number of people who are contributing directly

to the exercise feel a part of the process is not difficult — ensuring, as we noted previously, that all participants are circulated with summaries of every meeting that is held goes a long way toward keeping people identified with the process — but there is a very large and important community which is *not* directly involved in the process. Indeed, one of the dangers of having many people involved in the policy development process is that you come to believe that somehow or other they represent the majority of interested parties; and that can be a grave mistake.

There are two main groups of people who could potentially be alienated from the process: the staff in the IT department who are not directly involved in the policy development process (the service providers); and the community in the institute or organization who are not involved (the service consumers). Both must be given due care and attention. In a sense, it is easier to deal with the staff in the IT department, if only because they are an identifiable group. Unfortunately, it is less easy to deal with the user community since they are organized in very different ways at very different levels in the organization and it is essential to choose the appropriate way to address each segment of the population.

Without fail, a concerted programme of liaison must be formulated and followed in an effort (which will not always successful) to ensure that everyone knows what is going on. The groups that this programme should address includes:

- Staff of the IT department
- Management of the IT department
- The Board of Directors
- The Executive Management
- The staff of each department in the organization
- All representative bodies

Each of these groups have their own particular agenda. And it *is* an agenda, for to assume that people can divorce their responsibilities from their views is to misunderstand human nature, and to misunderstand human nature in such an endeavour as this would be folly indeed. It would be impossible to catalogue all of the possible agendas, but it is possible to draw out some common threads which underpin the need to deal with these agendas. All of these threads are concerned with the success of the policy development process; and success is predicated upon people having a sense of ownership of the process (they feel that it is a part of them and that they have a personal stake in it) and having a sense of ownership in the results (walking away from the results is less easy if you feel that they embody solutions to your personal needs). The threads, then, which can be identified include the need to avoid alienation by exclusion, the need to ensure that the decision makers will support the endeavour, the need to ensure that those with control of the finances undertand at every juncture the

possible implications of adopting the strategies to be suggested, and perhaps most important of all, the absolute need to engender a feeling that individuals and groups have nothing to fear — and perhaps much to gain — from adopting the results of the process and from departing from the *status quo*. This isn't necessarily easy for, while the *status quo* may not be optimal, it is at least a familiar face; alternatives may sound fine in theory (or in Final Reports) but it is all to easy to turn your back on them. *Minimizing the risk of making Final Reports attractive shelf-ware is a fundamental part of the process of policy development.* Make no mistake, you can't guarantee that you will cover all the bases; but it is essential to make the attempt.

The following are some guidelines for a successful program of liaison.

- Try to engender free (& colourful) exchanges without any concern (real or imaginary) over possible retribution
- Remember that the ISPDG has much to learn from the views and experience of the staff
- Encourage any interested party especially those who are not a formal part of the policy development exercise to make submissions
- Try to foster a sense of goodwill
- Make sure that concerns are voiced — and addressed
- Use meetings to listen as well as to spread the word
- Use every possible organ to keep people informed
- Identifiy good news stories and advertize them
- Initiate and follow up on a policy of total transparency
- If people have concerns, act upon them and then make sure that you tell them that you have acted upon them, *i.e.* set up positive feedback loops.
- Above all, remember that people have agendas — it's a part of human nature — try to read these agendas and act accordingly.

6.1 A Resume of People Types

Given that the process of the development of a policy on information systems in an organization is primarily about, and driven by, people, and given the reality that every one of those human-beings will have a subliminal or overt agenda, you need to be aware of the type of people that you are likely to encounter in the policy development exercise. In the following we will summarize some of the many character types which you may have to deal with. All of these character types are based on *real* individuals and any similarity to people living or dead is entirely intentional! However, in every case, each type has been distilled from observations of many individuals and it represents something of a caracature

of the personality and behavioural traits. Consequently, there is no one-to-one correspondence between a given character type and a given individual and no correspondences should be inferred.

The Visionary This person is wholly altruistic and supportive; he or she is open to change and to rational argument. Often, he or she will develop present thinking beyond what was anticipated. Visionaries have no hidden agendas and don't play games.

The Bemused Participant Such a person is reasonably benign but can become obstructive to any real change which might in any way disturb the *status quo* or which might be replicated in the area for which he or she might have responsibility.

The Overarching Proponent This person is often the champion of the change or development process. He or she can be very valuable but he or she often can't resist asserting their point of view. In such instances, it's usually a case of assuming their perspective is right until proven wrong. This can result in the expenditure of a great deal of energy, especially as the overarching proponent tends to be a powerful individual. Nonetheless, this person can be a very powerful ally, if well-focussed.

The Schizophrenic This is an individual who is able to assume simultaneously several personality traits and to be:

1. Openly supportive
2. Openly critical
3. Surreptitiously critical and underhanded
4. Overtly defensive of his or her power base

The Schizophrenic is, by nature, very dangerous and difficult to deal with; it is often not clear which personality you are going to come up against, especially in meetings.

The Detached Individual This person often presides over a quasi-autonomous area (empire) and can often behave in a benign and supportive manner — as long as the changes or developments don't impinge on his or her autonomy. It is essential that good relationships with this person be fostered.

Those who would Make Haste Slowly These people tend to be cautiously supportive but they are also sceptical of change. Their approach is reasonable but they don't want to be rushed: matters will take their own course. Despite their good intentions, these people often stymie the process by virture of their inertia.

The Eager Proponent This person genuinely supports the process and its outcome; he or she is invaluable and, unless a critical number of these individuals can be identified and involved in a central way, the entire process may falter.

The Detached Proponent This person is, again, a valuable asset: he or she can dispassionately view all the issues — warts and all — and is capable of contributing in a very non-threatening and constructive manner.

The Fence-Sitter Fence-sitters are to be found at every level of an organization and they are dangerous at every level. Such a person is inherently unpredictable and is liable to degenerate into (and unreliable version of) any of the other character types spontaneously. The danger level of this person is proportional to their level of seniority.

The Cynic The cynic always begins by saying: 'In my experience, this won't work ...'. He or she is usually right if the proposal is carried out in the same manner which gave rise to his or her experience in the first place.

The Antagonist This person is a proactive fence-sitter: he or she sits back and launches the occasional torpedo at the process and watches to see what will happen before hoisting an appropriately chosen flag.

Watchers These people are not to be confused with fence-sitters. They are people who are not directly involved in the process and they simply await the outcome. You should ensure that there are as few senior 'watchers' as possible, *i.e.* you should ensure that there are as many senior people as possible directly involved.

Blind-Folded Watchers These people are oblivious to the fact that anything at all is going on. Typically, you have those who haven't been made aware of the process (in which case, you are to blame) or there are those who have been made aware but who simply don't care. Even with the latter group, you must take some of the responsibility for their disposition: evidently, you haven't (yet) managed to find out what matters to them and to help them understand what might the implications for them.

To help get an idea of what people of these character types can be like, the following is a series of fictitious interviews with a number of people who might typically be a part of the ISPDG process (or not). Try to identify the character type to which these belong.

6.2 Interview A

Can you tell me what the initials ISPDG stand for?

The Information Systems Policy Development Group — a bit of a mouthful, isn't it?!

What does it do?

Well, I suppose its primary goal is to chart a course for the organization through this very strange new technology-dependent world of ours and to make sure that we can take the opportunities that are presented to us to succeed. And, I imagine, to learn to spot those opportunities in the first place. Yes, that's probably their main objective: to spot the opportunities presented to the organization by technology.

How did you hear about it?

My secretary presented me with a sheaf of paper one day, saying it was a copy of the e-mail which I had received from them. I can tell you I wasn't too impressed! Most of it seemed to be irrelevant at first. But then I was invited to a seminar on the exercise and, lo, the veil was lifted!

What do you mean?

Well, I discovered that I wasn't supposed to print out all of that e-mail! Just scan it, and file the bits I thought relevant for future reference. Much more sensible! And it seems that they have their heads together after all.

Meaning?

Meaning that all they talked about was people and benefits and costs! I hardly heard a bit or a byte mentioned all day.

Who's heading the ISPDG up?

Interesting question. I suppose that in a sense this new IS Policy Manager is responsible for most of the day-to-day stuff, and the IT Committee Chair would be the key link with the Board, but the impression I have is that the user's themselves are heading it up, in the sense that they seem to be the people who are having the ultimate say in what we do and where we go. It does really seem to be a strange mixture of democracy and autocracy!

What changes will their work bring to the organization?

Well, now, crystal ball gazing has never been my *forte*. And I don't want to pre-empt the work of the group but, as I see the whole thing unfolding, I suspect that, if we are successful, everything will change. Mind you, even if we aren't successful, everything may change anyway, except that we won't be in control.

I'm sorry, I don't follow.

Hmm. I see. Well, look at it this way. The world in becoming a very small place. And at an alarming rate. People are talking, communicating, more and more and doing business all over the globe. Not that that's always necessarily a good thing. But the way we do business is changing and, if we want to stay in the game, we'll need to change too. The trick will be not to lose our values in the process of that change and, really, to try to get out in front and influence, if we can, the changes so that we come out on top.

Can you give me an example?

Ahh, let's see ... certainly, take distance education, for instance. It would seem that the communication revolution is opening up a whole new market and I think we need to be alert to the fact that that's happening — or happened — and to position ourselves to exploit the opportunity.

What changes do you think their work will bring to you job?

Well, it has already given me much too much e-mail to read! But, to be fair, I haven't been using the new tools for handling e-mail properly yet and I have a lot of learning to do. But, if I can filter out the chaff from the wheat, the mammoth amounts of information which are available to me now *will*, if I can handle it, allow me to be more effective in my decision making. For goodness sake, look at these research resources on the Web! A sort of a Pandora's box, a Trojan Horse, and a cornucopia, all rolled into one!

Do you think its worthwhile spending all this effort on IS?

Absolutely! If we didn't we would simply be making ourselves hostages to forture. And the market-place these days is far to precarious a place to be if you are drifting around.

If you were in charge, what would you do that they're not doing now?

Not a lot really. That lot seem to have the matter under control. Well, actually, no, there *is* something I'd be doing.

Which is?

Well, I'd be out re-working our organization, our mangement structures, our decision processes. They're not doing that .... but maybe it's too much to expect. But it *does* need to be tackled and I think it should be tackled in tandem with the IS policy.

What, in your opinion, is the difference between IT and IS?

Strange sort of question! Ahmm, never really thought about it. Technology or Systems? Is there any? Could it be that systems include people but technology doesn't? Yes, that's probably it. People, that's the difference.

Are you involved in the IS policy development exercise?

Not directly.

Are you happy with that?

You haven't seen my desk! Yes, I'm very happy about that. But I do feel its important to be in contact, and to launch a balloon occasionally. And to make sure that they keep their eyes on what is really important for me and our organization.

Do you think their recommendations will be adopted?

That depends on so many things. If the recommendations are good, and if people actually understand what they are saying, and what they mean, and what are the implications of what they are recommending, then I think, yes, they will be adopted. But there are so many other factors which can influence this, things which have nothing to do with the merit of their work, things like money, and personal agendas. I think that the chief danger we face is from these quarters ... and it's going to be essential to deal with them.

What do you think is the most important issue to address?

In a word? The belief that by good strategic planning, we can maximise our ability to deliver a top quality service. If we don't believe, and follow-up with the investment, we're all wasting our time.

6.3 Interview B

Can you tell me what the initials ISPDG stand for?

I can, certainly. ISPDG stands for the Information Systems Policy Development Group.

What do they do?

The ISPDG? That's a good question! Well, so far, there's been a lot of talking but not a lot of action.

Talking about what?

Well, harmless things, high-flown things like empowering users and obvious things like the goal of the organization! Doesn't everybody know what the organization does?!! But I suppose if it gets us all better computers and software then it will have been worth it.

How did you hear about it?

I'm on it! 'Though I wonder sometimes if I wouldn't be better off minding my own department's business.

Who is heading it up?

We have this new policy manager with all kinds of bright ideas but I think the person with the real power is our financial comptroller.

What changes will their work bring to the organization?

Goodness knows! Maybe, if we are lucky, none at all! Ah no, to be serious, though, I do think that we will have better tools and we could certainly do with them. Our own systems are falling apart at the seams and we've been trying to get new ones for two years now but this policy thing has delayed that. Still, if it works out, we will get them after all.

What changes do you think their work will bring to your job?

So far, they've just meant more work and more paper! In the long run? Well, I suppose that after all this is over, they might leave us alone for a while to get on with our job.

Do you think its worthwhile spending all this effort on IS?

Not at all! Couldn't I tell you right now exactly what is needed from computers and couldn't we then just get on with it, without all this discussion and consensus building. I mean, I know that that's all very important, keeps the morale up, but, at the end of the day, there's a job to be done, and I've got to make sure it gets done. And sometimes it seems that these policy discussions are getting in the way of that. Deflecting us, if you see what I mean.

If you were in charge, what would you do that they're not doing now?

I'd be sitting down, deciding what is really important to get fixed, fix it, and get on with business.

What, in your opinion, is the difference between IT and IS?

Oh, that one again. For the life of me, I really can't see any real difference. Yes, yes, I know that IS is supposed to mean all kinds of lovely additional things like user psychology and benefits assessment but, come on, at the end of the day, they're just computers.

Do you think their recommendations will be adopted?

I have no doubt that we'll eventually sort out what's important and, after all the discussions are over, we will eventually have a sensible set of concrete

proposals — things that matter — and these will go through.

What do you think is the most important issue to address?

Well, now, did I mention that I have a system hanging together by string and chewing gum!!!

6.4 Interview C

Can you tell me what the initials ISPDG stand for?

The Information Systems Policy Development Group.

What do they do?

They, well I should say we because I am a member of the Group, have been charged by the Board to assess the needs of the organization with respect to information technology and to identify the ways in which we should be exploiting the opportunities of information systems in order to deliver a better service.

A better service where?

A better service in all areas of the organizations: from the 'front office' where people are concerned directly with production and marketing right through to the 'back office' where the staff are engad in supporting the activities of the front office and also with maintaining the organization as a viable business whole.

How did you hear about it?

In fact, the first I heard of the ISPDG and its intended work was during a coffee break one day when one of our senior managers, who had obviously been reading some relevant article in the Financial Times, raised the issue and asked me had any views on the matter. He had mentioned that there was a feeling that somehow things were now quite right in the organization but he couldn't put his finger on exactly what.

How did the ISPDG emerge?

As is always the case in these matters when one starts to discuss issues of organizational impact, we continued the conversation and talked about the various approaches that one can take to a strategic review.

For example?

Well, one could contract a major management consultancy firm?

Why didn't you?

There was a feeling that the organizational ethic in these instance was very centred in the good-will of the staff and that a conventional consultancy-based review might concentrate just a little too much on the business issues and, consequently, it might be somewhat alienating to the majority of the staff who would, at the end of the day, have to live the results of the review and make them work.

And that's when the concept of an internally-led information systems policy development group was conceived?

Exactly.

What changes will their work bring to the organization?

I think that when most people think about this question, the immediate answer which comes to mind is: more computers! And, to an extent, there may (or may not!) be more information technology in the organization after the event. But there are not the changes which the review and plan will — or should — bring.

And they are?

Advances in the way in which we do our work: sometimes subtle changes in the procedures and mechanisms by which information is exchanged and ex-

ploited; and sometimes there might be wholesale re-organization of a particular function if it can be seen — and shown — that there will be significant benefits in so doing. But such changes, even if we can identify them, are not guaranteed to be implemented!

Why so?

Typically because there are many many agendas operating in an organization and just because there is a *prima facia* case for a given proposal, and even if one can show what benefits are likely to emerge, there is no guarantee that the plan won't be 'gazumped' by more political manoevering.

What changes do you think their work will bring to your job?

I think one has to be careful in making specific predictions when one is dealing with information technology and its impact. However, that said, I'd be quite happy to say that I do thing there will be a much greater emphasis in the future on the use of the so-called information super-highway in our business. In particular, I also think that this is going to be used in a more interactive manner and the information we will be trading will be much more accessible – visually and aurally – than heretofore. I hope (I don't wish to be so presumptuous as to expect) that this policy development will in fact bring this about sooner than would have been the case otherwise.

Do you think its worthwhile spending all this effort on IS?

I think that from what I have said so far, that the answer to this question is clearly yes. But, if I may, I'd like to underline the term information systems rather than information technology.

What, in your opinion, is the difference between IT and IS?

Information Technology is concerned solely with the tools of the trade, with the processing and analysis of information. Information Systems, on the other hand, embrace not just IT but the use of IT by organizations and individuals. It's a much bigger forum. And a much more challenging one.

If you were in charge, what would you do that they're not doing now?

Nothing! I think that those involved in the process are doing a difficult job well and I have on several occassions taken the opportunity which has been afforded me to make individual contributions to this process.

Do you think the recommendations will be adopted?

On balance, I'd have to say yes. But, as I mentioned above, organizations are complex entities and there are dangerous obstacles to effecting true change, irrespective of its value.

What do you think is the most important issue to address?

People! How they feel toward IT and IS, how they feel toward the changes, their own aspirations and fears and needs. That's the critical issue in all of this.

Chapter 7

Evaluating Recommendations

> And while they talked and talked, and while they sat
> changing their minds into baser coin;
> And telling — they! how truth and beauty join;
> And how a certain this was good, but that
> was baser than the viper or the toad,
> Or the blind beggar glaring down the road.
>
> James Stephens
> *The Breath of Life*

We noted in Chapter 4 that the primary goal of the ISPDG Working Groups is to feed the information systems policy development by producing a set of recommendations or proposals for information systems. These proposals are the result of the exhaustive requirements generation process which we discussed in detail in Chapter 5, a process which includes both the investigation of departmental and organizational needs and the validation of those needs against a set of critical success factors which made explicit the operational goals of the organization. Now that we come to the evaluation of these proposals, we again need a set of metrics against which to measure the likely success (and benefits) of commissioning a proposed system.

It is important that the merits of the proposal be evaluated in as unambiguous and transparent a way as possible so that its subsequent success or failure as a proposal can be understood by everyone in the organization and, furthermore, so that its success or failure as a system or service, if commissioned, can be reviewed in an objective light. It is equally important that the size of the proposal *per se* should not prejudice the objectivity of its evaluation. Rather, it is the value of the service which that proposed project would provide which is paramount, a value which can only be judged in the context of the overall organization goals. The ten critical success factors which we discussed in Chapter 5 constitute an ideal set of metrics for a particular organization for which they were developed. Note well that a different organization will have a different set of critical success factors (reflecting its different operational goals) and there may be more or less than ten of them. In this chapter, we will develop a scheme which allows these critical success factors to be used in evaluating

the merits of the proposed information systems. Acknowledging that there is nothing magical about the number ten or the particular critical success factors, we will nonetheless base the following discussion on these ten factors since they do in fact encapsulate many of the most important issues confronting the successful deployment of information systems.

7.1 The Evaluation Process

First, let us recap. on the ten critical success factors which are to be used as evaluation criteria in this instance. The ten criteria can be grouped together under three headings (a) *User-oriented criteria*, (b) criteria concerned with the *management of the IS infrastructure*, and (c) *financial issues*, as follows (refer to Chapter 5 for a detailed explanation).

User-oriented criteria.

1. Direct Achievement of the Organization's Goals
2. Projection of the Organization's Presence at a National and International Level
3. Urgency and Timeliness of the Proposal
4. Provision of Information
5. Organizational Risk

Criteria concerned with the management of the IS infrastructure.

6. Establishment of a Strong Information Systems Infrastructure
7. Maturity and Soundness of the Requirements
8. Minimization of Technical Risk
9. Minimization of Risk to Information Systems Infrastructure

Financial issues

Each proposal is evaluated to see how well it measures up against each criterion. This implies that a proposal is accorded a unique score for each criterion and this, in turn, raises a problem concerning the objectivity or impartiality of the evaluation.

To promote this impartiality and objectivity, it helps to lead the evaluator (which could be either an individual or a group) through a series of questions which have a bearing on the particular criterion being addressed. These questions are not exhaustive and are only intended to be indicative of the issues which arise in connection with that particular criterion. For example, one criterion might be the extent to which a proposal contributes to the projection of the presence of the organiztion at a national or an international level. The questions might then be directed at focussing the attention of the evaluator on the necessary implications in several *domains*, *e.g.* the *public perception* of the organization (its image of quality or the value of its products, and its social

awareness, nationally and internationally) or its *internal self-image*. Having answered these questions in each domain, and decided on the degree to which each issue is addressed by the proposal in hand, the evaluator then assigns a score (in the range 1–5) to reflect the manner in which the proposal satisfies the given criteria in that domain. *Each score has associated with it a prescribed minimum standard which the proposal must satisfy in order to qualify for that score.*

For instance, in the specific case of Trinity College Dublin, Table 7.1 contains an example of these focussing questions and the scoring guidelines for the three domains (Research, Teaching, and Impact on Society) which constitute the 'Direct Achievement of College Goals' criterion. The domains associated with each criterion are catalogued in Table 7.1.

The scores for each domain are then aggregated in a manner which is appropriate to the relationship between these domains. For example, the aggregation might be done in a purely additive manner if the criteria in all domains are pertinent to a successful system or service. On the other hand, if a successful project depends solely on the criteria in one domain, the aggregation might be done by taking the maximum of the scores. In other cases, where the criteria in each domain are mutually dependent, the scores can be aggregated in a multiplicative manner. This aggregated score, then, represents the extent to which a given proposal fulfils the given criterion, *overall*.

Not all criteria are equally important. To allow for this, the score against each criterion can be weighted. This means that a unique weight must be agreed, *by consensus*, for each criterion and the same weights apply, irrespective of the proposal. The weighted scores are then added to give a final total. We will discuss the weighting issues in more detail in the next section.

Figure 7.1 summarizes this evaluation process and the complete set of forms setting out the scoring for the ten criteria are included for reference in Appendix II.

Note well that this proposal evaluation and the attendant scoring is only the first part of the overall process. Whilst the evaluation will indicate the proposals which, considered independently, are likely to yield the best benefits, one must also ensure that the needs of the organization as a whole are considered. To that end, the Information Systems Policy Development Group must also formulate a strategic plan for implementation of the various information systems projects in order to ensure that the best mix of information systems are commissioned in a timely manner. We will deal with this issue in the next chapter.

In summary, then, the scheme involves the evaluation of proposals on the basis of the sum of weighted scores according to a number of predetermined and agreed criteria, wherein the scores are assigned after a full consideration of all of the attendant issues. On the basis of this evaluation, the ISPDG developed a global implementation plan which achieves the commissioning of the best mix of systems and services over time.

Direct Achievement of College Goals				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Research	Will the proposal maintain existing standards of research?			
	Will the proposal increase the likelihood of successful new research, *i.e.*, does it enable new research to take place?			
	Does Trinity have an established track record in this area?			
	If Trinity has no established track record, is this area likely to be of importance to the national community?			
	If Trinity has no established track record, is this area likely to be of importance to the international community?			
Teaching	Are there any implications for the improvement of teaching in College arising from this proposal?			
	Will the proposed system significantly increase the quality of teaching?			
	Is the proposal directed at the enhancement of existing approaches?			
	Is the proposal directed at the introduction of new, perhaps revolutionary, approaches?			
	Will the quality of the learning process be improved in any particularly innovative manner as a result of the proposal?			
Impact on Society	Is there likely to be a positive impact on the interaction with and contribution to the national community?			
	Is there likely to be a positive impact on the interaction with and contribution to the international community?			
	Does this proposal contribute in any way to the ease which which potential students have access to useful information on the College, its courses, its students, its staff, its intellectual property?			
	Does this proposal contribute in any way to the ease which which potential employers have access to useful information on the College, its courses, its students, its staff, its intellectual property?			
	Does this proposal make any impact on the transfer of intellectual property, know-how, or technology to the national community?			
	Does this proposal make any impact on the transfer of intellectual property, know-how, or technology to the international community?			

Scoring for Direct Achievement of College Goals			
Domain	*Scoring Guidelines*	*Score*	*Label*
Research	1 – No impact, directly or indirectly		A
	2 – Of marginal benefit in assisting researchers		
	3 – Enables research but will not be used directly in the course of research		
	4 – Enables research and is used directly in the course of research		
	5 – Key research will not be performed in the absence of this system or service		
Teaching	1 – No impact, directly or indirectly		B
	2 – Will be of marginal benefit in teaching		
	3 – Quality of teaching will improve as a direct result		
	4 – Brings teaching (& learning) practices in line with the best in Ireland		
	5 – Brings teaching (& learning) practices in line with best internationally		
Impact on Society	1 – No impact, directly or indirectly		C
	2 – Some indirect impact		
	3 – Some direct impact		
	4 – Direct impact		
	5 – Very strong direct impact		
Overall	Overall score is the larger of the sum of scores A and B or the sum of scores A and C, divided by two *i.e.*, Max [(A+C), (B+C)] / 2		Final

Table 7.1: Focussing questions and scoring guidelines for the 'Direct Achievement of College Goals' evaluation criterion.

Criterion	Domain
Direct Achievement of College Goals	Research
	Teaching
	Impact on Society
Projection of Trinity's Presence	External Public Image
	Internal Self Image
	External Collaboration
	Internal Collaboration
Urgency and Timeliness of the Proposal	Repuation
	Services
	Degree of Postponement
Provision of Information	Support
	Access
Organizational Risk	Risk
	Plans
Establishment of a Strong IS Infrastructure	Strategic Position
	Plans
	Benefits
Maturity and Soundness of the Requirements	Requirements
	Specifications
	Approval
	Review
Minimization of Technical Risk	Skills
	Hardware Dependencies
	Software Dependencies
	Application Software
	Viability of Suppliers
Minimization of Risk to IS Infrastructure	Change
	Capital Investment
	Staff Investment
Financial issues	Adequacy, Certainty, and Completeness
	Cost-per-user profile
	Internal Rate of Return

Table 7.2: Evaluation criteria and constituent domains.

Figure 7.1: The Evaluation Process

7.2 Weighting of Criteria

In the previous section, we noted that each criterion was not equally relevant in assessing the merits of an IS service in any given organization. Consequently, it is necessary to weight the scores against each these criteria according to their relative importance. The total of these weighted scores can then be used to rank the proposal or recommendations. It is extremely important that these weights be agreed by the ISPDG only after detailed discussion and validation for these weights represent in very explicit form the relative priorities of the IS policy and they, more than anything, represent the consensus of the Group. If inadequate attention is paid to the agreement of these weights or if they are agreed without the deep commitment of each and every member then there will inevitably be trouble when they are used to compute the final ranking of the recommendations of the working groups. In particular, if the weights are not fully agreed, it will be all to easy for disconsolate members of the Group to argue that the results are unacceptable because inadequate attention was paid to this weighting process and it is likely that the entire affair will have to be revisited. And revisiting it after the fact will be both divisive and open to prejudice.

Once these weights have been agreed in full, it is essential that they be communicated to the working groups so that they know what are the relative priorities and so that they can attach the appropriate emphasis when they are preparing their proposals. If this isn't done, then the ISPDG will be open to the criticism of 'cooking the books' and adjusting the results to suit some hidden agenda; a criticism which, real or imagined, would invalidate the ethos of transparency and could undermine the entire policy development process.

Following the evaluation of the proposals submitted by the working groups, and having created the ranked list of proposals, the next stage of the process it to create a number of scenarios or portfolios of proposals, based on this ranking, with a view to ensuring that all strategic areas are covered. These scenarios

should be accompanied by a complete financial analysis and a proposed schedule for commissioning.

Weighting the TCD Evaluation Criteria

After much consultation, the ISPDG agreed the following the following set of weights for the ten criteria to be used in evaluation the proposals for IS systems and services which were submitted by the various working groups.

Weight	*Criterion*
4	Direct Achievement of College Goals
2	Projection of Trinity's Presence
2	Urgency and Timeliness of the Proposal
3	Provision of Information
3	Organizational Risk
1	Establishment of a Strong IS Infrastructure
1	Maturity and Soundness of the Requirements
1	Minimization of Technical Risk
1	Minimization of Risk to IS Infrastructure
4	Financial issues

To give an impression of how these weights would influence the ranking of proposals, there follows a small example based on three hypothetical proposals. In each case, the proposal has been fully evaluated and the scores in each domain within each criterion are detailed below along with their final unweighted scores and their weighted scores. The three proposals are:

Proposal 1.
Development of a acronym-generator and proposal writer for the preparation of research proposals targetted perhaps at the European Commission! Cost: 200,000 pounds.

Proposal 2
Purchase of a site licence for a mathematical modelling system capable of simulating and visualizing the dynamic evolution of complicated systems. Cost: 15,000 pounds

Proposal 3
Development of a student performance analysis system which would correlate on-going performance of all students in College with their past achievements in, *e.g.* the Post-Primary School Graduation Certificate; the service would be available to all appropriate parties (e.g. tutors, admissions, Senior Lecturer) in College. Cost: 30,000 pounds

The Evaluation of Three Hypothetical Proposals

Criterion	Proposal Number		
	1	2	3
Direct Achievement of College Goals			
Research	3	5	1
Teaching	1	3	3
Impact on Society	2	4	4
Overall	3	5	4
Projection of Trinity's Presence			
External Public Image	1	3	4
Internal Self Image	1	4	5
External Collaboration	4	2	2
Internal Collaboration	2	3	4
Overall	2	3	4
Urgency and Timeliness of the Proposal			
Repuation	2	3	3
Services	1	3	4
Degree of Postponement	2	3	4
Overall	1	2	4
Provision of Information			
Support	1	1	5
Access	1	1	5
Overall	1	1	5
Organizational Risk			
Risk	4	5	5
Plans	3	4	4
Overall	2	4	4
Establishment of a Strong IS Infrastructure			
Strategic Position	1	1	1
Plans	2	2	4
Benefits	5	5	5
Overall	3	3	3
Maturity and Soundness of the Requirements			
Requirements	5	5	5
Specifications	5	5	5
Approval	5	5	5
Review	5	5	5
Overall	5	5	5
Minimization of Technical Risk			
Skills	4	3	5
Hardware Dependencies	3	5	4
Software Dependencies	1	5	5
Application Software	1	5	1
Viability of Suppliers	1	5	5
Overall	2	5	4
Minimization of Risk to IS Infrastructure			
Change	5	5	4
Capital Investment	3	5	3
Staff Investment	3	5	3
Overall	4	5	3
Financial issues			
Adequacy, Certainty, and Completeness	5	5	5
Cost-per-user profile	1	5	5
Internal Rate of Return	1	1	2
Overall	1	3	4

The Evaluation of Three Hypothetical Proposals

Summary - Overall Scores	Proposal Number		
	1	2	3
Direct Achievement of College Goals	3	5	4
Projection of Trinity's Presence	2	3	4
Urgency and Timeliness of the Proposal	1	2	4
Provision of Information	1	1	5
Organizational Risk	2	4	4
Establishment of a Strong IS Infrastructure	3	3	3
Maturity and Soundness of the Requirements	5	5	5
Minimization of Technical Risk	2	5	4
Minimization of Risk to IS Infrastructure	4	5	3
Financial issues	1	3	4
Total score UNWEIGHTED and UNNORMALIZED	24	33	38
Total score UNWEIGHTED and NORMALIZED (1-100)	48	66	76

Summary - Overall WEIGHTED Scores	Proposal Number		
	1	2	3
Direct Achievement of College Goals	12	20	16
Projection of Trinity's Presence	4	6	8
Urgency and Timeliness of the Proposal	2	4	8
Provision of Information	3	3	15
Organizational Risk	6	12	12
Establishment of a Strong IS Infrastructure	3	3	3
Maturity and Soundness of the Requirements	5	5	5
Minimization of Technical Risk	2	5	4
Minimization of Risk to IS Infrastructure	4	5	3
Financial issues	4	12	16
Total score WEIGHTED and UNNORMALIZED	45	75	90
Total score WEIGHTED and NORMALIZED (1-100)	41	68	81

The result of this hypothetical evaluation is that, in the unweighted scenario, proposals 1, 2, and 3, received scores of 44%, 66%, and 76%, respectively; in the weighted scenario, proposals 1, 2, and 3, received scores of 41%, 68%, and 81%, respectively. We can see straightaway that the effect of the weighting is that the score for the 'good' proposals improved while the 'bad' disimproved.

The Results of the TCD ISPDG Evaluation

Forty-four proposals were submitted by the Working Groups to the ISPDG for evaluation. Whilst the ISPDG recognized that the best way to evaluate each proposal would be for it to be read and evaluated by every member of the ISPDG, with the scores being allocated by the Group after discussion, this approach was unfortunately not practicable: it takes at least one hour to read and digest the contents of a proposal and it takes another hour to allocate the scores (there are a total of 35 scores to be allocated for each option of each proposal). This means that every member of the ISPDG would have had to commit 100 hours to the process over the fortnight allocated to the evaluation process and, irrespective of how desirable this might have been, it was not possible.

The ISPDG agreed to adopt an alternative approach, stipulating that every proposal should be read and evaluated by a minimum number of four people and that the final scores should be allocated after discussion amongst these evaluators. In order to promote consistency in the allocation of scores, every group was chaired by a common evaluator (the Information Systems Project Officer). The ISPDG also agreed to enlarge the pool of people from which the evaluators are drawn by including, as appropriate, members of the Working Groups. *As a general rule, no evaluator was a member of the Working Group which prepared and submitted the proposal.*

The ISPDG also recognized the need for the collective evaluation of one proposal in order to calibrate the scoring, *i.e.*, to promote consistency across all evaluation groups. The result of this 'calibration' evaluation was then discarded and this proposal was re-evaluated toward the end of the process to minimize any bias which might have occured. The evaluation was held over a full fortnight. Each option of each proposal was evaluated during this period and a list of the best options (minimal, useful, desirable) for each proposal submitted, *i.e.,* the option that achieved the best score, was created. In general, if two options gained the same score, the minimal option was selected simply for the sake of expediency. The list is ordered by score, in decending order, and it sets out the following information:

- Proposal Number
- Option (Mininal, Useful, Desirable)
- Option noted by evaluators as having particular merit
- Proposal Title
- Working Group
- Score
- Total Cost
- Central IS Total Cost
- Central IS Capital Cost
- Central IS Pay Cost
- Central IS Non-Pay Cost
- User Total Cost
- Score for Adequacy and Completeness of Financial Analysis
- Cost under-estimated (-) or over-estimated (+) as noted by evaluators
- Classification of proposal according to IS Service functions
- Classification of proposal according to College functions
- Interdependencies with other proposals

The Results of the TCD ISPDG Evaluation

In reading these scores and the ranked list of submitted proposals and recommendations, one needs to be mindful of three things:

1. It is the proposals which were evaluated and not the ideas behind them. Many proposals had excellent ideas at their core and the rationale was usually clear. Sometimes, however, these proposals just didn't address key issues like detailed requirements and deployment in the workplace (*e.g.* organizational risk). The evaluation team decided not to attempt to second-guess the intentions of the proposers as there was no guarantee that they could have done this in a consistent (or reliable) manner for all proposals. In any case, proposals which reflect poorly-defined requirements are inherently risky and, as such, it is right that they should not do well in the evaluation.
2. The scores simply reflect an impartial assessment of the benefits that a proposed system or service would generate, according to the ten weighted criteria.
3. Every proposal represents a legitimate statement of requirements (or needs) and consequentially there is no 'pass' or 'fail': everything passes. The rank ordering simply allows the ISPDG to develop a well-grounded view about the *relative* merits of the proposals and the likelihood of a successful deployment, *given the information contained in the proposal*.

Chapter 8

Creating the Plan

> '... It is no trick to formulate a strategy, the problem is to make it work.'
>
> I. Ansoff
> *Corporate Strategy*

The detailed evaluation process, based on critical success factors which we discussed in Chapter 5, results in the generation of a rank ordering of proposed information systems and services. As we noted, this list must be transformed in order to create a strategic plan in which no critical area in the organization is neglected. This transformation is effected by:

(a) Analysing the functionality and costings of each proposal on the basis of the evaluation;

(b) Requesting working groups to re-work a subset of the proposals on the basis of the evaluation results;

(c) Classifying of the proposals to facilitate scheduling and commissioning, according to the collective view of the organization's strategic goals.

8.1 Re-Working Proposals

Following a detailed assessment of each proposal, it is likely that a number (and hopefully a small number) of proposals can't be included in the final IS plan in their present form, normally because it may be felt that a particular criterion or criteria had been poorly addressed in the original proposal. Consequently, the originating working groups should be asked to re-work the proposals on the basis of a detailed set of guidelines which the ISPDG should create using the evaluation forms and notes taken during the evaluation. In most circumstances, a number of general guidelines, as follows, may be of use.

8.1.1 General Guidelines

In most cases, the changes to the proposal will be concerned with re-focussing rather than with fundamental alterations. In re-working the proposals prior to their inclusion in the final plan, groups might be asked to bear in mind the following issues which are often neglected in information systems planning:

- One can expect newly purchased workstations (PCs, Macs, or other platforms) to have a useful life-expectancy of no more than 4 to 5 years; adequate provision should be made for decommissioning and replacement, as appropriate.
- Upgrades to equipment and software may be required in due course. Whilst it may not be possible in every case to anticipate these upgrades, provision should be made where possible.
- There may be significant double counting of recurrent pay costs where new projects involve a replacement of services or systems which are presently provided in the baseline (*i.e.* these services are provided at the moment by the IT Department) and where the resultant benefits are not noted in the 5-year costs. These cost benefits should be estimated and recorded in the spreadsheets provided.
- There may be significant double counting of recurrent pay costs where proposals identify legitimate support costs and these costs are already catered for in other proposals. These should be reconciled and the required support provision and costs should be amended accordingly.
- The total user effort in the present proposals appears to be low; this may need to re-assessed and the spreadsheets should be amended accordingly.
- There might be greater potential for funding from 'other than central sources'; this should be re-assessed and amended accordingly.

Finally, the re-working groups might be asked to look at the title of the proposal and to alter it if it did not convey the nature of the service and the benefits which accrue from the provision of that service. This may seem to be a trivial point, but bear in mind that most people who read abstracts of the proposed plan will tend to read only the titles and if they are to read further, these titles should be rich and informative.

Guidelines for Pilot Projects

In some circumstances, *e.g.* where the organizational risk is deemed to be high, the ISPDG may decide that some of the proposals which were submitted should only be commissioned following the execution of a pilot phase and dependent on a successful assessment of this pilot exercise. There are two primary reasons for recommending this course of action:

- The benefits of the full project may not be obvious and the pilot will allow a reasonably objective and quantitative assessment of these benefits;

- The achievement of the benefits may be somewhat uncertain and the pilot will allow one to learn from experience and to modify the manner in which the subsequent phase is commissioned;
- The resources which may be required for the commissioning of the full project may be uncertain and the pilot allows one to calibrate the resource requirements prior to full commissioning.

Clearly, the purpose of a pilot is primarily to allow the users and the IS service providers to measure one or more of benefits, resources, or the efficiency of commissioning or service provision. Thus, it is essential that each pilot sets out:

- The goals of the system or service in clear, unambiguous, measurable, and (preferably) quantitative terms.
- The manner in which the expected benefits will be measured.
- The resources which will be required.
- The manner in which the resources actually used will be monitored and measured.
- The manner in which the service or system will be provided.
- The mechanisms which will be used to monitor and measure deviations from the anticipated mode of service provision.
- The test which should be applied to the measured results of the pilot in order to decide whether or not the full project should proceed.

Figure 2.8 shows an example project summary for a pilot project to assess electronic storage and transformation of library texts and resources. This summary succinctly abstracts the project description, the benefits, and the costs in a single page.

8.2 Classification of Proposals

In creating the final IS plan, one needs to look at the global portfolio of proposals from a number of perspectives: from the point of view of the organization and its functions, from the point of view of the impact they will have on the IS Service which will be providing the service or system (*e.g.* Helpdesk, Support, Liaison and Training, Data Architecture, Application Development and Maintenance, Core Services, Networks and Servers), and, finally, from the point of view of their strategic importance.

Turning to the issue of strategic importance, yet another classification system is needed. In this instance, proposals are classified according to whether there are:

- Mandatory (in the sense that non-implementation would cause severe damage to a function in the organization);
- Discretionary (in the sense that non-implementation would not cause severe damage to a function in the organization);

and, additionally, according to whether they can (or should be) implemented

- Now, in this current year
- Later, in the next year.

The score which a proposal receives in the evaluation will be a major consideration in the assignment of the class 'Now' or 'Later', in that proposals which scored well are likely to be those which are best developed in terms of functional requirements and maturity of plans for commissioning (especially with respect to the implications for integration into the user environment) and, thus, they are likely to be more readily commissioned 'Now'.

The next step in the process is to assess the financial and human resource implications of those proposals in each of the four categories with a view to creating, for example, a three-year schedule of activities leading to the commissioning of the projects. The two primary constraints in this are (a) the maximum amount of effort which is available to develop new applications or systems and (b) the maximum amount of finance which is available. In a sense, the effort is a harder constraint since the level of finance is dependent upon the total amount of funds which are available and one can borrow forward if the spending profile is front-loaded; borrowing forward on effort is not quite so straightforward.

We turn now to the organization of the body which will be charged with delivering the services and systems which are identified in the final plan.

Electronic Storage and Transformation of Library Texts and Resources - Pilot Project

Project Number: 9408 | *Working Group:* Library

Description

A Pilot Project will investigate the costs and benefits of creation of electronic documents from library-held materials, importing electronic documents from remote sources, and electronic Journal Subscriptions. The aims of the pilot project will be to investigate the technical and practical issues relating to delivery of electronic documents to users and storage of electronic texts. The Project Manager will complete a report after the implementation of the Pilot giving the results and of the technical, practical and costs issues.

Benefits

The proposal contributes to College goals in providing published information in the appropriate media for current research and teaching activities. As documents produced for research and teaching are increasingly created in electronic format, it is important that primary literature requirements are fulfilled appropriately. Students will have access to recommended reading materials and scholars have timely supply of research publications. In particular, electronic delivery of materials from closed access will significantly reduce delays to users. The research process will be enhanced as delivery of local and remote sources of information can be extended from the reading rooms to users' offices and workplaces and beyond the campus. The transformation of text information for students is a new approach and will enable developments in teaching and learning including self-paced learning and distance education. New exercises for course work can be devised. For researchers using historical sources, the availability of key documents in electronic formats will permit novel investigative techniques for textual analysis and allow their use away from in-library microfilm equipment.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	7	0	0	0	0	7
IS Service Pay Cost	8	27	16	16	16	83
IS Service Non-pay Cost	2	4	4	4	4	18
User Cost	36	77	20	22	24	179
Gross Total Cost	53	108	40	42	44	287
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	53	108	40	42	44	287

Table 8.1: Summary of Project Number 9408

Chapter 9

Organization of the IS Service

> The separation of powers does not feature among Trinity's traditions.
>
> Aidan Clarke
> in *The Idea of a University*

9.1 Organizational and Technological Change

Different systems evolve and change at different rates. Nowhere is this more evident than in information systems which combine two very different components: the human organization and the technological infrastructure. Human organizations change, quite naturally, at a much slower rate than does technology and this inevitably leads to difficulties. This is particularly so when the technological infrastructure not only changes but also undergoes paradigm shifts such as we have seen over the past twenty years in the move from central mainframe approaches to, *e.g.*, distributed client-server models. If to this you add the extra dimension which arises when you extend the nature of the service being offered from the supply of computing resources to the provision of facilities for access to, creation of, processing of, and archival of information then the complexity of the situation becomes very apparent.

The IT Department in many companies and institutes often attempts over a period of years to make many incremental changes to its organization in an effort to deal with these trends. There comes a time, though, when incremental changes in an organization are no longer sufficient to deal with the mismatches in structures and services which inevitably occur. In such circumstances, there is great merit in standing back, assessing what services should be provided, and re-structuring the organization appropriately. Consequently, we will spend a little time and space in this chapter discussing the creation of a plan for the development of the organization of an IT Department with a view to ensuring that the information systems services which will need to be provided in the future can be delivered in an efficient and effective manner.

In this regard, two issues must be addressed:

1. The identification of the services which are to be provided by the IT

Department.

2. The internal structure and organization of the IT Department and its relationships with other bodies, be they Departments, Offices, or Committees.

The subject matter of this chapter is, then, organization in the context of service provision.

In the following, we will refer to the re-organized IT Department as the *Information Systems Service* (or *IS Service*, for short) in order to differentiate it from the existing IT Department structures.

9.2 The Role of the Information Systems Service

Let us begin by defining what we understand by the term Information System. This will allow us to proceed to define the functions which the IS Service should fulfil and the services which it should provide.

An Information System enables people to create, process, access, or archive information in the fulfilment of any legitimate personal or organizational goal. An Information Systems Service must provide the infrastructure and support to facilitate the execution of these activities in an efficient and effective manner.

With this in mind, four additional aspects must be taken into consideration:

1. The total organization of the company or institute.
2. The complete handling (creation, processing, access, and archival) of information of all kinds (numeric, textual, aural, and visual).
3. The development and maintenance of a robust infrastructure embracing information technology and communications systems.
4. The provision of a complete spectrum of user services.

These considerations allow us to set out the role of the IS Service, as follows:[1]

Network Infrastructure. To provide a robust and reliable network infrastructure to facilitate organization-wide access to information resources.

Information Infrastructure. To provide a robust and reliable infrastructure of information resources.

Information Access. To provide core resources to allow all members of the organizations reasonable access to the organization Information System.

Information Services. To provide core resources to allow all members of the organizations reasonable access to standard utilities for information processing.

[1]It should be noted that some of these services may be devolved in appropriate circumstances to Departments or Offices in the organization. Such devolution is discussed in the next chapter.

Administration. To provide all Departments and Offices at every level of the organizational hierarchy with information systems to enable them to handle all information relating to their administrative activities.

Application Development. To provide a service of the specification, design, testing, implementation, and maintenance of the organization's information systems applications.

User Training. To provide the level of training to allow users to exploit these resources effectively.

User Support. To provide coordinated, monitored, and timely assistance of high quality to the organization's user community concerning any difficulties they may be experiencing with their information systems.

User Advice. To provide advice (proactively and reactively) to the user community on the options which they may take in dealing with computer and communication aspects of information handling.

Note that, in all of the above, no distinction is made between users drawn from different offices or departments in the organization. It is a working principle of the approach being advocated in this book that all users in the organization, irrespective of which section they belong, are deserving of whatever service is appropriate to meet their needs. Clearly, such a system is workable if, and only if, there are unambiguous guidelines for the provision of every type of information system and service to every area in the organization. This exhaustive identification of the responsibilities of the IS Service is essential and is dealt with in detail in the next chapter. Suffice it for the present to note that we can choose to identify these responsibilities under three headings:

1. Setting policy and standards.
2. Delivery of information systems and services.
3. Funding of information systems and services.

As always, and whenever possible, these policies should be achieved by consensus at a series of ISPDG workshops. It is important to note that this explicit policy is open to scrutiny and to review on an on-going basis.

9.3 The Role of the Other Bodies in the Organization

At this point in the development of the information age, with the increasing pervasiveness of information systems and the near domestication of information technology, it is inevitable that people of all backgrounds and levels of techological sophistication or naivity will wish to provide some information services for themselves. This can be a good thing and it should be accepted that any department in a large organization may provide for itself some of the services or

functions identified in the previous section. This is a fundamental principle of devolved service provision, a principle which is essential in large organizations with quasi-autonomous offices. If we wish to create a cohesive information infrastructure, there are, however, some natural and necessary corollaries to this principle of devolution. We will return to these issues in the next Chapter on IS Policies.

9.4 The Organization of the Information Systems Service

Having set out in broad terms the roles of the IS Service (notwithstanding the fact that a policy on the delivery of these services to specific areas in the institute or company has yet to be dealt with in the next chapter), we are now in a position to elaborate on the requisite organization which should be put in place to allow these roles to be fulfilled. Note well that the organization we will develop in this chapter is no more than one model, albeit a model that has worked in practice. Let us begin by addressing what we mean by the term organization.

9.4.1 The Elements of Organization

In specifying the organization of any entity it is necessary to identify the following:

1. The components of the organization.
2. The *rôles* and functions of each component.
3. The interaction between the components: the connections and the mechanisms for communication.
4. The interaction between the components and external bodies: the connections and the mechanisms for communication.

All of the above four issues must be fully developed before we have a satisfactory plan for the organization of the IS Service. That in itself is still insufficient for there is a need also to set out the process by which the new organization will be implemented and the auxilliary activities (such as human resource development and training) that need to be effected in order to support this implementation.

9.4.2 Principles Governing the Creation of a New Organization

Before commencing to address each of these four issues in turn, we need to agree some principles to govern the creation of a new organization. These are as follows:

- The organization should reflect the services which are to be provided to the organization community.

- There needs to be a single primary contact point for dealing with the IS Service so that there is no confusion about how to contact the IS Service for whatever reason.
- There is a need for rigorous logging of jobs, allocation of jobs, task scheduling, monitoring, and review so that people's requests for assistance can be tracked.
- There is a need to develop a protocol of the allocation of IS Service resources to the different areas in the organization, particularly in the context of urgent demands for service.
- A quality assurance procedure should be put in place to monitor the success (or otherwise) of the IS Service in achieving defined service levels for each area in the organization.
- It is desirable (arguably, essential) that accountability and responsibility (functional and financial) be required of all levels of the IS Service organizations. *This means that individuals at all levels of the IS Service should be empowered to make decisions and be held accountable for those decisions.*
- It is essential that the organization facilitate a prompt turnaround time on requests for service.

9.4.3 The Components of the Proposed IS Service

On the basis of the role of the IS Service as set out in Section 9.2, it is clear that there are three main functions of the IS Service: the provision of user support, the provision of an Information Systems application development and maintenance service, and the development and maintenance of an IS infrastructure. Given that structures are best organized when they directly reflect the services they are providing, it is necessary to have at least three Units in the IS Service. These units are:

1. User Support Unit
2. IS Application Development & Maintenance Unit
3. IS Infrastructure & Core Services Unit

There is also a need for a group to facilitate Strategic Planning and General Coordination of Operations. This would require the creation of a group whose membership would be drawn from the each of the three above-mentioned Units and which would be chaired by the Director of the IS Service.

In turn, the User Support Unit comprises a Helpdesk section, a Support section, and a Liaison and Training section. The IS Application Development and Maintenance Unit comprises a Data Management and Data Administration section and a section which deals with application development for the research & education areas, for the Library, and for the administrative areas. Finally, the

Figure 9.1: The Proposed Structure of the IS Service

IS Infrastructure & Core Services unit comprises a Network & Servers section and a Core Information Systems Service section. This overall structure of the IS Service is shown in figure 9.1.

Tables 9.1, 9.2, and 9.3 summarize the functions of the User Support Unit, the IS Application Development & Maintenance Unit, and the IS Infrastructure & Core Services Unit, respectively. Note that in the IS Application Development & Maintenance Unit, no cognizance is taken of the essential need to allocate responsibility for functional domains in the organization to specific individuals. The IS Application Development & Maintenance Unit personnel should collectively form a pool of expertise which will be drawn upon and commited to the distinct domains as the requirements for application development and liaison demands.

Finally, we come to the fourth entity, the Strategic Planning and General Coordination of Operations Group, which comprises the Director of the IS Service and the managers of the three units, together with the heads of all sub-units (Helpdesk, Support, Liaison and Training, Data Management and Administration, Liaison and Systems, Core Information Systems Service, Networks & Servers). Its primary function is to contribute to the identification and resolution of operational hotspots, in addition to assisting and advising the management of the IS Service on

- Budgetary review
- Coordination of advance planning
- Assessment and review of installed systems
- Assessment and review of current projects

User Support Unit	
Section	Function
Helpdesk Functions (One-Stop Shop for Advice and Problem Resolution)	Helpdesk. Dealing with person-to-person user requests. Commercial outlet. Query and request logging, answering, redirection. Task allocation, scheduling, monitoring, follow-up, and review. Consulting and advice service. Staffing terminal rooms.
Support Functions	Installation of end-user computing and networking hardware and software. Upgrade of end-user computing and networking hardware and software. Trouble-shooting. Repair. Maintenance. Administration and coordination of site licences.
Liaison and Training Functions	Training. Awareness programmes. Liaison with Faculties, Departments, Offices, and User Groups. Support of 'local enthusiasts/experts' in Departments and Offices. Support of IS Service systems (e.g. colour printing, scanning, optical mark readers, ...). Teaching activities. Technical writing.
Planning Function	Planning and developmental investigations. Standards and quality assurance.

Table 9.1: Functions of the User Support Unit.

IS Application Development & Maintenance Unit	
Section	Function
Liaison Function	Liaison and awareness activities (fostering of strong working relationships with end-users) Requirements generation. Maintenance. Test.
Systems Function	System specification, design, development, testing, and implementation. Technical documentation.
Data Management & Administration Function	Coordination and planning of the global the organization data architecture. Administration and tuning of database management systems.
Planning Function	Planning and developmental investigations Standards and quality assurance.

Table 9.2: Functions of the IS Application Development & Maintenance Unit.

IS Infrastructure & Core Services Unit	
Section	Function
Core Services	Provision of core services: *Information access* *Information information processing services* Electronic communications systems administration. the organization's WWW server. Security. Generation of usage and accounting profiles. Special systems development and facilities (e.g. Disabled Users).
Networks and Servers	Network maintenance. Network development and extension. Facility testing. Server maintenance. Desktop systems software. Central system administration. Technical maintenance.
Planning Function	Planning and developmental investigations Standards and quality assurance.

Table 9.3: Functions of the IS Infrastructure & Core Services Unit.

- Human resource development and training within the IS Service

As always, the managers of the IS Service will continue to assume responsibility for executive management, taking operational decisions on the basis of, *inter alia*, the deliberations of this group. In this context, it is clear that the implementation and operation of this unit should be such that it complements normal executive management functions.

9.4.4 Coordination of Units in the IS Service

Whilst there is clearly an overlap in some of the activities of the three functional units, this overlap is quite natural in that the provision of some information systems requires the expertise of all areas in the IS Service. That being said, it is essential to specify how this overlap is coordinated. It is proposed that the coordination of such activities be vested in the unit which is primarily responsible for liaison with the users in the organization, *i.e.*, the User Support Unit. Such coordination would then be subject to review — and arbitration, should that prove necessary — by the Strategic Planning and General Coordination of Operations Group and by the management of IS Service.

9.5 Implementation of the IS Organization

So far, we have only dealt with the organization of the IS Service in reasonably general terms and, clearly, at a level of detail which is insufficient to allow immediate implementation. At this point, it is necessary to proceed to address the issues which will enable the implementation of this organization, identifying appropriate human resource levels for each individual section, creating an appropriate set of job titles, and linking existing salary structures to these new titles. Such a task will require a very significant amount of effort on behalf of the ISPDG, in collaboration with the management of the IT Department, under the guidance of the Personnel Department, in teasing out the details which would be necessary to bring the general plans to the point where they can be implemented.

It can be useful to identify an intermediate stage in this process, specifically the creation of an 'unpopulated' organogram which sets out a complete organizational framework for the functioning of the new IS Service without attaching specific people to specific jobs. That is, the unpopulated organogram addresses the functional breakdown of the service, the *rôles* and responsibilities of the major units and sub-units within the organization, and the lines of reporting between these units. It may include a detailed specification of the number of people, their necessary qualifications and their job titles, which are required to adequately staff these units and sub-units. It does not assign specific identities to these positions; it is in this sense that it is unpopulated. It becomes 'populated' when names are attached to each of the positions set out in the unpopulated organogram. The population of this organogram is well-outside the scope of this book and will require the human resource management and

negotiating skills and experience of the personnel office. That said, the consultative approach which has been advocated throughout this book should go some way toward easing this delicate process. The creation of an unpopulated organogram has the major benefit of decoupling (to an extent) the construction of an useful and appropriate structure from the naturally emotive area of staff allocation.

In the next section, we will go on to consider the identity and form of external monitoring and long-term policy development bodies (such as the IS Management Committee and the User Groups), and the working relationships between the IS Service and these external bodies.

9.6 Interaction between the IS Service and External Bodies

The on-going development of policy in information systems (*i.e.* the essential subject matter of this book) is not done best by those charged with the execution of that policy. Consequently, it is very important that policy be set by a body other than the management of the Information Systems Service, *i.e.* by some information systems Steering Committee. Clearly the Information Systems Service management should be represented on the steering committee but it should be populated mostly by representatives of the user community and the organization's senior management, in addition to a small number of external Information Systems experts. Obviously, if every user were to be represented then this steering committee would quickly become ineffective and it will normally be necessary to have additional user groups. In the following discussion, we will refer to the information systems steering committee as the ISSC and the user groups as ISSC Working Groups.

Let us consider both of these issues in turn. First, however, note that the overall goal of the proposed structure is to involve the user to a much greater extent in determining how to deploy necessarily limited resources so as to derive maximum benefits for the organization.

9.6.1 The ISMC Working Groups

Because of the key *rôle* which the ISPDG Working Groups have played in identifying the needs and requirements of every area in the organization for information systems, there is a strong argument for retaining these core resources with a view to allowing them (as anticipated in their Terms of Reference) to continue their work throughout the commissioning of whatever IS services are finally approved. In retaining these resources, the ISPDG Working Groups should be rationalized and reconstituted as, say, ISSC Working Groups. These Groups would then be in a position to coordinate the essential user aspects of the commissioning of these IS services: implementing appropriate organizational and operational changes in the user domain, coordinating user validation of the services, preparing for third-party training, and reviewing the progress of the commissioning process. The ISSC Working Groups would liaise directly

Figure 9.2: Proposed Interaction between the IS Service and External Bodies

with the appropriate responsible person in the IS Service on these issues.

Given the desirability of carrying forward the transparent practice of requirements generation and preparation of recommendations or proposals which has been introduced in the IS policy development exercise, the ISSC Working Group would also be in an excellent position to execute these tasks in the development of IS services in the future.

There may be a need to rationalize the membership of each ISSC Working Group in order to emphasize the profile of the area or function in the organization with which the Group is associated (re-assigning, for example, the Chairpersons and Secretaries) and to include well-focussed representation of the final end-user of the system or service. Given the benefits of transparency articulated at the outset, *membership of these Working Groups should be open to any member of the organization's user community who has a contribution to make.*

The operation of each of the working Groups should be subject to review by the ISSC which may, in due course, decide to reduce the number through amalgamation if this would allow them to accomplish their work more effectively and more efficiently.

It is expected that the IS Service itself will also need to prepare and submit proposals and recommendations of an IS infrastructural nature. Again, to

continue the promotion of transparency, these should be handled in exactly the same manner as those to be submitted by the IS Users' Group.

9.6.2 IS Users' Group

With a large number of ISSC working groups, there is a need for a focal point (or body) which will facilitate the overall consistency of the individual requirements. Typically, there should be a single body, or Group, which would represent the interests of all users of information sytems in the organization in liaison with the IS Service and with the IS Steering Committee. This body, the IS Users' Group, would typically comprise the Chairpersons and Secretaries of each ISSC Working Group. The IS User's Group would liaise directly with the Strategic Planning and General Coordination of Operations Group in the IS Service and a sub-set of the Group would be *ex officio* members of the IS Steering Committee. The Group should prepare a portfolio of proposals or recommendations for IS services once a year, say, in much the same way as has been advocated throughout the book, and present them to the IS Steering Committee for evaluation and, as appropriate, commissioning. Clearly, issues of urgency could be dealt with on a case by case basis but a yearly exercise of this nature would normally ensure that IS resources are used to the organization's best advantage.

9.6.3 The IS Steering Committee

The IS Steering Committee will typically adopt a pro-active approach to on-going policy development, planning, implementation, and review in exactly the same way as has been espoused throughout this book. The foundation for these functions should have been laid through the activities of the ISPDG. Concerning its membership, it should be constituted according to the same principles, though not necessarily in every case by the same people, as was the ISPDG.

In addition to its own policy development, planning, implementation, and review fuctions, the IS Steering Committee would be responsible for soliciting IS recommendations and proposals (through the IS Users' Group), for the evaluation of these proposals and recommendations using, in all likelihood, the evaluation system developed in the ISPDG exercise, and for the strategic deployment of successful submissions. This would be effected both on an on-going basis for urgent submissions and annually for the set of proposals which would be submitted once a year by the IS Users' Group.

Figure 9.2 depicts a diagrammatic summary of the proposed structure.

Chapter 10

Developing Policies

> The tools of working out salvation,
> by mere mechanic operation!
>
> Samuel Butler
> *Hudibras*

The goal of this book is to explore how an organization can develop a policy on information systems which will benefit the users in executing their work and which will exploit the significant opportunities presented by the maturing information age. So far, we have concentrated mainly on the generation and articulation of requirements for IS services and, to an extent, on the creation of an Information Systems Service which would be capable of delivering this service effectively and efficiently. Both of these issues have been developed on the basis of the broad understanding of the nature of information systems, the information revolution, the relevance of information systems to organizations, and the problems of gaining benefits from information systems in a human and organizational context: an understanding which we developed in the first few chapters of this book. Little has been said so far in specific terms about issues of policy or, more correctly, little has been said about policies as prescriptive guidelines governing the development of strategic areas. These are the issues to which we turn in this chapter and we will address the following topics:

1. The responsibilities of the organization's Information Systems Service
2. Devolution of responsibility for information systems to other bodies in the organization
3. The World-Wide Web (WWW)
4. Interactive Teleworking and Distance Learning
5. Policy Formulation as an On-going Process

10.1 The Responsibilities of the IS Service

If the organization is a large one, then one of the most important and difficult issues which will arise during the course of the IS policy development exercise will concern the nature and extent of the responsibilities of the central Information System Service. This might seem to be surprising since it would be expected that it would be straightforward to establish clear boundaries on its *rôle*. However, when one recognizes that the past ten years has seen some fundamental shifts – which have been primarily technology driven — in the way that services are delivered to end-users or, increasingly, acquired by end-users, it is clear that the demarcation can prove difficult.

There are many facets to this change but perhaps the most significant is the 'creeping decentralization' of service provision which has occurred. It has occurred for two primary reasons: first, the emergence and the rapid increase in power[1] and functionality [2] of so-called personal computers; and, second, the ease with which these computers can be purchased and installed by the end-users themselves. But herein lies the rub: whilst it is reasonably trivial to purchase and install the machines, it is quite a different matter to maintain them, and to connect them together in a network (which is an increasingly critical factor in exploiting information systems). The result has been that a certain amount of ambiguity can very naturally arise concerning the service which users would like to see being provided by the central Information Systems Service and the service which that body (or its predecessor) may have been set up to provide.

The development of this prescriptive policy is one of the primary goals of the ISPDG. Note, however, that to identify, unambiguously, what the IS Service does — or does not — provide, is equally to define what others must, in turn, provide. Thus, when we identify a policy for the IS Service, there are some very strong implications for others in the organization. Quite naturally, this will be a contentious issue. Nonetheless, this must not deflect us from our task.

10.1.1 Demarcation between the Responsibilities: Central and Devolved

As we have already noted, there is often a 'creeping decentralization' in the provision of Information Systems services in an organization with Departments and Offices providing more and more of the information systems functions needed to facilitate their operation. Whilst such decentralization seems to be inevitable, and indeed it may even be very beneficial, there is a need to maintain some degree of central managment or, rather, coordination. *The goal should be to achieve devolution, not decentralization; the ordered assumption of responsibility and decision-taking rather than a haphazard migration of activities.*

What *rôle* then is there for a central Information Systems Service? To what extent should it support the systems on the periphery? What type of

[1] Computer power has increased by over two orders of magnitude in the past twelve years.

[2] Functionality ranges from strict computing, through advanced scientific simulation, to information and word processing, information analysis, and the placement of information in archives.

service is now appropriate for the IS Service to provide? What should be the responsibilities of the Department and Offices in the provision of Information Systems? These are difficult questions, questions which we will now proceed to answer in full. In setting out the responsibilities of the IS Service, one must identify (a) the services for which it might be responsible and (b) the people to whom they are provided (see figure 10.1). You can then proceed to identify the service/consumer pairs which are the *minimal*[3] responsibilities of the IS Service and, *voilá*, you have completely defined the IS Service's brief.

Unfortunately, it's not quite that easy. The primary reason for this is that there are a number of different aspects to this idea of responsibility for service provision to an area. The three aspects which have been identified by the ISPDG are:

1. Policy and Standards.
2. Service Delivery.
3. Funding.

Each of these represent an orthogonal component of the overall responsibilities of the IS Service. For example, it may be the case that the IS Service delivers an application development service to the Sports Facility in the organization, but this would not necessarily mean that the service should be financed from central funds; it may well be the responsibility of the Sports Facility to pay for it. Equally, it may be the case that an engineering or product development department wishes to purchase some equipment from its own capital budget but it wishes to ensure that it is getting systems which will interface smoothly with the existing the organization infrastructure. In such cases, the department may have a right to expect professional advice from the IS Service and the IS Service may have a responsibility to provide it.

Armed with this framework for the potential responsibilities of the IS Service, the ISPDG might well conduct a number of workshops on the matter with a view to developing a consensus on each of the three issues (policy and standards, service delivery, and funding). The end result should be a set of three charts (similar to the one shown in figure /reffig:services with the responsibility for each service/consumer pair appropriately flagged. These charts represent an explicit and unambiguous mapping of the obligations of the IS Service.

Such a framework is essential if the IS Service is to be enabled to adopt a pro-active *rôle*, *i.e.* a *rôle* of leadership, in serving the user community in the organization.

All that said, we need to recognize that identifying the *rôle* and responsibilities of the IS Service in the provision of information systems services is only one side of the coin: we must also address the *rôle* of other bodies in the organization in devolved provision of information services and the relationship between the IS Service and these bodies. We will explore these issues in the next section.

[3]By a minimal service we mean those services which users have a right to expect from the IS Service.

Figure 10.1: Service/Consumer pairs for which the IS Service might be responsible.

10.2 Devolution of Responsibility for IS to other Bodies

In large organizations, any given office or department may wish to provide for itself some of the services or functions identified in the previous section. This is a fundamental principle of devolved service provision, a principle which is an increasingly significant trend. However, if we wish to create a cohesive information infrastructure, there are some natural and necessary corollaries to this principle of devolution.

The first corollary establishes a form of *quid pro quo*: if a body provides a service for itself (*e.g.* a department-wide multi-media computer-assisted learning programme), releasing the IS Service of this responsibility, then it is natural to expect that it get support or assistance in return. In this instance, it is reasonable to assert that, if a department provides a devolved service, and if it does so in strong liaison with the IS Service, then the IS Service should be expected

to provide access to essential core resources, such as network services, certain system services (*e.g.* archival systems), and aspects of system administration.

The second corollary takes the *quid pro quo* a little further in that it is natural to expect the body providing the devolved service to be bound to abide by certain codes of practice (*e.g.* concerning network access privileges) set down by the IS Service in liaison with interested parties.

All of this will make for the effective and efficient use of information in a modern organization. There needs to be some limitations, however, on the freedom with which this principle of devolution is implemented. Clearly, there is no difficulty if the IS service in question impinges exclusively on the 'devolved service provider', if one can call it that. However, the situation is quite different if the system function is essential to the administration of the organization as a whole and if it impinges on more than one department (*e.g.* the creation and maintenance of client database). **In these circumstances, such systems must remain under the control of the IS Service and they cannot be devolved.** If, for historic reasons, these have become devolved then it is mandatory that they be gradually migrated back to the IS Service in a manner which either maintains or improves on the current level of service to all users.

In this context, it is important to distinguish between the owners of an information system and the body responsible for the creation, maintenance, or enhancement of it in a technological sense. Departments are the ultimate owners of a given information system in that they are responsible for the use of that information system and for maintaining the integrity of the information in that system. In the case of systems which are to be maintained by the IS Service, the ownership remains vested in the department which is responsible for the information.

Departments, being the owners of a given information system, are responsible for the use of that information system and for training third party users in the operation of that system. For example, whilst the IS Service would be responsible for training the Finance Office in the operation of a hypothetical Research Account Information System, the Finance Office would take responsibility for training and providing user support to researchers on the use of the system.

Note that the financing of a devolved service is a matter for the department in question and not for the IS Service. At the same time, it must be acknowledged that there may be resource implications for the IS Service in linking a devolved service with the organization's overall information system.

10.3 The WWW

As we have noted on many occasions, the past ten years have seen a transformation of the world of computing and information systems. This transformation has not so much been a product of the great increase in power so much as it is a consequence of the networking of computer systems. The emphasis has changed from a situation which was solely concerned with the processing of information to one which sees the sharing and exchange of information as its

overriding concern. This networking has manifested itself as geographically localized communications networks (so-called Local Area Networks — LANs) and as global networks (Wide Area Networks — WANS). In some sense, the emergence of LANS was the harbinger of doom for the main-frame mentality which dominated all of the 1960s and most of the 1970s for it allowed the creation of collectively powerful systems from relatively simple machines. But if this was a great change, it is not nearly as significant as what can only be described as a cultural information revolution borne on the wave of globally-distributed — and globally accessible — information repositories supported by WANS.

The INTERNET is perhaps the best known of these global networks and up until recently it was an extremely valuable resource for academics as it provided a communication medium that facilitated their often idiosyncratic style of dialogue. However, the INTERNET is maturing at a remarkable rate and it now supports, in the guise of the World-Wide Web — WWW — information repositories which are well-organized and which contain useful information that has been placed there with some forethought. Significantly, this information is no longer just textual but it also encompasses still and moving images and audio. The interfaces to this resource have also matured with standard easy to use point-and-click systems, such as *Mosaic* and *Netscape* becoming widely available. The visual appearance of these WWW profiles is becoming very professional and they are becoming increasingly interactive. With the advent of *HotJava* from Sun Microsystems, a WWW browser which allows WWW profiles (applets) not just to be displayed on the user's screen but to run interactive programs *without* communicating with the source site, this is set to accelerate at an even faster rate.

Why is this significant? Although there is great benefit in using WWW simply as a mechanism for dialogue and communication, it is the fact that it is now being populated by high quality well-presented information of general interest which is of particular importance in this instance. Specifically, very many organizations now keep detailed profiles of their expertise, activities, and personnel on WWW, together with large amounts of relevant information, such as product data, example scenarios, courses, research papers, and, significantly, easy-to-complete enquiry and order forms. In a very real sense, the WWW has become a globally visible electronic shop window on organizations and institutes world-wide. And your organization should probably be one of them.

Whilst an organization often pays great attention to the appearance of its physical facade, acknowledging that appearance and image are strongly interrelated, it is crucial that organizations now realize that there is another new facade which it presents (or should present) to the outside world. This new facade is unique in that people are examining it by simple mouse clicks from computer workstations in all major institutions around the developed world. Just as we are conscious of our physical appearance, so too must we be equally conscious of our appearance on our electronic WWW facade. Arguably, we should be *more* concerned about its appearance since it is potentially much more visible and tells far more about the organization than does the look of a building. Clearly, we need to ensure that the appearance attains certain standards and this in turn requires an explicit policy and framework for maintaining

the WWW profile. We will return to this issue shortly.

From the organization's perspective, WWW can be viewed as both a source of information and as a consumer of information. We, as users can locate and access in a efficient fashion great tracts of relevant information and services which are available on the the organization's own network and the global Internet. Obviously, people have to be trained how to use this tool effectively. An organization is also an information producer and it is in this regard that special attention needs to be paid to the implications of the information and services that the organization is itself making available, *via* the Web, for consumption of others in the world-wide community.

Clearly, the type of information that the organization is, and will be, making available to the global community must be presented and catalogued to the same high standard as is the norm for conventional promotional literature. However, there is more to creating a good facade than indexing: the web is not just a text-based medium. Sound, pictures, and full motion video can be transmitted in real time. Thus great care should be taken in presenting as attractive and innovative a multi-media image as possible. Thus, *the creation of an appealing WWW profile is not just a technology issue but an issue of graphic design, animation, and human psychology.*

An inherent feature of the Web is that its contents are decided upon and controlled by its end users. This allows for tremendous creativity but also means that the quality, and accuracy, of the contents vary enormously. And this is what poses the great challenge to large organizations and it is exactly why a policy is required. An organisational infrastructure, including training, must be put in place to allow members of the organization to utilize the medium to its and their full potential. At the same time, there is an institutional dimension to the profile being presented to the world via the web and the organization has an obligation and responsibility to ensure that this is of the highest quality and accuracy. It is a well known characteristic of the Web that this last goal is difficult to achieve.

Locally-generated information should, and can only be, administered locally. Responsibility for the top-level structure of the the organization Web and for 'official organizational information' should reside in a single Officer, such as the Company Secretary. This is not to say that this person should have to handle the day-to-day inserting and updating of information, but rather that she or he would organise the overall structure and have editorial control over any material that is deemed to be appropriate, *e.g.* she or he could have information deleted from the Web if it is inaccurate, inappropriate, or out of date.

10.3.1 A Programme for WWW

With all this in mind, and depending on the nature of the organization, it may well be essential that the organization inaugurate a WWW Programme to oversee the development of the the organization WWW profile and to assess its completeness and quality. There are three key components in the proposed programme.

1. The creation of a central unit which is responsible for providing the tech-

nical know-how and infrastructure to create the WWW profiles, including a multimedia and graphic service.

2. The identification and training of one or more individuals in each Department and Administrative Office throughout the organization; each individual would be responsible for providing the information which is put on the Web and for maintaining the integrity of this information.

3. The establishment of a central office, and the appointment and training of an officer (*e.g.* the Company Secretary), which would be responsible for assuring the quality of the information and its presentation on the Web.

All three components are essential.

We have chosen to advocate this three-pronged approach (incorporating central technical administration and support, central quality assurance by a non-technical officer, and distributed creation and maintenance of information) as it reflects the inherent distributed ethos of WWW whilst providing adequate support to those charged with creating the information and whilst, at the same time, ensuring a high quality of presentation and comprehensive coverage. The WWW by its very nature is a very dynamic structure which does not lend itself to any traditional control structure: it would be unwieldy to invest all functions in a single body and it would not be appropriate to remove responsibility for the integrity of information from those who create it.

Perhaps the best way to get an idea of what an organization's WWW profile should like is to have a look at existing WWW sites. You will see that multimedia information — sound and images — are the norm. The following are the URLs (Universal Resource Locators, *i.e.* the WWW addresses) of a number of interesting sites on the Web, the home pages of which are shown in Figures 10.2 to 10.6.

http://www.un.org WWW home page of the United Nations

http://www.tcd.ie WWW home page of Trinity College Dublin, Ireland

http://www.cs.may.ie WWW home page of Department of Computer Science, St. Patrick's College, Maynooth, Ireland

http://www.esi.es WWW home page of The European Software Institute

http://www.khoros.unm.edu/khoros/home.html WWW home page of Khoros

http://home.netscape.com WWW home page of Netscape

http://www.utexas.edu/world/lecture WWW home page of the World Lecture Hall

http://www.iol.ie/resource/kennys/Visitor.html WWW visitor page of Kennys Bookshop and Art Galleries

Figure 10.2: WWW home page of the United Nations (*http://www.un.org*)

Figure 10.3: WWW home page of Trinity College Dublin, Ireland (*http://www.tcd.ie*)

Figure 10.4: WWW home page of Department of Computer Science, St. Patrick's College, Maynooth, Ireland (*http://www.cs.may.ie*)

Figure 10.5: WWW home page of The European Software Institute (*http://www.esi.es*)

Figure 10.6: WWW home page of Khoros (*http://www.khoros.unm.edu/khoros/home.html*)

Figure 10.7: WWW home page of Netscape (*http://home.netscape.com*)

Figure 10.8: WWW home page of the World Lecture Hall (*http://www.utexas.edu/world/lecture*)

Figure 10.9: WWW visitor page of Kennys Bookshop and Art Galleries (*http://www.iol.ie/resource/kennys/Visitor.html*)

10.4 Interactive Teleworking and Distance Learning

We made a great play in the opening few chapters on the revolutionary aspects of the information age and, in the previous section, we saw one of the ways in which the information revolution can transform an organization: the manner in which it is perceived and the way in which it presents itself. Let us carry this a little further to see what might be the implications for the transformation of, not just the organization's image, but of the whole operation of the organization.

Consider again the scenario we first encountered in Chapter 1 (even better, consider it after having visited the WWW home page of the World Lecture Hall (*http://www.utexas.edu/world/lecture*)).

> The chief executive of the largest software corporation in the world, MicroHard, is sitting at his desk contemplating the future of his company. Despite being a billionaire, he has this insatiable urge

to vent his creative energies in business and to follow success with success. He asks himself: 'what is the one commodity which everyone in the world seems to want and which has minimal transportion costs, low development costs, almost endless reusability, and is an up-market product for which people will pay great sums of money'. He ponders awhile and a thought strikes him. Information! Almost as soon as the thought strikes, he dismisses it. Information respositories are ten-a-penny. He ponders again. What is the bill that most people in the USA most concerned about? That's where the money would be: in providing a substitute product. Let's see: the car, the mortgage, the school fees, ... education! Everyone wants to be educated. Here is a service which is expensive but which is relatively cheap to develop, reusable, and has quality stickers all over it. The problem with education is that people are educated in universities and schools. Now, if he could only replace the universities.

In an amazing coincidence, the president of an Ivy League college, Haahvid University, is pondering the future and wondering what threats she might have to deal with in the coming year. Budget cuts? Not really a problem. Falling standards in the freshman years? No difficulties there either. It seems like everything in the garden is rosy, especially if you're in the top one percent (although she knew it was not so simple for other, equally good, but less established universities). Her telephone rings and Mr. G. Bates from MicroHard engages her in a long conversation.

Six months later, MicroHard announce accredited Haahvid degrees in fifty disciplines, including their prestigeous M.B.A., on their global interactive network. For £1,000 you get enrolled into a full degree programme, sitting at home in front of your interactive television which is hooked up to the SuperNet via you TV cable; most classes are pre-recorded and you simply watch them on interactive video, on demand. Course work involves you in a trawl through the Natural History Museum's archives, the Smithsonian, or even a browse though the facimile of the Book of Kells in Trinity College to check on the pigmentation of ancient books. Regular tutorials are held in tele-conferencing mode.

Haahvid's student numbers now stand at 5,000,000 and 200 univerities in the USA are filing bankruptcy. They couldn't compete with Haahvid when it was just a physical university — but they didn't have to, most people couldn't afford to go there. But now, everyone could afford it and worst of all, Haahvid had an exclusive strategic alliance with the biggest corporation in telecommunications and multi-media entertainment in the world. Things did not look good; for everyone except MicroHard and Haahvid, that is.

Just how fanciful is this scenario? I would venture to say that, if there is even so much as a grain of plausibility in it (and there is: recall that the Mind Extension University (MEU) plans to extend the reach of its cable-transmitted

courses to 50 million homes in the U.S by 1996 — see Chapter 1), then the threat is potentially so great that to ignore the possibility would be to be grossly negligent. The danger comes not so much from the fact that there are alternative media and alternative ways of learning, but of being exposed to so-called 'Killer Corporations'. Unless you are prepared, it's not so much a question of not being able to complete effectively, *but of not being able to compete at all.*

These type of developments don't announce themselves at the door; they just appear at the dining table. It would be very prudent for organization's in *all* sectors to launch an immediate 'sentinel programme' to monitor these potential developments and to brainstorm — on an on-going basis — ways in which they can anticipate and adapt accordingly. In particular, this programme should actively seek ways in which they can become a Haahvad (or a Microhard)!

10.5 Policy Formulation as an On-going Process

All of which brings us nicely to the final section of the final chapter. The process of information systems policy development which we have described in this short book will see some truly remarkable advances in an organization's thinking and the way in which it perceives the opportunities presented by information systems and the information technology revolution. The plan which emerges will certainly enable the organization to embrace the opportunity, exploit the potential, and enable its staff to contribute to the organizations' mission in a positive user-centred manner. However, upon conclusion of this process, we must be under no illusions that the thinking is all done; it isn't. You may well have produced an excellent IS plan and the newly-organized IS Service may well provide the organization community with the service it badly needs; but, make no mistake, even if every single proposed project is commissioned and comes in on budget, you are still in danger. All you have accomplished, *if* you follow through on it, is to set your raft upon a rising tide, 'a tide ... which leads on to fortune.' You must navigate that tide and set a course which takes you safely through the strait between the Scylla monster of information overload and the Charybdis whirlpool of organizational complacency. Much will have been done and much will remain to be done. Over the next several years, as the Information Age develops, rapidly and unpredictably, the successful organization must take the helm and actively chart that course. *Bon voyage!*

Part II

The Result of Information Policy Development

Chapter 1

Roles and responsibilities of the IS Service

The Responsibilities of the IS Service are set out under three orthogonal headings:

1. Policy and Standards
2. Service Delivery
3. Funding

Under each heading, the responsibilities are identified according to (a) the services the IS Service should provide and (b) the people or sections of College to whom the services are provided.

The detailed responsibility for policy and standards, service delivery, and funding are depicted in Figures 1.1, 1.2, and 1.3, respectively.

Each marked (service/section) pair represents the minimal services which the IS Service is obliged to provide, subject to the special provisions associated with a particular hatching in the marked (service/section) cell. In particular, each marked cell sets out those services which a member of staff or a student of the university can legitimately request of the IS Service in the expectation that this service will be provided.

The policy on devolution which has been set out in Chapter 10 remains in force. This means that individuals, offices, or departments are not obliged to ask for or use the service offered (the stated exceptions on critical activities notwithstanding).

Policy and Standards

The IS Service is responsible for setting standards and executing policies relating to information systems service provision. These standards are designated mandatory, strongly recommended, and recommended. Mandatory standards must be adhered to by the area in question (these areas mostly relate to network services and data interchange standards, and to the open-access facilities). The 'Strongly Recommended' standards relate to e-mail and word processing

facilities in the administrative sections of College. For the present, no standards are set for application development in the education and research areas.

Service Delivery

The IS Service should be capable of providing all of the services identified in Figure 1.2. Bearing in mind the comments above, it must be understood that it is not intended that all members of the College be forced to use the particular service being offered by the IS Service, merely that a service or system is available and is supported by the IS Service, should a user in College wish to avail of it (again,the conditions pertaining to devolution in critical areas notwithstanding).

Funding

The financing of systems is clearly a contentious issue. The policy being recommended asserts that:

1. Desktop equipment should be funded by the individual, department, or office in question. Whether or not the individual, department, or office chooses to allocate funds locally to information systems is essentially an issue for that individual, department, or office.

2. Servers (for databases, computing, and so on) will be funded by the IS Service if and only if it is a system or service which will be used by several departments or offices, that is, if it is a general purpose system or service.

3. Application-specific software (either developed in-house or acquired externally) will be funded by the IS Service if and only if it is a system or service which will be used by several departments or offices, that is, if it is a general purpose systems or service, and on the understanding that its commissioning will be dependent on the priorities set by the ISMC.

4. Standard desktop software will be funded by the IS Service although a nominal charge will be made to individuals, offices, and departments, for each system or service.

5. All user-support for services which are delivered by the IS Service will be funded by the IS Service.

6. All issues associated with the College network, with the exception of the interface hardware for desktop machines, will be funded by the IS Service.

7. The IS Service will be responsible for funding all items pertaining to the IS Service open-access laboratories (i.e. 'terminal rooms') and, in addition, pertaining to the Library open-access facilities, *i.e.*, those which offer the prescribed basic desktop services.

Figure 1.1: Responsibility of the IS Service for Policy and Standards

Figure 1.2: Responsibility of the IS Service for Service Delivery

Figure 1.3: Responsibility of the IS Service for Funding

Chapter 2

The Five-Year Information Systems Plan

2.1 The Work of the ISPDG Working Groups

We noted in Section 4.4 that there were eleven ISPDG Working Groups, each of which was charged with addressing specific technical aspects of the policy development. The terms of reference were discussed in Chapter 4 but the most significant deliverable of each of these groups was a set of recommendations or proposals for information systems and services, each of which was well-validated and well-costed.

2.1.1 Research Working Group

Research is a fundamental part of our *raison d'être* as a university and the Research Working Group addressed the many ways in which information systems can be used to consolidate and improve our research activities.

The Group submitted three proposals:

Proposal Number	Title
9411	Availability of Information on Research Interests and Expertise within College
9412	Computer Graphics Facility
9413	Graduate Student Facilities

Whilst, the group re-directed a number of issues to other working groups, it is clear that the Research Working Group's proposals do not represent an exhaustive treatment of all possible ways in which research in College can be enhanced or improved through the deployment of information systems. That said, at least one other group, the High Performance Working Group, has submitted proposals which are relevant to research. In any case, due attention will

have to be paid in the coming years to ensure that research in College takes advantage of the opportunities presented by information systems.

2.1.2 Education and Teaching Working Group

As with research, education and teaching is fundamental to our activities in the university and this Group has identified several ways in which education can benefit from information systems.

The Group submitted two proposals:

Proposal Number	Title
9414	Pilot Project - Use of Portable Information System in Teaching
9415	Software for Reliable Electronic Submission of Coursework

In a similar vein to the Research Working Group, it is clear that the Education and Teaching Working Group's proposals do not represent an exhaustive treatment of all possible ways in which the process of learning in College can be enhanced or improved through the deployment of information systems and due attention will have to be paid in the coming years to ensure that learning in all its forms in College takes advantage of the opportunities presented by information systems.

2.1.3 Student Affairs Working Group

The activities of the Student Affairs Working Group were concerned with cataloguing existing information systems facilities for students and establishing the information needs of students. Two questionnaires were compiled, distributed, collated, and analysed. The first questionnaire was directed at the student body and was intended to discover student attitudes and aspirations with regard to information systems. This was a broadly-based study and it was conducted in a manner which ensured the statistical integrity of any conclusions which were drawn from the results.

The second questionnaire targetted every academic department in College with a view to finding out what equipment and software is available to students in College and with a view to ascertaining the attitudes and expectations of these departments concerning future developments.

Both questionaires significantly influenced the seven proposals which were submitted by the Group:

Proposal Number	Title
9404	IS Support for Extra-Curricular Activities
9406	Provision of General Access Printing Facilities
9417	Replacement of Existing Student IS Equipment
9418	Provision of Appropriate Equipment for Student IS Needs
9419	General Access Multimedia Production and Peripheral Facilities
9420	Undergraduate Access to the Internet
9405	Access to Electronic Communication (E-mail, News) for all Students and Staff

2.1.4 Library Working Group

Given the central role which the Library plays in the provision of information in College, it is not surprising that, as an entity, it is deeply committed to the appropriate exploitation of information systems. This is reflected in the scope and depth of work which has been undertaken by the Library Working Group, a scope which merited the submission of four proposals:

Proposal Number	Title
9407	An Integrated Library System
9408	Electronic Storage and Transformation of Library Texts and Resources
9409	Study of Application of Smart Warehousing in Santry Book Repository
9410	Special Research and Personal Information Services from the Library System

2.1.5 High Performance Computing Working Group

High performance computing has the potential to enable quality research and state-of-the-art teaching in many different areas, primarily because it provides a viable alternative to the classical experimental and theoretical avenues of research. This so-called computational science is now pervading advanced work in physics, chemistry, molecular biology, and almost every area of engineering. Economic and geological modelling also require very high level of computing performance. It is precisely this disparate applicability which creates a challenge for those involved in specifying the requirements of high-performance computers: the inately heterogeneous needs are not easily satisified by one or even a small number of architectures. Nevertheless, the High Performance Computing Working Group has made considerable progress in bounding this problem and the single proposal which was submitted articulates these needs and suggests a plausible solution in the commissioning of a workstation farm.

Proposal Number	Title
9403	High Performance Computing Facilities for Trinity College

2.1.6 Networking and Architectures Working Group

The Networking and Architectures Working Group is one of the so-called 'horizontal' groups in that it was concerned primarily with the information systems infrastructure of the College and with the provision of general-purpose services to the broad community of users.

Having dealt with several short-term issues (see Chapter **??**), the importance of which should not be underestimated, the Working Group moved on to address the nature of the information network in the College and the services which should be provided to every user. The Group have decided to distinguish between the required infrastructure (*e.g.* the network, the various computers which serve that network, and the interfaces between various networks) on the one hand, and the so-called 'common desk-top' on the other. This desk-top refers to the suite of applications — or functions — which should be offered to every user in College. They include, for example, a friendly and intuitive electronic mail service, access to global network information resources, word-processing, reporting, on-line dialogue, and so on. The Working Group has also been concerned with the creation of an infrastructure that can support, *e.g.* a WWW College Profile (Prospectus and/or Calendar) in electronic form which can be accessed from anywhere in the world.

The Networking and Architecture Working Group submitted four proposals:

Proposal Number	Title
9421	A Set of Common Software Facilities for Staff and Students
9422	Wide Area Network
9423	College Network
9424	Home Access

2.1.7 User Support and Training Working Group

It is an axiom of the present policy development and planning exercise that it is the people which matter in College, not the technology. A consequence of this is the primacy of user support and training (and, notably, training here refers not only to the users but also to the staff of the Computer Laboratory). This group, then, was central to the successful outcome of the exercise and it addressed the many ways in which the College community as a whole can be supported. Significantly, the 'helpdesk' idiom has been developed in many ways to ensure that timely, effective, and well-directed assistance is available to users of every degree of expertise in College.

The Group submitted nine proposals:

Proposal Number	Title
9425	Implementation of 'Helpdesk' to replace Computer Laboratory Support Function
9426	Training for Graduate Students in Information Systems and Research
9427	Initial Training of Incoming Junior Freshmen and Evening Students (Student Training Proposal T1)
9428	Initial Training of Undergraduate Students in College when CWIS is introduced (Student Training Proposal T2)
9429	Basic Computer Literacy for Junior Freshmen (Student Training Proposal T3)
9430	Certification of IS Literacy for Junior Freshmen Students (T4)
9431	Initial Training of Incoming Graduate Students (Student Training Proposal T5)
9432	Initial Training of Graduate Students in College when the CWIS is introduced (Student Training Proposal T6)
9433	Training in I.S. for Staff in College

2.1.8 Administration (Finance) Working Group; Administration (Senior Lecturer) Working Group; Administration (General and Infrastructure) Working Group

Whilst this is indeed an academic institution and, consequently, the focus of our work is on scholarly research and teaching, it is an inescapable fact that the College would cease to be a viable entity if there were not an effective administration powering its operations. Increasingly, this administration is being subjected to severe strain as the College grows and as demands mount for ever improved productivity and cost-efficiency. College administration is also a very complex process and this complexity pervades the very many Offices which serve the community. This complexity is a very natural consequence of the variety of the academic activities which we support in Trinity: admissions, student administration, pastoral care of students, examinations, timetabling, issuing of degrees, maintenance of the alumni register, promotion of careers and appointments for students, staff recruitment, maintenance of buildings, site development, catering, provision of accommodation, ... the list goes on and on. If you then consider that issues of finance and accounting pervade almost every single one of these areas then you begin to get some small inkling of the scale of administrative activities for a community of over twelve thousand people.

If for no other reason other than the necessity to grasp this nettle of complexity and facilitate it (rather than transform it in any fundamental way), the present exercise in information systems policy development is of key importance. The benefits that can be gained by introducing appropriate information

systems and attendent workpractice changes are potentially huge. There is, however, one problem: we must first understand all of the component functions and practices in our present, complex, administration and, equally, we must understand the manner in which information is collected, collated, stored, shared, and updated. This is clearly an enormous undertaking and it is one which the three Administration Working Groups — Finance, Senior Lecturer, and General and Infrastructure — set to with great dedication. It is fundamental, too, that this understanding be modelled and documented in the same manner for all three Groups for, otherwise, there will be no way to rationalize their individual contributions. It is for this reason that the three have been grouped together under the one heading in this report: as a reflection of their coherence and not as a reflection of any diminished importance *vis-a-vis* the other Working Groups.

Progressing all three of these Administration Working Groups has been remarkable. Given the complexity of the task, all three achieved a clear, comprehensive, and detailed description of the functions of each Office in College and, in addition, they identified each repository of information (paper or computer-based) which is associated with every function. This in itself is an extremely useful result. The three groups also addressed the *rationalization* of these functions, information repositories, and at the introduction of practices and concommitant systems which will facilitate a more integrated and effective College administration.

Three proposals were submitted from the Administration (Finance) Working Group:

Proposal Number	Title
9401	Updgrade the Student Fees System
9402	Replacement of General, Purchases and Sales Ledger Systems
9434	Optimising the User of Current Systems in Processing Staff Pay Deductions

Four proposals were submitted from the Administration (Senior Lecturer) Working Group:

Proposal Number	Title
9435	Rationalisation and Integration of Existing Student Administration Systems
9436	Management Information System for Student Administration Database
9437	An Insight into TCD - To Provide on World Wide Web the Calendar, the College Prospectuses, the Alumni files, *et. seq.*
9438	Produce Up-to-Date Version of Catalogue of Graduates and Alumni Dubliniensis, and Red Calendar

Seven proposals were submitted from the Administration (General and Infrastructure) Working Group:

Proposal Number	Title
9440)	Database of External Bodies with Links to TCD for Fund Raising,
9441)	Research Sponsorship, and Careers & Appointments
9443)	(Three proposals were rationalized following the evaluation.)
9442	A Computerised Box-Office System for the Samuel Beckett Theatre
9444	Information System for the Secretary's Office
9445	Extended Use of Staffmaster System, Review of Coding, On-line Access to Central Personnel Record by Depts.
9446	Sports Management System

2.1.9 Administration (Steering) Working Group

And, finally, the Steering Group. This Group met only twice, a testimony to the degree of coordination which has been achieved, operationally, in the work of the three Administration Groups discussed above. The word 'operationally' is stressed for this coordination has been an artifact of the huge amount of commitment and work invested by the Computer Laboratory staff in interfacing with the many members of the three Groups and in documenting the functional and informational practices in each office (a commitment which has been echoed in every other Working Group, without exception).

2.2 Summaries of IS Projects

There follows a sequence of abstracts for each project which has been submitted by the various working groups. These abstracts present a description of the system or service, its benefits, and its costs. The abstracts are ordered by working group, in the same manner as the preceding introduction. Following the forty-four, there is a recommended schedule for the commissioning of these projects. This schedule is divided into three phases addressing those projects

which should be commissioned *immediately* (*i.e.* in the academic year '94/'95 — see Table 2.43), those which should be commissioned in an *intermediate* time-frame, (*i.e.* in the academic year '95/'96 — see Table 2.44), and those *final* projects which should be commissioned in the academic year '96/'97 — see Table 2.45). The costs of each phase are presented in Tables 2.46 to 2.48) and summary of the total costs of the projects is given in Table 2.49.

Note that the total costs are actually less than the sum of the individual costs of each project. This is due to an *a posteriori* adjustment which the IS-PDG made to the pay costs on the basis that the total support staffing should maintained at present levels, allowing for increases in the number of workstations, systems, and services. It is also due to a coordination of the costs of individual projects to eliminate double-counting, particularly in the support costs (*e.g.* one project might involve the commissioning of a new service, including support costs while another project concerned, say, with user support might already be catering from the same support needs).

Upgrade the Student Fees System

Project Number: 9401 | *Working Group:* Admin. (Finance)

Description
This project will entail a complete systems review of the operation of the Fees System, which has been in place for six years, addressing its interaction with other areas such as Student Records. The system will be upgraded to the most recent version of the Oracle database management system. Access to the fees system for appropriate College offices outside of the Finance Office will be enabled.

Benefits
The main benefits which will accrue from the review and upgrade include improved functionality, elimination of operational problems, and wider access to the fees system by appropriate College Offices.

As the student tuition fee income currently represents some 33% of College funding, it is imperative that a system be in place which ensures that all monies due to College in respect of student fees are paid in full, as they fall due. Furthermore the provision of reliable reports and statistics for the purposes of financial planning and control are vital to the successful management of College. Having on-line access to the fees system for certain offices will aid the smooth operation of student administration in Faculty and other offices. As the type of course offered by College continues to vary to meet ever changing consumer demand, (eg. in the area of self-financing courses), it will be necessary to provide more detailed analysis of fee income to management to enable them to plan their teaching and research activity and to adapt to changes in the organization and deliver of courses.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	2	0	0	2
IS Service Pay Cost	0	0	47	12	12	71
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	11	5	1	17
Gross Total Cost	0	0	60	17	13	90
Financial Benefit	0	0	0	20	20	40
Nett Total Cost	0	0	60	(3)	(7)	50

Table 2.1: Summary of Project Number 9401

Replacement of General, Purchases and Sales Ledger Systems

Project Number: 9402 | *Working Group:* Admin. (Finance)

Description
The replacement of the General, Purchases, and Sales Ledger system will provide for full implementation (in some instances on a phased basis) of *commitment accounting* and on-line access by authorised account holders.

Benefits
The financial accounting and information systems of College pervade every aspect of College's operations. This project will maintain and improve both teaching and research activities in College insofar as the proposed financial information system will provide well-defined information for strategic decision making and the effective management of scarce resources. The proposed user-friendly system should save academic departmental and research administration time thus allowing time saved to be used directly in core academic and research activity. The provision of a modern financial and management information system will enhance the College's ability to provide professional budgeting and timely reporting while at the same time providing College with interest earning cash flow benefits arising from its ability to make timely cost claims to funding agencies.

There is a very significant risk that the existing twelve year-old systems will become inoperable in the future as it may not be possible to provide adequate and timely support of an aging system. This is particularly important in the light of the likely need to provide upgrades to the present systems due to new legal or statuary changes. The risk of collapse will increase with time and the limited functionally of existing systems becomes more acute with growing demands for better up-to-date information, more flexible reporting and wider access.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	85	25	0	0	0	110
IS Service Pay Cost	19	25	34	13	13	104
IS Service Non-pay Cost	37	18	13	13	13	94
User Cost	16	79	94	85	83	357
Gross Total Cost	157	147	141	111	109	665
Financial Benefit	0	113	114	120	120	467
Nett Total Cost	157	34	27	(9)	(11)	198

Table 2.2: Summary of Project Number 9402

High Performance Computing Facilities for Trinity College

Project Number: 9403 | *Working Group:* High Performance Computing

Description

This service will provide a parallel high performance computing (HPC) facility to researchers and it will provide a Unix facility to undergraduates, providing a service ranging from undergraduate training in languages and Unix utilites to high performance computing for researchers and, where appropriate, for undergraduates. These facilities will be provided by a workstation farm. It should be noted that this service meets only some of the requirements set out by the high performance computing working group and, in particular, it does not met the requirement for access to massively parallel processor (MPP) computing facilities.

Benefits

The most important impact of the implementation of this project is that new research will be enabled which would otherwise have been impossible with existing facilities. The new projects are not just different by virtue of 'size' but also by 'kind' (*e.g.* bioinformatics and simulation of environment effects on the secondary structure of biomolecules; geographical information systems; cluster physics and chemistry; simulation of defects in materials; physics of semiconductor surfaces; structure and dynamics of foams; aeroelasticity, aeroacoustics and structural analysis; quantum chromodynamics and quantum field theory; global visualization for design visualization; simulation of room acoustical responses and reconstruction).
Having such a facility will (i) enable groups of researchers such as the Centre for Scientific Computing at Trinity College (CSCTC), comprising eight staff members and their postgraduate students from the Departments of Chemistry, Physics and Mathematics, to achieve an international reputation in its associated research areas; (ii) help TCD to retain some of its most talented graduates as postgraduate students as well as attracting more talented students from abroad. The proposed HPC facility will also assist researchers in making grant applications and in setting up international collaborations.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	333	100	100	100	633
IS Service Pay Cost	0	91	86	97	97	371
IS Service Non-pay Cost	0	38	33	40	40	151
User Cost	0	19	0	0	0	19
Gross Total Cost	0	481	219	237	237	1174
Financial Benefit	0	64	64	64	64	256
Nett Total Cost	0	417	155	173	173	918

Table 2.3: Summary of Project Number 9403

IS support for extra-curricular actives

Project Number: 9404	*Working Group:* Student Affairs

Description
The objective of this project is to encourage societies, clubs, and College publications to become integrated into the IS infrastructure. This is to be effected by extending College site licences to cover the various capitated bodies, to encourage them to have accounts on information systems so that they have access to electronic communication and other facilities using a common society/club/publication account. In addition, capitated bodies, clubs, societies, publications, *etc.* will be supported in setting up e-mailing lists and news groups/bulletin boards and on the College Wide Information System.

Benefits
This proposal supports extra-curricular activities in College. It will enable more people to find out about the various possibilities, thereby encouraging involvement. Extra-curricular activities are regarded as an integral part of the education of students in Trinity College, and as such, this proposal has educational benefits.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	0	0	0	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	0	0	0

Table 2.4: Summary of Project Number 9404

Access to Electronic Communication (E-mail, News) for all Students and Staff

Project Number: 9405 | *Working Group:* Student Affairs

Description
A control sample of 500 students, lecturers, and teaching assistants will be given access to a user-friendly graphic interface electronic mailer and a similar electronic news/bulletin boards reader, and they will receive adequate training in their use.
200 students will be chosen on the basis of the willingness of their lecturers to integrate the use of e-mail and News into their courses. The remainder of students will be chosen on the basis of the willingness of their lecturers to integrate the use of e-mail, News, **and** the Internet into their courses. The sample will be distributed across faculties.

Benefits
This project will first be run on a pilot basis to allow the users and the IS service providers to assess and to measure the likely benefits, resources, and the efficiency of commissioning the service.

It is anticipated that the successful commissioning of such a service will support research by facilitating communication with people in other institutions, who can conduct discussions, send each other results or paper pre-prints, *etc*, as well as by providing access to relevant newsgroups. It will support teaching and learning directly by providing opportunities for class discussion, electronic submission of work, joint projects with students in other universities, *etc.* The administrative support for teaching and learning will also be enhanced *e.g.*, timetabling, notifying people of changes in lectures, deadlines for assignments, *etc.* Student support services should benefit from a greater opportunity to communicate with their users, through general advertisements, mailing lists and individual communication.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	15	17	7	5	5	49
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	15	17	7	5	5	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	15	17	7	5	5	49

Table 2.5: Summary of Project Number 9405

Provision of General Access Printing Facilities

Project Number: 9406 | *Working Group:* Student Affairs

Description
The number of laser writers connected to UNIX/VAX will be increased to achieve a ratio of the order of 1 for each 12 dumb terminals (*i.e.*, purchasing three additional laser writers) in addition to augmenting the printing facilities which are available from the PCs and Macintoshes.

Benefits
This enhancement will facilitate users, mainly students, both undergraduate and postgraduate, in getting essays, projects and other printed work produced more speedily. This will avoid problems where students are unable to meet deadlines due to lack of a working and accessible printer, and will allow people more opportunities to improve their work. The presently poor printing service is a major cause of concern among the student population. As more and more students make greater use of computers (as a result of initiatives such as the Technology Awareness Programmes and the ISPDG process itself), the demand for printing will increase further. Thus, the problem increase without remedial action such as is proposed here.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	10	0	0	10	10	30
IS Service Pay Cost	6	7	7	5	5	30
IS Service Non-pay Cost	3	3	3	3	3	15
User Cost	0	0	0	0	0	0
Gross Total Cost	19	10	10	18	18	75
Financial Benefit	7	7	7	7	7	28
Nett Total Cost	12	3	3	11	11	47

Table 2.6: Summary of Project Number 9406

An Integrated Library System

Project Number: 9407 | *Working Group:* Library

Description

The System will support core Library functions: book and journal acquisition processing; catalogue records creation; circulation functions (variable loan periods, self-issue, recalls, reservations, easy-to-use interface for Library users, multiple indexes, link to non-Library resources, on-line requests for stack books); closed bookstacks management; budget monitoring; management information. The user interface will be consistent with the College Information System and will require no special technical skills. The System will have sufficient processing and storage capacity to provide a service to the projected number of users on campus and users remote from the campus, and also to maintain the expanding database of records. The Library System will provide access to a range of sources of data, documents and images, internal and external to College. There will be terminals designed for use by disabled persons placed in Library Reading Rooms.

Benefits

The system will have the flexibility to respond to developing research and teaching needs by providing accurate tools for locating information and giving access to resources without necessarily acquiring and maintaining local holdings. The Library System will empower College members to take more direct control of their information needs by facilitating self-service functions, giving a service less dependent on the constraints of staff resources, opening hours and physical space. This independence will free teaching staff from routine information transfer and allow time for developing teaching methods and learning skills. Teachers can be confident that students will have good access to their core reading requirements. In providing access to remote resources and end documents, the System will enable the development of educational initiatives such as self-paced learning, distance education and mechanisms for teaching large classes.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	2	305	32	27	27	393
IS Service Pay Cost	0	178	87	87	87	439
IS Service Non-pay Cost	0	83	71	71	71	296
User Cost	25	412	132	127	127	823
Gross Total Cost	27	978	322	312	312	1951
Financial Benefit	0	154	154	154	154	616
Nett Total Cost	27	824	168	158	158	1335

Table 2.7: Summary of Project Number 9407

Electronic Storage and Transformation of Library Texts and Resources - Pilot Project

Project Number: 9408 | *Working Group:* Library

Description

A Pilot Project will investigate the costs and benefits of creation of electronic documents from library-held materials, importing electronic documents from remote sources, and electronic Journal Subscriptions. The aims of the pilot project will be to investigate the technical and practical issues relating to delivery of electronic documents to users and storage of electronic texts. The Project Manager will complete a report after the implementation of the Pilot giving the results and of the technical, practical and costs issues.

Benefits

The proposal contributes to College goals in providing published information in the appropriate media for current research and teaching activities. As documents produced for research and teaching are increasingly created in electronic format, it is important that primary literature requirements are fulfilled appropriately. Students will have access to recommended reading materials and scholars have timely supply of research publications. In particular, electronic delivery of materials from closed access will significantly reduce delays to users. The research process will be enhanced as delivery of local and remote sources of information can be extended from the reading rooms to users' offices and workplaces and beyond the campus. The transformation of text information for students is a new approach and will enable developments in teaching and learning including self-paced learning and distance education. New exercises for course work can be devised. For researchers using historical sources, the availability of key documents in electronic formats will permit novel investigative techniques for textual analysis and allow their use away from in-library microfilm equipment.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	7	0	0	0	0	7
IS Service Pay Cost	8	27	16	16	16	83
IS Service Non-pay Cost	2	4	4	4	4	18
User Cost	36	77	20	22	24	179
Gross Total Cost	53	108	40	42	44	287
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	53	108	40	42	44	287

Table 2.8: Summary of Project Number 9408

Study on Application of Smart Warehousing in Santry Book Repository

Project Number: 9409 | *Working Group:* Library

Description
Examination of technology applicable to storage and retrieval of items in Santry Book Repository.

Benefits
The study will provide essential information on the potential for automating the handling of print materials in the Santry Book Repository which currently houses 70% of the Library's holdings. Its remoteness from the campus renders it an under-used resource of academic information. This study will identify the most suitable storage and retrieval methods for the management of the repository so as to maximize the use of this material. Any mechanism to increase the use of information resources will enhance the effectiveness of the College's main business of research, teaching, and learning.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	2	0	0	0	0	2
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	20	0	0	0	0	20
Gross Total Cost	22	0	0	0	0	22
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	22	0	0	0	0	22

Table 2.9: Summary of Project Number 9409

Special Research and Personal Information Services from the Library System - Pilot Project

Project Number: 9410	*Working Group:* Library

Description
A Pilot Project will investigate technical and practical matters relating to the incorporation of a Departmental library into the Library Systems Database. This pilot will extrapolate the costs and technical issues relating to the creation of electronic versions of material on students' Reading Lists, and methods of access from project 9408: Electronic Storage and Transformation of Library and Resources - Pilot Project. Sample College research publications will be obtained to investigate their capture, archiving and retrieval. A report will be completed after the implementation of the Pilot giving results of the technical, practical and cost issues.

Benefits
To maintain high standards of research and teaching, it is essential that all available information resources are exploited to the maximum. This proposal extends the Library System to incorporate access to resources already on campus. These resources have been created or obtained at considerable expense and effort by College, and for Departmental libraries mainly represent research information. By giving greater visibility and access to these collections, the Library System will enable further academic work, building on this information and, at the same time, to promote a view of the breadth of research interest in Trinity by its network connections.

Maximising the use of reading-list texts by students will enhance the teaching activity of the College, freeing teaching time from routine information transfer to allow for concentration on developing teaching methods and learning skills. It will allow the exploration of novel approaches to information delivery and dissemination.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	10	6	0	3	19
IS Service Pay Cost	0	4	4	2	2	12
IS Service Non-pay Cost	0	2	3	3	3	11
User Cost	0	18	12	10	10	50
Gross Total Cost	0	34	25	15	18	92
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	34	25	15	18	92

Table 2.10: Summary of Project Number 9410

Availability of Information on Research Interests and Expertise within College

Project Number: 9411	*Working Group:* Research

Description
This service is concerned with the provision of research and expertise information for the Research Information Office with a networked link between the PC and a UNIX workstation in the IS Service which in turn acts as a server of the information for the WWW. The relevant extracts from the database would be downloaded regularly to the workstation. From the user's viewpoint, this means that the information on the WWW would be up-to-date and consistent with that in the database. Updates to the WWW can be made regularly or can be triggered when changes in the relevant portion of the underlying database occur. The amount of information available to the user could be more easily increased by use of this automatic extraction than with the manual extraction which remains limited by its labour intensive nature.

Benefits
Obviously Trinity's entry on the WWW will be used by many around the world as a 'view' on the College and its ongoing activities. The proposed service will provide the public with a chance to see the quality of teaching and research that is carried out within the College. By providing such information the public should see more easily that Trinity is a resource which is in itself, by way of quality research and teaching providing a valuable service within Ireland. Details of present collaboration with other institutions would also be made as part of the Trinity entry. By indicating success stories arising from existing collaboration with other companies and institutions, further collaboration will be fostered.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	3	0	0	2	0	5
IS Service Pay Cost	12	4	2	2	2	22
IS Service Non-pay Cost	2	2	2	2	2	10
User Cost	5	0	0	0	0	5
Gross Total Cost	22	6	4	6	4	42
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	22	6	8	6	4	42

Table 2.11: Summary of Project Number 9411

Computer Graphics Facility

Project Number: 9412 | *Working Group:* Research

Description

High quality 2D and 3D computer graphics is an important, often essential, tool for a range of academic activities. It is vital to the Molecular Sciences, to many aspects of Physics and Engineering, and in other areas where images must be stored, manipulated, and evaluated. Based on an initial grant from external sources, the TCD Molecular Graphics Facility has provided a 3D computer graphics capability to members of the Science Faculty over the past five years. The aim of this project is to renew the facility and broaden its scope, providing a general Computer Graphics Facility which will secure the future of the molecular graphics activity and also satisfy the needs of a large number of other potential users. The Facility will provide a graphics front-end for the High Performance Computing Service and will be managed in conjunction with it. In order to cope with the projected demand it is proposed that, as a minimum requirement, the Facility should comprise three Silicon Graphics workstations of varying capabilities, with maintenance of appropriate software, and a hard-copy facility.

Benefits

The Graphics Facility will make vital contributions to many research programmes with the College, including the visualisation of results from advanced computational work on quantum mechanics, visualisation of biological macromolecules, computer-aided molecular design, visualization of results of surface minimisation and its relevance to the structure of foams. Although mainly used in research (and thus in teaching at postgraduate level), the Molecular Graphics Facility can also be of great value in undergraduate teaching. It has been used to demonstrate the principles of molecular structure and intermolecular interactions to students at both freshman and sophister level.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	6	5	8	19
IS Service Non-pay Cost	0	0	16	16	18	50
User Cost	0	0	134	0	40	174
Gross Total Cost	0	0	156	21	66	243
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	156	21	66	243

Table 2.12: Summary of Project Number 9412

Graduate Student Facilities

Project Number: 9413 | *Working Group:* Research

Description

Due to the increasing amount of valuable information available through the Internet, it is essential that each postgraduate student have unlimited access to the full Internet system. This includes, email, FTP, Telnet, News, Gopher, World Wide Web.
Research software resources are also required: statistical/data-analysis software, word processing/diagram production software, database/data archival software (with support for programming and customisation), text manipulation and processing facilities, mathematical packages, data visualisation systems. These facilities constitute a subset of the project 9421: A Set of Common Software Facilities for Staff and Students.

Benefits

Improving the infrastructure available for researchers within College will bring an improvement in the research potential and, hopefully, the quality of research itself. Currently, too much time is being devoted by researchers in re-inventing wheels, writing software that cannot be afforded. In providing this software and suitable platforms to run the software, we release the student from unnecessary work and thus maximise the time available. In providing real publication quality facilities for papers and presentations we allow individuals to create professional presentations of their results and show off the talent fostered by the College to its maximum potential.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	0	0	0	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	0	0	0

Table 2.13: Summary of Project Number 9413

Pilot Project - Use of Portable Information Systems in Teaching

Project Number: 9414	*Working Group:* Education and Teaching

Description
This project intends to provide, on a pilot basis, the appropriate hardware, software and support to stimulate the use of IS in teaching in two academic departments in College. The proposal would make available the following resources to each department anApple Macintosh Powerbook computer or PC compatible laptop, a colour LCD display panel, a high specification overhead projector, a portable screen, training in the use of the this equipment, a suite of software corresponding to the project 9421 (A Set of Common Software Facilities for Staff and Students), software to allow use of MS DOS disks and files, training in the use of presentation software. At the end of the pilot, projected to last one academic year, the department would be offered the equipment at a discounted price. If this offer is not taken up then the pilot is repeated in another department. The proposal envisages the possibility of the pilot being run three times with the initial capital outlay being written off after three years.

Benefits
The proposal aims to improve the teaching process in College by improving access to the resources of the College Information System at the point where teaching is being conducted. In recognising the increasing role IS will play in the teaching process, the proposal is concerned to explore the most efficient and effective ways in which this can be achieved. The pilot is a necessary exercise prior to significant future investment in this area which is very likely to take place in a 5-10 year time frame.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	17	1	1	0	19
IS Service Pay Cost	0	2	1	1	0	4
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	3	3	3	0	9
Gross Total Cost	0	22	5	5	0	32
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	22	5	5	0	32

Table 2.14: Summary of Project Number 9414

Software for Reliable Electronic Submission of Coursework	
Project Number: 9415	*Working Group:* Education and Teaching

Description
This project is to commission a system to allow students to submit course-work or other exercises electronically in a simple and reliable way. To do this, senders and recipients will have to be uniquely and securely identified, and the submission will have to be correctly authorized, recorded, and receipted.
The system will also allow users to invoke other services during submission of work, for instance virus checking programs, style & plagiarism analysis programs, attendance monitoring programs, *etc.*

Benefits
This project will first be run on a pilot basis to allow the users and the IS service providers to assess and to measure the likely benefits, resources, and the efficiency of commissioning the service.

This project should improve the quality of teaching in the College by its effect on the processing of continuous assessment. Many courses are already making do with other systems of course work submission; hence widespread use of this software is assured as soon as it becomes available. In addition, it might remove a difficulty that many see in the use of computers for continuous assessment work.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	5	5	5	15
IS Service Pay Cost	0	0	35	37	75	147
IS Service Non-pay Cost	0	0	0	0	1	1
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	40	42	81	163
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	40	42	81	163

Table 2.15: Summary of Project Number 9415

Replacement of Existing Student IS Equipment.

Project Number: 9417 | *Working Group:* Student Affairs

Description
This project allows for the maintenance and upgrade of the existing central student computing facilities. It is an essential element of the College academic IS Service, and forms part of the basis for the service levels provided in Project 9418.

Benefits
This proposal provides for the upkeep of a core teaching tool, and therefore directly supports both teaching and research activities. Arguably, failure to implement this programme of replacement will seriously damage the standards of teaching in College. This proposal aims to maintain our technological reputation. It will be unable to do this unless there is some expansion of services, but unless we maintain existing services there is no point in expanding.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	106	64	0	46	106	322
IS Service Pay Cost	95	93	86	93	95	462
IS Service Non-pay Cost	22	22	22	22	22	110
User Cost	0	0	0	0	0	0
Gross Total Cost	223	179	108	161	223	894
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	223	179	108	161	223	894

Table 2.16: Summary of Project Number 9417

Provision of Appropriate Additional Equipment for Student IS Needs

Project Number: 9418 | *Working Group:* Student Affairs

Description

This project addresses the provision of appropriate equipment required to address the likely IS needs of students in the future. The service consists of three parts: an increase in traditional fixed computer laboratories for both teaching and independent use, a notebook computer lending facility which is intended to help bridge the gap between the current emphasis on static computing facilities and the expected future use of portable machines, and the encouragement of student ownership of computers.

Increased Laboratory Space: the commissioning of six new static laboratories over a two year period is recommended.

Lending Facility: a substantial number of machines will be made available to students on short-term loans.

Encouraging Ownership: College will attempt to encourage students to purchase their own computers by negotiating prices on standard models with suppliers and by arranging discounted loans.

CWIS Access: Facilities to access the mooted CWIS will be provided in Libraries and in three other locations in College.

Benefits

This proposal greatly improves the IS facilities available for teaching and learning use: it upgrades the facilities from the current inadequate level to an improved level. It is a prerequisite for the expansion of the use of information systems by students.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	275	215	75	10	565
IS Service Pay Cost	0	75	121	128	133	457
IS Service Non-pay Cost	0	23	40	46	46	155
User Cost	0	44	40	15	0	99
Gross Total Cost	0	417	416	264	189	1286
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	417	416	264	189	1286

Table 2.17: Summary of Project Number 9418

Graphic Workshop and Multimedia Design Centre.

Project Number: 9419 | *Working Group:* Student Affairs

Description
The service will consist of a graphics workstation with scanning editing and printing facilities, video recording facilities for rent/loan, a sound workstation with sound recording and editing facilities, a PC workstation for cross platform development and programming, and a video workstation with video capture and editing facilities.
Because of the size of these file types, extra disk storage and a backup facility will also be needed.

Benefits
Heretofore academics have been inhibited in making top class presentations by the absence of suitable resources. This proposed service will go some way to filling this void and will be a considerable benefit to staff and students alike in the education process, enhancing teaching skills and making available tools and techniques which students will use later in their careers. Academic staff who travel abroad to other universities and colleges will now have the facilities to produce the highest quality material for their talks and presentations. The training of people in the use of these techniques will also increase the quality of our entries on the WWW (World Wide Web) further enhancing the image of Trinity with the international community.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	74	0	0	0	74
IS Service Pay Cost	0	43	43	43	43	172
IS Service Non-pay Cost	0	20	20	20	20	80
User Cost	0	5	0	0	0	0
Gross Total Cost	0	142	63	63	63	331
Financial Benefit	0	22	22	22	22	88
Nett Total Cost	0	120	41	41	41	243

Table 2.18: Summary of Project Number 9419

Undergraduate Access to the Internet	
Project Number: 9420	*Working Group:* Student Affairs

Description
A broadly representative selection of undergraduate students will be given access to the Internet during the academic year 1995-1996 as part of a pilot study to evaluate the costs and benefits of providing such access. These students will also be part of the pilot project contained in proposal 9405 (Access to Electronic Communication — E-mail, news — for all Students and Staff).

Benefits
This project will first be run on a pilot basis to allow the users and the IS service providers to assess and to measure the likely benefits, resources, and the efficiency of commissioning the service.

The primary benefit of this pilot project will to establish whether or not there are significant pedagogical merits in allowing undergraduates access to the Internet. The purported merits include on-line access to newly developed software, for example computer-based learning packages in their own subjects; databases, of such diverse information as share prices, exchange rates and genetic structures; state of the art research papers written by academics worldwide; on-line profiles of international organisations, such as the World Bank, *etc.*. Access to remote learning facilities may also benefit staff and student in Trinity. Academics who wish to link their Trinity courses into this system can easily do so. Staff may also be more willing to teach novel material if they have support from colleagues on the Internet who are engaged in similar exercises.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	10	0	0	0	10
IS Service Pay Cost	0	10	0	0	0	10
IS Service Non-pay Cost	0	3	0	0	0	3
User Cost	0	8	0	0	0	8
Gross Total Cost	0	31	0	0	0	31
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	31	0	0	0	31

Table 2.19: Summary of Project Number 9420

A Set of Common Software Facilities for Staff and Students	
Project Number: 9421	*Working Group:* Networking and Architecture

Description
This project will provide: a basic set of services including word processing, drawing, spreadsheet, e-mail, an interface to the Campus Wide Information System (CWIS), printing services *etc.*, a single transparent College-wide file system allowing users access to common application programs (word processor, spreadsheets, *etc*) as well as allowing easy exchange of files between users in different parts of College using different systems (Mac, PC and Unix), and provision of appropriate end-user software tools to enable access by all users to the College network. Central to this proposal is the assumption that there is an extensive College network in place providing communication links between all areas in College. The proposal is null and void without such an underlying service. (It is also assumed that there are connections to the external world. The working assumption is that all users have external e-mail with staff and postgraduates having full Internet access.) Equally, it is assumed that users are trained in the use of the desktop. Again if they are not then the proposal should be implemented.

Benefits
Central to excellence in teaching and research is the gathering, distillation and dissemination of information and, by implication, knowledge. This proposal, if adopted, would give the College community access to state-of-the-art tools to help carry out these tasks.
College rightly prides itself on its collegiate nature and no technology can replace essential human core of the institution. That said, the size of the College has grown, and the complexity of the world in which it operates has become so huge that the functionality proposed by the standard desktop is essential to manage the sheer volume of information that must be processed.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	167	153	136	167	150	773
IS Service Pay Cost	175	176	176	176	176	879
IS Service Non-pay Cost	22	35	47	57	62	223
User Cost	0	0	0	0	0	0
Gross Total Cost	364	364	359	400	388	1875
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	364	364	359	400	388	1875

Table 2.20: Summary of Project Number 9421

Wide Area Network

Project Number: 9422 | *Working Group:* Networking and Architecture

Description

The Wide Area Network project is intended to allow for, and facilitate increased access to the international information superhighway: the Internet, WWW, and international e-mail. The costs arise mainly from the communication charges attendent to increased volumes of data being traded and the provision of a secure College network interface.

Benefits

Participation in the Internet will make an enormous and direct contribution to the achievement of College goals, and two-way participation will also allow College to make an enhanced contribution to society on an international scale.

Users will have on-line access to newly developed software, for example computer-based learning packages in their own subjects; databases, of such diverse information as share prices, exchange rates and genetic structures; state of the art research papers written by academics world-wide; on line profiles of international organisations, such as the World Bank. All such information will be available in a much more timely fashion than using any older communications technology. As this information is easily reproduced, pressure will be taken off overcrowded library facilities in certain areas.

Complete courses are already being given over the Internet, most collaboratively. Those academics who wish to link their Trinity courses into this system can easily do so, provided that Trinity students have the requisite access to the external parts of the courses.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	25	0	0	0	25	50
IS Service Pay Cost	40	29	29	29	29	156
IS Service Non-pay Cost	122	124	124	124	124	610
User Cost	0	0	0	0	0	0
Gross Total Cost	187	153	153	153	178	824
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	187	153	153	153	178	824

Table 2.21: Summary of Project Number 9422

The College Network	
Project Number: 9423	*Working Group:* Networking and Architecture

Description
The goal of this project is to ensure that everyone in College has a connection to the current 10 Mbps shared Ethernet and to upgrade the backbone network in college to ensure it will be able to cope with the new areas being connected and to allow for future expansion. This involves installing three ATM (Asynchronous Transfer Mode) switches and progressively moving the backbone from Ethernet to ATM running at 155 Mbps. These actions will increase the resilience of the network when power outages occur. Un-interuptable Power Supplies (UPS) will be installed at three key locations. Finally, sophisticated network management tools which are required to manage the network will be installed.

Benefits
The network will be College's information highway. What information we care to send over it is what will determine how well College will meet its goals over the coming years. It is the services which can be provided via the network that help us to meet the goals of College. It makes as much sense to try and run college without a proper network as it does to try and do it without a telephone system or a library.
The current network has evolved in a less than satisfactory way. With the connection of Arts Block users to the network and the wide-spread deployment of information systems around College, the need for a substantial network infrastructure to be put in place is of the essence in order to connect all members of college and to support the projected load that will be placed on the system.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	309	117	136	31	177	770
IS Service Pay Cost	109	109	109	66	66	459
IS Service Non-pay Cost	30	44	54	54	74	256
User Cost	24	0	0	0	24	48
Gross Total Cost	472	270	299	151	341	1533
Financial Benefit	59	59	59	59	59	295
Nett Total Cost	413	211	240	92	282	1238

Table 2.22: Summary of Project Number 9423

Home Access	
Project Number: 9424	*Working Group:* Networking and Architecture

Description
The project will allow end-users the ability to use the University's Computer Systems from remote locations outside of the main College campus, especially the home. The end-user will be able to use the same logon procedures and access the same information as he/she would in the office but this service would operate at a slower speed than the College Network. This will involve the installation of up to thirty-two 28,800 Baud V34 Modems connected to 2 MicroAnnex XL Server or similar running over the current Public Switched Telephone Network (i.e. Existing telephone lines). The system will be implemented in phases, over a two year period depending on the demand for the service.

Benefits
The implementation of this proposal will allow for ease of access to a large volume of information, to all who require it in a simple manner from their most convenient location. This will give everybody, including those unable to attend the College, for whatever reason, to take advantage of the information available. Clearly, the primary advantage of the project is that it will ease demand for increasingly-scarce space in College by allowing people to work remotely, *e.g.* from home or from other countries, when necesary.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	23	18	0	0	23	64
IS Service Pay Cost	30	21	12	12	30	105
IS Service Non-pay Cost	5	7	8	8	8	0
User Cost	0	0	0	0	0	0
Gross Total Cost	58	46	20	20	61	205
Financial Benefit	3	3	3	3	3	15
Nett Total Cost	53	43	17	17	58	190

Table 2.23: Summary of Project Number 9424

Implementation of Helpdesk to replace present Computer Laboratory support function

Project Number: 9425 | *Working Group:* User Support and Training

Description

The Helpdesk will provide the first point of contact for computer users in College. It will incorporate a telephone, e-mail and a 'person-to-person' support feature. Telephone support will be via a single telephone number, which will be staffed by two persons who will deal with all incoming telephone contact. Calls will be logged to register the user details and the substance of the request; the call will then be referred to the appropriate support person. Two teams will support the telephone personnel: one team of two people will deal with all enquiries from users calling in person to the helpdesk while the other, consisting of four people, will handle queries, both referred by the telephone support staff and also by the staff dealing with people who call in person. These backup support staff will have the flexibility to visit users on-site within a short period and they will have the technical expertize to solve a wide range of problems. One member of this staff will have responsibility for supporting remote micro-clusters while remaining in radio contact with helpdesk control. Appropriate support software will be installed to ensure effective logging of all requests and to ensure that an audit trail is constructed which can easily provide information on the progress of the request being resolved.

Benefits

With the increasing role of Computers in the everyday academic life of College there is a growing responsibility on such systems to respond to the needs of our academic community. The efficient processing of queries by the helpdesk will considerably reduce the load placed on academics by their involvement with computers as a teaching tool. The development of the FAQ database will also provide an invaluable resource which should enable them to devote more time to the development of their students without having to become enmeshed in the mechanics of the computer's operation. When the community comes to regard the computer as an efficient and powerful tool without the current reservations about its complexity and arbitrariness then will that fundamental commitment of College to the advancement of learning be greatly enhanced. The role of the helpdesk in establishing itself in the forefront of this process of information dissemination is extremely important.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	93	0	0	0	12	105
IS Service Pay Cost	259	259	303	303	324	1448
IS Service Non-pay Cost	22	26	26	26	26	126
User Cost	50	0	0	0	0	50
Gross Total Cost	424	285	329	329	362	1729
Financial Benefit	172	172	172	172	172	860
Nett Total Cost	254	113	157	157	190	869

Table 2.24: Summary of Project Number 9425

Training for Graduate Students in Information Systems and Research

Project Number: 9426 | *Working Group:* User Support and Training

Description
The goal of this service is to afford graduate students the opportunity to equip themselves with the basic skills required to exploit the College's IS facilities, focussing on the planning, researching and writing of a thesis.
It will involve 6 day series of course modules, the series will be held twice yearly, and students will register for individual modules.

Benefits
The proposal is geared to the improvement of the research process, culminating in thesis production, by means of the appropriate use of computer-based facilities. Increasingly post-graduate students are drawn towards the use of computers in conducting their research and in producing their theses. In many cases this proves to be a much less fruitful experience than it should be due to lack of guidance and training in the initial stages.
This service will promote efficient use of costly and scarce IS facilities and efficient use of Helpdesk services as students lacking training rely more heavily on central support.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	3	3	3	3	12
IS Service Non-pay Cost	0	3	4	4	4	15
User Cost	0	1	2	2	2	7
Gross Total Cost	0	7	9	9	9	34
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	7	9	9	9	34

Table 2.25: Summary of Project Number 9426

Initial Training of Incoming Junior Freshmen and Evening Students (Student Training proposal T1)

Project Number: 9427	*Working Group:* User Support and Training

Description
This service will give incoming Junior Freshmen and incoming Evening Students an outline introduction to the CWIS.

Benefits
These students will be able to use the basic features of the system and will be prepared to learn more as required. The service provides for a first - small but essential - stage in giving students access to remote sources of information (hence supporting research). It also familiarises them with tools that may be used for the enhancement of teaching and learning using information systems. For some students, it may provide an initial meaningful introduction to computer systems, and overcome ignorance or fears of technology . This would be a contribution to the students' general education for living in the technological age (in the national and wider international community).

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	1	1	1	1	4
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	1	1	1	1	4
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	1	1	1	1	4

Table 2.26: Summary of Project Number 9427

Initial Training of Undergraduate Students in College
when CWIS is introduced (Student Training proposal T2)

Project Number: 9428 | *Working Group:* User Support and Training

Description
This programme will give continuing undergraduate students an outline introduction to the CWIS.

Benefits
They will be able to use the basic features of the system and will be prepared to learn more as required. Provided that its is accompanied by appropriate staff training — so that the students are not frighteningly ahead of the less computer-literate staff in this respect! — the proposal should enhance internal views of College and help to counteract perceptions of non-communication and unavailability (or invisibility) of information.

The value of the services provided by the CWIS, and hence of College's investment in the system, will be greatly decreased if students were unaware of its existence and importance and were unprepared to use it.

The proposal provides for a first — small but essential — stage in giving students access to remote sources of information (hence supporting research). It also familiarises them with tools that may be used for the enhancement of teaching and learning using information systems.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	2	0	0	0	2
IS Service Non-pay Cost	0	1	0	0	0	1
User Cost	0	0	0	0	0	0
Gross Total Cost	0	3	0	0	0	3
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	3	0	0	0	3

Table 2.27: Summary of Project Number 9428

Basic Computer Literacy for Junior Freshman (Student Training Proposal T3)

Project Number: 9429	*Working Group:* User Support and Training

Description
This programme will allow Junior Freshmen to achieve competence in basic information-processing skills: machine management, word processing and the use of email; also, knowledge of the internet.

Benefits
Students will have the basic IS skills appropriate for their work in College, and will therefore be equipped both to work and to use resources efficiently; they will also be prepared to learn more as required. Provided that it is accompanied by appropriate staff training - so that the students are not frighteningly ahead of the less computer-literate staff in this respect! - the proposal should enhance internal views of College.
Internal collaboration will be improved, notably in terms of communication between staff and students by the use of E-mail and opportunities for more help with academic writing (with the production of legible drafts that are easily updated to incorporate lecturers' suggestions). Students who have learnt good machine management and are familiar with one applications package (word processing) will be better prepared to extend their IT skills to other areas helpful in learning and in research (use of databases, statistical packages, and so forth).

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	3	1	1	1	6
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	6	6	6	6	24
Gross Total Cost	0	9	7	7	7	30
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	9	7	7	7	30

Table 2.28: Summary of Project Number 9429

Certification of IS Literacy for Junior Freshman Students (T4)

Project Number: 9430 | *Working Group:* User Support and Training

Description
This service is designed to administer a test to all students completing training proposal T3, to mark work submitted as a result of the teat and to issue a certificate to all who pass.

Benefits
Motivation and reward for students satisfactorily completing the programme; higher standards than would otherwise be the case reached by at least some. Certification may provide the impetus to achieve competence and hence gain confidence in using computers. Especially for mature students, this may help to overcome ignorance or fears of technology. It would therefore be a contribution to the students' general education for living in the technological age (in the national and wider international community). Assuming that certification leads to enhanced expertise for many students, internal collaboration will be improved, notably in terms of communication between staff and students by the use of E-mail, and opportunities for more help with academic writing (with the production of legible drafts that are easily updated to incorporate lecturers' suggestions). Again assuming that certification leads to enhanced expertise, postponement of the project would have adverse consequences: costly facilities might be inefficiently used; the Helpdesk would receive many calls for help that could have been obviated, so valuable human resources would be wasted.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	3	3	3	3	12
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	3	3	3	3	12
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	3	3	3	3	12

Table 2.29: Summary of Project Number 9430

Initial Training of Incoming Graduate Students (Student Training proposal T5)	
Project Number: 9431	*Working Group:* User Support and Training

Description
This training programme is intended to give incoming Graduate students an outline introduction to the CWIS.

Benefits
The students will be able to use the basic features of the system and will be prepared to learn more as required. The programme provides for a first — small but essential — stage in giving students access to remote sources of information (hence supporting research). It also familiarises them with tools that may be used for the enhancement of teaching and learning using information systems. For some students, it may provide an initial meaningful introduction to computer systems, and overcome ignorance or fears of technology. This would be a contribution to the students' general education for living in the technological age (in the national and wider international community). Provided that its is accompanied by appropriate staff training - so that the students are not frighteningly ahead of the less computer-literate staff in this respect! - the proposal should enhance internal views of College and help to counteract perceptions of non-communication and unavailability (or invisibility) of information. Internal collaboration will be improved notably in terms of communication between staff and students and enhancement of non-academic aspects of College life (activities of clubs and societies).

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	0	0	0	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	0	0	0

Table 2.30: Summary of Project Number 9431

Initial Training of Graduate Students in College
when the CWIS is introduced (Student Training Proposal T6)

Project Number: 9432	*Working Group:* User Support and Training

Description
This programme will give continuing graduate students an outline introduction to the CWIS.

Benefits
As a result, the students will be able to use the basic features of the system and will be prepared to learn more as required. The proposal provides for a first — small but essential — stage in giving students access to remote sources of information (hence supporting research). It also familiarises them with tools that may be used for the enhancement of teaching and learning using information systems. For some students, it may provide an initial meaningful introduction to computer systems, and overcome ignorance or fears of technology (the presence of which are referred to in the paper provided by the Student Counsellor). This would be a contribution to the students' general education for living in the technological age (in the national and wider international community). Provided that it is accompanied by appropriate staff training - so that the students are not frighteningly ahead of the less computer-literate staff in this respect! - the proposal should enhance internal views of College and help to counteract perceptions of non-communication and unavailability (or invisibility) of information. Internal collaboration will be improved, notably in terms of communication between staff and students and enhancement of non-academic aspects of College life (activities of clubs and societies.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	0	0	0	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	0	0	0

Table 2.31: Summary of Project Number 9432

Training in IS for staff in College

Project Number: 9433	*Working Group:* User Support and Training

Description
A two-member group is to be established in the User Support Group in the IS Service. This group is to be exclusively concerned with the training programme. Room 25 in Pearse St will be upgraded to a 12 unit teaching lab devoted to the training program. Cognisance will need to be taken of the different constraints under which different categories of staff operate. Academics indicate a greater willingness to avail of educational opportunities which are scheduled outside of lecture term whilst a great number of responses indicated that it would be preferable if courses were split into half day modules with a period of time in between for practice rather than an attempt to cover all aspects of the application in one period.
Checkback procedures will be set up so that the efficacy of the long term educational strategy can be monitored, these to include site visits and constant surveying of the user base, this can usefully by constant reference to, and updating of the user profile database created by the helpdesk team.

Benefits
This training programme will provide visible evidence of the commitment to training and because the team is involved full-time in training initiatives this will enable it liaise closely with our users in the upgrading of all such training initiatives. A better trained workforce in any area of operation benefits College. In the critical area of IS this is especially so.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	38	1	1	1	33	74
IS Service Pay Cost	44	43	43	43	43	216
IS Service Non-pay Cost	10	10	10	10	7	47
User Cost	0	0	0	0	0	0
Gross Total Cost	92	54	54	54	83	337
Financial Benefit	24	27	27	27	27	132
Nett Total Cost	68	27	27	27	56	205

Table 2.32: Summary of Project Number 9433

Optimising the Use of Current Systems in Processing Staff Pay Deductions

Project Number: 9434 | *Working Group:* Administration (Finance)

Description
The implementation of this project will allow all voluntary deductions to be processed through the Payroll System thereby completely eliminating the need for a separate Staff Incidentals System. It is also intendeed to automate the folding and inserting of payslips/cheques *etc.* into envelopes.

Benefits
At present, because of the large volumes (monthly: *c.* 1700; weekly/casual: *c.* 700) considerable time will be saved by automating this operation for which proven technology exists. This technology would also be used in other sections of the Finance Office, for example, for the issue of fee payment forms in the Student Fees Office and customer statements in the Debtors Office. This project aims to optimise scarce resources by making the most effective use of staff resources available and to make better use of the technology currently available to us by ensuring our ability to absorb increasing volumes of incidental/charge-out transactions without undue recourse to College's limited income which benefits both teaching and research. Immediate benefits can be achieved: *e.g.*, VHI deductions could be automatically loaded into the salaries deductions system

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	2	0	0	0	0	2
IS Service Pay Cost	4	0	0	0	0	4
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	9	11	3	2	3	28
Gross Total Cost	15	11	3	2	3	34
Financial Benefit	5	8	8	8	8	37
Nett Total Cost	10	3	(5)	(6)	(5)	(3)

Table 2.33: Summary of Project Number 9434

Rationalisation and Integration of Existing Student Administration Systems

Project Number: 9435 | *Working Group:* Administration (Senior Lecturer)

Description
The project comprises a series of small projects to rationalise and enhance the current portfolio of student administration systems. The projects seek to avoid duplication of processes, provide for data input at source, avoiding unnecessary memoranda, improve integration between systems, automate some routine tasks, improving efficiency, provide for more detailed information to be held in the database, and increase service levels to student.

Benefits
Analysis of course costs will assist in planning teaching programs. The efficient operation of administrative processes in International Student Affairs and the database of overseas universities will promote interaction with the international community
In general, a more efficient administrative function will efficiently support the academic community and allow them to concentrate on their prime functions; an unreliable inflexible administration would hamper College in responding to and predicting change in the national and international environment.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	20	0	0	0	20	40
IS Service Pay Cost	55	19	4	4	4	86
IS Service Non-pay Cost	0	1	1	1	1	4
User Cost	1	0	0	0	0	1
Gross Total Cost	76	20	5	5	25	131
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	76	20	5	5	25	131

Table 2.34: Summary of Project Number 9435

Management Information System for Student Administration Database	
Project Number: 9436	*Working Group:* Administration (Senior Lecturer)

Description
Development of a Management Information System for the Student Administration Database. This will provide access for academic staff and various administrative offices including: Faculty Offices, Secretary's Office, Academic Departments, Staff Office, International Student Affairs Office, Enquiries Office, Finance Office, Buildings Office, Senior Tutor and Tutors, Accommodation Office, Security, Development Office, Student Health to a variety of information repositories. These include: Student Record (undergraduate and postgraduate), Teaching Information System (including room booking), Examination Administration System, Alumni, International Student Affairs, Direct Applicant and CAO file. College officers will have access to a Management Information analysis system

Benefits
The proposal will assist the college in its mission as set out in Section 2.2.2 of the CARC Report 'Strategic Planning' chapter by providing a tool to explore various teaching options. The ability to analyse course costs and popularity, and to make projections based on various possible decisions, will assist in the effective planning of teaching programs. It will be possible to measure college performance against entry qualifications and thus identify key requirements, enabling college to select the more appropriate students for a course. Analyses of final results *vs.* options followed could assist in assessing the merits of new teaching methods. The greater access to the student administration database will promote combined responsibility between departments, both academic and administrative to ensure its accuracy and currency.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	2	1	33	0	0	36
IS Service Pay Cost	10	17	33	12	12	84
IS Service Non-pay Cost	2	3	7	4	4	20
User Cost	0	3	0	0	0	0
Gross Total Cost	14	24	73	16	16	140
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	14	24	73	16	16	140

Table 2.35: Summary of Project Number 9436

Proposal to provide on World Wide Web the Calendar, the College prospectuses, the Alumni files, general statistics, course handbooks, College Gazette and Listings, lecture and examination timetables.

Project Number: 9437	*Working Group:* Administration (Senior Lecturer)

Description
This project will provide an electronic version of the following so that they can be consulted on-line
(a) The University Calendar and supplement (in modified form
(b) College prospectuses: Undergraduate, Postgraduate (Part 2 of Calendar), and International Student Affairs prospectus
(c) Course handbook
(d) Statistics - such as undergraduate and postgraduate student numbers, number of staff, number of library volumes, pay scales, etc
(e) Alumni files, which contain name, year of graduation and degree
(f) Lecture timetables and examinations timetable
(g) College Gazette and Listings

Public access PCs in the Arts Building and Hamilton Building concourses will be installed to facilitate access to the above information

Benefits
The benefits of this project are many: Promotion of TCD nationally and internationally by developing an awareness of its activities and its excellence as a third level educational institution; enhancement of awareness of TCD as a national and international centre of excellence; integration of TCD as part of the community, both nationally and internationally; the provision of user friendly information, would attract well-qualified applicants and who would become high calibre graduates.
In addition, potential employers will be able to see the broad academic base and levels of specialisation offered within College.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	10	0	10
IS Service Pay Cost	3	0	0	22	6	31
IS Service Non-pay Cost	1	0	0	1	0	2
User Cost	0	0	0	8	0	8
Gross Total Cost	4	0	0	41	0	51
Financial Benefit	0	0	0	5	10	15
Nett Total Cost	4	0	0	36	(10)	26

Table 2.36: Summary of Project Number 9437

Produce up-to-date version of Catalogue of Graduates and Alumni Dublinienses, and Red Calendar.

Project Number: 9438	*Working Group:* Administration (Senior Lecturer)

Description
The objective of this project is to produce up-to-date published version of the Catalogue of Graduates, the *Alumni Dublinienses*, and the Trinity College Record Volume - Red Calendar.

Benefits
The execution of this project will promote awareness of Trinity College at home and abroad by providing information on Alumni to graduates and descendants of graduates. The image of Trinity College as a centre of learning and research may also be enhanced by highlighting achievements of famous graduates. In promoting an awareness of availability of Alumni information, more enquiries, interest and visitors may be attracted.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	2	0	2
IS Service Pay Cost	0	0	0	20	0	20
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	9	9
Gross Total Cost	0	0	0	22	0	31
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	22	9	31

Table 2.37: Summary of Project Number 9438

Database of External Bodies with Links to TCD for Fundraising, Research Sponsorship, and Careers & Appointments

Project Number: 9440, 41, 43	*Working Group:* Administration (General and Infrastructure)

Description

A database will be developed comprising information appropriate to the needs of the Development Office in all aspects of fund-raising and related activities. The database will also contain information on employers and graduates that is relevant to the Careers and Appointments Office. In year two, the Research and Innovation Service will join the system for use in obtaining funding and for promoting collaboration in research projects.
The existing Alumni database will be the definitive source of home addresses, Seanad correspondence addresses, and of academic data for alumni. The new database will be the source of employment data about graduates, employers, and other external bodies. The Development Foundation, the Research and Innovation Service, and the Careers and Appointments Office will have different views of the data. The system will also incorporate a means of transferring addresses and employer details from the Careers and Appointments 'First Destination Returns' (FDR) system to the Alumni database. It will incorporate the means to transfer graduate addresses and graduation details from the Alumni database to the new database, and to transfer some business data back to the Alumni database.

This project is a rationalization of proposals 9440, 9441, and 9443.

Benefits

In the current economic climate, effective fund-raising is essential to fund research and to provide expensive equipment. An effecient and knowledgeable interaction with employers and corporations will improve College's standing and thus facilitating research partnerships and funding. An accurate and detailed knowledge of the graduates sought by employers provided a measure of the vlue of courses provided be College. The system will also improve the administrative efficiency of the Careers and Appointments Office thus allowing them more time to provide potential graduates with a quality service.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	25	2	3	0	7	37
IS Service Pay Cost	11	5	5	5	5	31
IS Service Non-pay Cost	9	11	10	9	10	49
User Cost	32	9	7	10	15	73
Gross Total Cost	77	27	25	24	37	190
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	77	27	25	24	37	190

Table 2.38: Summary of Project Number 9440

A computerised box-office system for the Samuel Beckett theatre

Project Number: 9442 | *Working Group:* Administration (General and Infrastructure)

Description
This project involves the commissioning of a computerised box-office system for Samuel Beckett theatre which will handle reservations, sales, ticketing and analysis of sales data.

Benefits
The system will make the theatre a more efficient service, increase security, and it will give single honors Drama Studies students experience of IS technology relevant to their studies. It will also enable market research & analysis/surveying of customers. Furthermore, outside touring performances (opera, ballet, performance art *etc.*) will be more easily accommodated.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	18	0	0	0	0	18
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	1	3	3	3	3	13
User Cost	0	0	0	0	0	0
Gross Total Cost	19	3	3	3	3	31
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	19	3	3	3	3	31

Table 2.39: Summary of Project Number 9442

Information System for Secretary's Office						
Project Number: 9444	*Working Group:* Administration (General and Infrastructure)					
Description This project is simply to provide the College Secretary with full access to the College information system and all relevant database systems.						
Benefits The benefits will be more efficient and effective administration.						
Costs						
Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	5	0	0	0	0	5
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	1	0	2	2	2	7
User Cost	1	0	0	0	0	1
Gross Total Cost	7	0	2	2	2	13
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	7	0	2	2	2	13

Table 2.40: Summary of Project Number 9444

Extended use of Staffmaster system, review of coding, and on-line access to central personnel by record departments.

Project Number: 9445	*Working Group:* Administration (General and Infrastructure)

Description
This project will entail a number of new services: on-line access will be provided for Heads of Departments and administrators to allow them to read certain fields in the personnel system. There will also be a review of coding to facilitate generation of Management Information and College Calendar. The project is also concerned with the development of a computerized attendance recording system using time-clocks (in areas where staff already clock-in/clock-out). Staffmaster facilities will also be better utilized to include recording of absences on a central system.

Benefits
Improvements in recording and analysis of absences is likely to result in fewer absences. A primary need of college is to achieve maximum efficiency with limited resources. Improvements in the level of attendance at work of staff would be a direct contribution to this. Better use of Reportwriter facility (Staffmaster system) would allow statistics and reports to be generated more quickly and in varied formats as required by the HEA, CSO and other organisations. More information held on staff and more easily accessible (on-line access by heads of departments, improved coding) should contribute to improved decision-making. Improved monitoring of absenteeism as well as the possibility of a reduction in absenteeism would contribute to more efficient running college. Confidence in the accuracy of absence records will enhance confidence in local management and improved attendance records will enhance perceived performance throughout college.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	6	0	0	0	0	6
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	6	0	0	0	0	6
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	6	0	0	0	0	6

Table 2.41: Summary of Project Number 9445

Sports Management System	
Project Number: 9446	*Working Group:* Administration (General and Infrastructure)

Description
This project will provide an integrated computer management system as an alternative to the present manual paper-intensive and complicated method presently in use. It will encompass all areas of sport in TCD — Sports Centre, DUCAC, Clubs, Grants, and all reports and accounts relating to same.

Benefits
There is an urgent need to modernise and improve the administration and standard of provision for sport through computerisation. This is due to the huge increase in the student numbers since the Sports Centre was opened. Although the College would not be severly damaged if this project does not proceed, it would not be possible to attain the levels of efficiency and effectiveness that are required by users of modern day sports centres and such as other universities, *e.g.* UCD and DCU, have realised.

Costs

Cost Category	1994/5	1995/6	1996/7	1997/8	1998/9	Total
IS Service Capital Cost	0	0	0	0	0	0
IS Service Pay Cost	0	0	0	0	0	0
IS Service Non-pay Cost	0	0	0	0	0	0
User Cost	0	0	0	0	0	0
Gross Total Cost	0	0	0	0	0	0
Financial Benefit	0	0	0	0	0	0
Nett Total Cost	0	0	0	0	0	0

Table 2.42: Summary of Project Number 9446

Information Systems and Services to be Commissioned *Immediately*	
Proposal Number	Title
9411	Availability of Information on Research Interests and Expertise within College
9413	Graduate Student Facilities (subset of 9421)
9417	Replacement of Existing Student IS Equipment
9408	Electronic Storage and Transformation of Library Texts and Resources
9421	A Set of Common Software Facilities for Staff and Students
9422	Wide Area Network
9423	College Network
9424	Home Access
9425	Implementation of 'Helpdesk' to replace Computer Laboratory Support Function
9402	Replacement of General, Purchases and Sales Ledger Systems
9434	Optimising the User of Current Systems in Processing Staff Pay Deductions
9435	Rationalisation and Integration of Existing Student Administration Systems
9437	An Insight into TCD - To Provide on World Wide Web the Calendar, the College Prospectuses, the Alumni files, *et. seq.*
9440)	Database of External Bodies with Links to TCD for Fund Raising,
9441)	Research Sponsorship, and Careers & Appointments
9443)	(Three proposals were rationalized following the evaluation.)
9444	Information System for the Secretary's Office
9445	Extended Use of Staffmaster System, Review of Coding, On-line Access to Central Personnel Record by Depts.

Table 2.43: Schedule of projects to be commissioned in the academic year '94/'95.

Information Systems and Services to be Commissioned in an *Intermediate* Time-Frame	
Proposal Number	Title
9414	Pilot Project - Use of Portable Information System in Teaching
9406	Provision of General Access Printing Facilities
9418	Provision of Appropriate Equipment for Student IS Needs
9420	Undergraduate Access to the Internet
9405	Access to Electronic Communication (E-mail, News) for all Students and Staff
9407	An Integrated Library System
9403	High Performance Computing Facilities for Trinity College
9426	Training for Graduate Students in Information Systems and Research
9427	Initial Training of Incoming Junior Freshmen and Evening Students (Student Training Proposal T1)
9428	Initial Training of Undergraduate Students in College when CWIS is introduced (Student Training Proposal T2)
9429	Basic Computer Literacy for Junior Freshmen (Student Training Proposal T3)
9430	Certification of IS Literacy for Junior Freshmen Students (T4)
9431	Initial Training of Incoming Graduate Students (Student Training Proposal T5)
9432	Initial Training of Graduate Students in College when the CWIS is introduced (Student Training Proposal T6)
9433	Training in I.S. for Staff in College
9436	Management Information System for Student Administration Database
9442	A Computerised Box-Office System for the Samuel Beckett Theatre

Table 2.44: Schedule of projects to be commissioned in the academic year '95/'96.

Information Systems and Services to be Commissioned in the *Future*	
Proposal Number	Title
9412	Computer Graphics Facility
9415	Software for Reliable Electronic Submission of Coursework
9404	IS Support for Extra-Curricular Activities
9419	General Access Multimedia Production and Peripheral Facilities
9409	Study of Application of Smart Warehousing in Santry Book Repository
9410	Special Research and Personal Information Services from the Library System
9401	Updgrade the Student Fees System
9438	Produce Up-to-Date Version of Catalogue of Graduates and Alumni Dubliniensis, and Red Calendar
9446	Sports Management System

Table 2.45: Schedule of projects to be commissioned in the academic year '96/'97.

Information Systems and Services to be Commissioned *Immediately*						
Proposal Number	Strategic Classification	Capital Cost ('000)	Years of Operation	Annual Recurrent Cost (Net) ('000)	Total Cost 1994/95 ('000)	Commission Pilot Phase
9408	1	141	4	37	287	Pilot
9423	1	818	5	116	1,399	
9402	1	318	4	82	647	
9445	1	72	5	2	83	
9424	1	64	5	27	200	
9421	1	773	4	276	1,876	Pilot
9435	1	101	4	8	131	
9422	1	61	5	153	824	
9417	1	32	5	4	54	
9425	1	155	5	173	1,020	
9444	1	6	5	1	13	
9411	2	22	4	5	42	
9440	2	109	5	16	190	
9434	2	34	1	0	34	
9437	4	38	2	7	51	Pilot
Total		2,744		907	6,850	

Notes.
Strategic Classification: 1 - Mandatory / Now; 2 - Discretionary / Now;
3 - Mandatory / Later; 4 - Discretionary / Later
Proposals 9441 and 9443 are incorporated into proposal 9440.
Proposal 9413 is incorporated onto proposal 9421

Table 2.46: Total costs for projects to be commissioned in the academic year '94/'95.

Information Systems and Services to be Commissioned *Immediately*						
Proposal Number	Strategic Classification	Capital Cost ('000)	Years of Operation	Annual Recurrent Cost (Net) ('000)	Total Cost 1994/95 ('000)	Commission Pilot Phase
9405	1	10	4	9	44	Pilot
9406	1	40	4	9	75	
9436	1	77	4	13	127	Pilot
9418	1	674	4	153	1,286	Pilot
9433	1	63	5	38	254	
9414	2	29	3	1	32	
9407	3	973	4	114	1,427	
9420	3	24	1	7	31	Pilot
9403	3	652	4	131	1,174	
9426	3	1	4	8	34	
9429	3	0	4	8	30	
9427	3	1	4	1	4	
9428	3	0	1	3	3	
9442	3	18	5	2	28	
9430	3	0	4	3	12	
9431	3	0	4	0	0	
9432	3	0	1	0	0	
Total		2,562		497	4,561	

Notes.
Strategic Classification: 1 - Mandatory / Now; 2 - Discretionary / Now;
3 - Mandatory / Later; 4 - Discretionary / Later

Table 2.47: Total costs for projects to be commissioned in the academic year '95/'96.

Information Systems and Services to be Commissioned *Immediately*						
Proposal Number	Strategic Classification	Capital Cost ('000)	Years of Operation	Annual Recurrent Cost (Net) ('000)	Total Cost 1994/95 ('000)	Commission Pilot Phase
9401	3	54	3	(1)	51	
9419	3	79	3	63	268	
9410	4	40	3	17	92	Pilot
9438	4	22	2	5	31	
9412	4	175	3	23	243	
9415	4	156	2	4	163	Pilot
9409	4	12	1	10	22	
9404	4	0	3	0	0	
9446	4	0		0	0	
Total		538		120	870	
Notes. Strategic Classification: 1 - Mandatory / Now; 2 - Discretionary / Now; 3 - Mandatory / Later; 4 - Discretionary / Later						

Table 2.48: Total costs for projects to be commissioned in the academic year '96/'97.

Information Systems and Services to be Commissioned				
Comments	Capital Cost ('000)	Years of Operation	Annual Recurrent Cost (Net) ('000)	Total Cost 1994/95 ('000)
Base:				
Ongoing operation of existing systems	3,750	5	1,212	9,810
Deduct uncommitted development capacity	(429)	5	0	(429)
Deduct uncommitted capital expenditure capacity	(1,105)	5	0	(1,105)
Deduct Costs included in proposal	0	5	(173)	(867)
Ongoing operation of existing systems (Net of costs provided for in proposals)	2,216	5	1,039	7,409
Immediate Commissions (1994/95)	2,744		907	6,850
Intermediate Commissions (1995/96)	2,562		497	4,561
Future Commissions (1996/97)	538		120	870
Global adjustments made by ISPDG	(87)	5	(264)	(1,406)
Grand Total	7,973	5	2,299	18,284

Table 2.49: Total costs for all projects.

Chapter 3

The Organization of the IS Service

The ISPDG recommends that the IS organization which is set out in Tables 3.1 to 3.3 overleaf be implemented in the shortest time-period practicable. The rationale for this organization is set out in Chapter 9. The implementation should be effected by the management of the IS Service, coordinated by the Director of the IS Service, under the guidance of the Staff Secretary. The management shall be accountable to the IS Management Committee (ISMC) for the successful implementation of this organization and no changes shall be made to the recommended organization without the express authorization of the ISMC.

Unit	Section	Functions	Dedicated Resources and Titles	Comments
IS Service		Management	1 x Director	
User Support		Management	1 x Manager	
User Support	Helpdesk	Coordination Task allocation Scheduling Monitoring Follow-up Review	1 x IS Consultant	
		Person-to-person user request Query and request logging, answering, and redirection	8 x IS Administrator IS Consultant or Programmer Analyst	3 IS Administrators on Helpdesk duty; 3 off, 2 in rotation
		Product Sourcing	1 x IS Administrator	Additional resources of one off-duty IS Administrator
		Consulting and advice service	1 x IS Administrator or IS Consultant	Additional resources of one off-duty Helpdesk
		Staffing terminal rooms	1 x IS Administrator	IS Administrator Additional resources of one off-duty Helpdesk IS Administrator
	Support	Installation and upgrade of end-user computing requirements; Administration of site licences	1 x IS Administator	
		Installation and upgrade of end-user computing requirements; Trouble-shooting, Repair, Maintenance	4 x Technicians, Senior Technicians, Chief Technicians	
	Liaison and Training	Training Awareness programmes Liaison with Faculties, Departments, Offices, and User Groups Support of local 'enthusiasts/experts' in Departments and Offices Support of IS Service systems Teaching activities Technical writing	4 x IS Administrators, Progammer Analysts, or IS Consultant	

Table 3.1: Unpopulated organogram for Top Management and the User Support Unit.

Unit	Section	Functions	Dedicated Resources and Titles	Comments
IS Application Development & Maintenance		Management	1 x Manager	
	Liaison and Systems Development	Liaison and awareness activities Requirements generation, System specification Design, Development, Maintenance Technical documentation	12 x Programmer Analysts or IS Consultants Testing, Implementation	This implies, on average, two persons per 'Application Area'. 'Area Experts' and 'Project Leaders' will be assigned.
	Data Management & Administration		1 x IS Consultant	

Table 3.2: Unpopulated organogram for the Application Development & Maintenance Unit.

Unit	Section	Functions	Dedicated Resources and Titles	Comments
IS Infrastructure & Core Services		Management	1 x Manager	
	Core Services	Staff access, student access, student information processing	2 x Programmer Analysts or IS Consultants	
		Computer-dependent , research Computer-dependent education	1 x Programmer Analysts or IS Consultants	
		Electronic communications systems administration	1 x Programmer Analysts or IS Consultants	
		College WWW server	1 x Programmer Analysts or IS Consultants	
		Security, usage and accounting profiles special systems	1 x Programmer Analysts or IS Consultants	
	Networks and Servers	Network maintenance, facility testing, server maintenance, technical maintenance	1 x Technician, Senior Technician, or Chief Technician	
		Network development and extension	1 x Senior Technician, Chief Technician, Programmer Analyst, or IS Consultant	
		Desktop systems software, Central system administration	2 x Programmer Analysts or IS Consultants	

Table 3.3: Unpopulated organogram for the Infrastructure & Core Services Unit.

Chapter 4

The College Context — Committees and Working Groups

The ISPDG recommends that the organization of the working groups and committees which is set out in Figure 4.1 be implemented in the shortest time-period practicable. The rationale for this organization is set out in Chapter 9.

Figure 4.1: Recommended Organization of External Bodies

Chapter 5

Summary of Recommendations

The past year has seen some truly remarkable advances in our thinking in Trinity College on the subject of information systems and the plan which has been developed to allow us to turn this thinking into reality and to benefit greatly in the process was presented in the previous chapters. However, we must be under no illusions that the thinking is all done; it isn't. We may well have produced an excellent IS plan and the newly-organized IS Service may well provide the College community with the service it badly needs; but, make no mistake, even if every single proposed project is commissioned and comes in on budget, we are still in danger. All we have accomplished in the past year, *if* we follow through on it, is to catch up on lost ground and to begin the process of active change. It remains for us to transform our approaches and to deploy truly innovative ways of attaining excellence in teaching, in research, and in our support functions. Much has been done and much remains to be done. Over the next several years, the new Information Systems Management Committee must provide strong direction for the College and the IS Service.

With this in mind, the Board of the College is asked to endorse the following recommendations, all of which have been detailed in this report.

1. The IS Plan should be launched by commissioning those projects set out in the *immediate*, *intermediate*, and *future* scenarios, in that order.

2. The College should make available, insofar as is possible, the finance to fund the IS Plan.

3. The ISMC should determine the priority to be accorded to each project within each scenario, in the event of a shortfall of funds, and bearing in mind the score which the project received in the ISPDG evaluation.

4. The IS organization which is set out in Tables 3.1 to 3.3 overleaf should be implemented in the shortest time-period practicable.

5. The job titles and grades for staff in the IS Service should be developed as set out in the body of the report, incorporating the new nomenclature of IS Administrator, IS Consultant, and Programmer Analyst.

6. IS Administrators, Programmer Analysts, and Technicians should be able to progress to the level (and title) of IS Consultant, assuming that they have the appropriate qualifications and experience.

7. The Computer Management Committee be re-constituted as a pro-active IS Management Committee (ISMC), reporting to the Information Services Board Committee.

8. There should be just one user committee, the Information Systems Users' Group.

9. The ISPDG Working Groups should be retained in modified form.

10. The ISMC should continue the process of system or service proposal and subsequent evaluation, through the ISMC Working Groups, in further developments of the IS infrastructure in College.

11. The policy on the responsibilities of the IS Service regarding

    (a) Policy and Standards;
    (b) Service Delivery;
    (c) Funding;

    should be implemented.

12. The policy on devolution of IS service provision should be implemented

13. College should inaugurate a World Wide Web (WWW) Programme to oversee the development of the College WWW profile and to assess it completeness and quality.

14. College should launch an immediate 'sentinel programme' to monitor and promote developments regarding distance learning and the exploitation of information communication networks to further scholarly research and teaching.

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Part III

Appendices

Appendix II — Evaluation of Proposal for Information Systems in Trinity College Dublin

Class	*Criterion*	*Final Score*	*Weight*	*Weighted Score*
User Criteria	Direct Achievement of College Goals		4	
	Projection of Trinity's Presence at National and International Levels		2	
	Urgency and Timeliness of the Proposal		2	
	Provision of Information		3	
	Organizational Risk		3	
Information Systems Management Criteria	Establishment of a Strong Information Systems Infrastructure		1	
	Maturity and Soundness of the Requirements		1	
	Minimization of Technical Risk		1	
	Minimization of Risk to Information Systems Infrastructure		1	
Criteria Associated with Financial Issues			4	
TOTAL				

Direct Achievement of College Goals				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Research	Will the proposal maintain existing standards of research?			
	Will the proposal increase the likelihood of successful new research, *i.e.*, does it enable new research to take place?			
	Does Trinity have an established track record in this area?			
	If Trinity has no established track record, is this area likely to be of importance to the national community?			
	If Trinity has no established track record, is this area likely to be of importance to the international community?			
Teaching	Are there any implications for the improvement of teaching in College arising from this proposal?			
	Will the proposed system significantly increase the quality of teaching?			
	Is the proposal directed at the enhancement of existing approaches?			
	Is the proposal directed at the introduction of new, perhaps revolutionary, approaches?			
	Will the quality of the learning process be improved in any particularly innovative manner as a result of the proposal?			
Impact on Society	Is there likely to be a positive impact on the interaction with and contribution to the national community?			
	Is there likely to be a positive impact on the interaction with and contribution to the international community?			
	Does this proposal contribute in any way to the ease which which potential students have access to useful information on the College, its courses, its students, its staff, its intellectual property?			
	Does this proposal contribute in any way to the ease which which potential employers have access to useful information on the College, its courses, its students, its staff, its intellectual property?			
	Does this proposal make any impact on the transfer of intellectual property, know-how, or technology to the national community?			
	Does this proposal make any impact on the transfer of intellectual property, know-how, or technology to the international community?			

Scoring for Direct Achievement of College Goals			
Domain	*Scoring Guidelines*	*Score*	*Label*
Research	1 – No impact, directly or indirectly		A
	2 – Of marginal benefit in assisting researchers		
	3 – Enables research but will not be used directly in the course of research		
	4 – Enables research and is used directly in the course of research		
	5 – Key research will not be performed in the absence of this system or service		
Teaching	1 – No impact, directly or indirectly		B
	2 – Will be of marginal benefit in teaching		
	3 – Quality of teaching will improve as a direct result		
	4 – Brings teaching (& learning) practices in line with the best in Ireland		
	5 – Brings teaching (& learning) practices in line with best internationally		
Impact on Society	1 – No impact, directly or indirectly		C
	2 – Some indirect impact		
	3 – Some direct impact		
	4 – Direct impact		
	5 – Very strong direct impact		
Overall	Overall score is the larger of the sum of scores A and B or the sum of scores A and C, divided by two *i.e.*, Max [(A+C), (B+C)] / 2		Final

Projection of Trinity's Presence at a National and International Level				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
External Public Image	Will the proposal have positive effect on the public image of College, *i.e.*, on the manner in which Trinity is perceived by the Irish and international community?			
	Will the proposal enhance College's public image in research?			
	Will the proposal enhance College's public image in education?			
	Will the proposal enhance College's public image concerning its ability and willingness to fulfil social responsibilities?			
	Is this perception likely to be widespread?			
Internal Self-Image	Will the proposal have a positive effect on our own image of College, *i.e.*, on the manner in which we perceive Trinity?			
	Is this perception likely to be widespread?			
External Collaboration	Does the proposal foster or enable active collaboration with outside institutes or companies?			
	Does the proposal foster or enable access to College resources from other institutes or companies?			
Internal Collaboration	Does the proposal foster or enable active collaboration between faculties, departments, or offices?			
	Does the proposal foster or enable active collaboration between the academic and administrative and support services in College?			
	Does the proposal foster interaction between staff and students?			
	Does the proposal foster enhancement of the non-academic life of the university, *e.g.* activities of societies and clubs.			

Scoring for Projection of Trinity's Presence at a National and International Level			
Domain	*Scoring Guidelines*	*Score*	*Label*
External Public Image	1 – Negative impact		A
	2 – No positive impact, directly or indirectly		
	3 – Some direct positive impact		
	4 – Direct positive impact		
	5 – Very strong direct positive impact		
Internal Self-Image	1 – Negative impact		B
	2 – No positive impact, directly or indirectly		
	3 – Some direct positive impact		
	4 – Direct positive impact		
	5 – Very strong direct positive impact		
External Collaboration	1 –Negative impact		C
	2 – Some indirect positive impact		
	3 – Some direct positive impact		
	4 – Direct positive impact		
	5 – Very strong direct positive impact		
Internal Collaboration	1 – Negative impact		D
	2 – No impact, directly or indirectly		
	3 – Some direct positive impact		
	4 – Direct positive impact		
	5 – Very strong direct positive impact		
Overall	Overall score is the sum of scores A, B, C, and D, divided by 4 *i.e.*, (A+B+C+D) / 4		Final

Urgency and Timeliness of the Proposal – Impact of Postponement				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Reputation	Will postponement of the proposed project severely damage the reputation of College?			
	Will postponement of the proposed project result in a lost opportunity to enhance the reputation of College?			
	Will existing activities which have an excellent reputation be curtailed because of the lack of the proposed system?			
Services	Will postponement of the proposed project severely damage the quality of services in a strategically important area?			
	Will postponement of the proposed project result in a lost opportunity to enhance the quality of services in a strategically important area?			
Degree of Postponement	Will the impact of the postponement increase with the amount of time by which the proposed project is postponed?			

Scoring for Urgency and Timeliness of the Proposal – Impact of Postponement			
Domain	*Scoring Guidelines*	*Score*	*Label*
Reputation	1 – No damaging impact, directly or indirectly		A
	2 – Some impact, but could be contained		
	3 – Some unavoidable impact		
	4 – Direct unavoidable impact		
	5 – Very strong damaging impact		
Services	1 – No damaging impact, directly or indirectly		B
	2 – Some impact, but could be contained		
	3 – Some unavoidable impact		
	4 – Direct unavoidable impact		
	5 – Very strong damaging impact		
Degree of Postponement	1 – Impact decreases in direct proportion to the extent of postponement		C
	2 – Impact does not vary with the extent of postponement		
	3 – Impact increases in direct proportion to the extent of postponement		
	4 – Impact doubles every year of postponement		
	5 – Impact doubles every six months of postponement		
Overall	Overall score is score C multiplied by the larger of scores A or B, divided by 5, *i.e.*, [C * Max(A, B)] / 5		Final

Provision of Information				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Support	Does this proposal deal with the provision of information to people in College (staff and students alike) which would enable them to perform their function more effectively and efficiently?			
	Does this proposal deal with the provision of information to people outside College which would enable them to perform their function more effectively and efficiently?			
	Does the proposed service or system provide key management information support to core activities (research and teaching) in the immediate future?			
	Is this information of a strategic or highly important nature?			
Access	Would people benefit significantly from having access to this information in 'real-time' *i.e.* accurate up-to-date information the moment they ask for it?			
	Does the information to be accessed reside outside the university and is it freely available?			
	Would a large percentage of the total College population of 10,000, say, benefit from access to this information?			

Scoring for Provision of Information			
Domain	*Scoring Guidelines*	*Score*	*Label*
Support	1 – No impact, directly or indirectly, now or in the future		
	2 – Some indirect impact in the future		
	3 – Direct impact in the future		A
	4 – Immediate direct impact on activities other than core activities		
	5 – Immediate direct impact on core activities (research and teaching)		
Access	1 – No impact, directly or indirectly, now or in the future		
	2 – Some indirect impact in the future		
	3 – Direct impact in the future		B
	4 – Immediate direct impact on activities other than core activities		
	5 – Immediate direct impact on core activities (research and teaching)		
Overall	Overall score is the sum of scores A, B, and C, divided by 3 *i.e.*, (A+B) / 2		Final

Organizational Risk				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Risk	Is the proposed system or service well defined?			
	Is there a substantial risk of disruption in existing service levels in the commissioning of the service or system detailed in the proposal?			
	Have the risks been identified?			
	Has an 'owner' for this project been identified?			
	Are the desired benefits clearly-articulated and well-understood?			
Plans	Is there a well-formulated plan for implementing the proposed system or service			
	Have plans for the containment of risks been drawn up?			
	Are training plans included?			
	Have all parties upon whom the system will impact been consulted on the implementation and training plans?			
	Have the the organizational, procedural, and technical issues been identified which will have to be addressed in order to realize all of the required benefits?			
	Does the project 'owner' consider that any of the issues identified constitute a significant risk to the ultimate success of the project?			

Scoring for Organizational Risk			
Domain	*Scoring Guidelines*	*Score*	*Label*
Risk	1 – Poorly-defined system, substantial risk of disruption		A
	2 – Poorly-defined system, unidentified risks		
	3 – Well-defined system, unidentified risks		
	4 – Well-defined system, substantial risks		
	5 – Well-defined system, minimal risks		
Plans	1 – No risk containment plans, no implementation plans, no training plans		B
	2 – Poor or no risk containment plans, good implementation plans		
	3 – Reasonable risk containment plans, good implementation plans		
	4 – Good risk containment plans, good implementation plans		
	5 – Very good risk containment plans, implementation plans, and training plans		
Overall	Overall score is score A multiplied by score B, divided by 5 *i.e.*, (A*B) / 5		Final

Establishment of a Strong Information Systems Infrastructure				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Strategic Position	Does the proposed system or service form an integral part of the strategic infrastructure?			
	Is the proposed system or service a prerequisite for other strategic projects			
Plans	Are the inter-relationships with other projects well detailed?			
	Are the knock-on effects on other projects well-identified?			
Benefits	Are the benefits (in terms of service levels and/or the additional infrastructural facilities) of commissioning this system well identified?			

Scoring for Establishment of a Strong Information Systems Infrastructure			
Domain	*Scoring Guidelines*	*Score*	*Label*
Strategic Position	1 – Negative impact on the information system infrastructure		A
	2 – No impact, directly or indirectly, on the information system infrastructure		
	3 – Prerequisite for other projects		
	4 – Critical short-term impact on the information systems infrastructure		
	5 – Critical long-term impact on the information systems infrastructure		
Plans	1 – No inter-relationships identified with other projects		B
	2 – Poorly-identified inter-relationships, no plans for coordination		
	3 – Reasonably well-identified inter-relationships, reasonable coordination plans		
	4 – Very well-identified inter-relationships, reasonable coordination plans		
	5 – Very well-identified inter-relationships, good coordination plans		
Benefits	1 – Service levels and/or benefits not addressed		C
	2 – Benefits loosely specified, service levels not addressed		
	3 – Service levels well-addressed, benefits unclear		
	4 – Service levels well-addressed, benefits are marginal		
	5 – Service levels are well-addressed, benefits are substantial		
Overall	Overall score is the sum of scores A, B, and C, divided by 3 *i.e.*, (A+B+C) / 3		Final

Maturity and Soundness of the Requirements				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Requirements	Are the requirements well documented?			
	Are the requirements complete?			
	Do the requirements anticipate issues which may arise in the future?			
Specifications	Are the specifications complete?			
	Are the specifications well documented?			
	Do the specifications exactly match the requirements?			
Approval	Have the requirements been formally approved by users?			
	Have the specifications been formally validated?			
Review	Are review procedures proposed?			
	Have contingencies for requirement changes been incorporated?			

Scoring for Maturity and Soundness of the Requirements			
Domain	*Scoring Guidelines*	*Score*	*Label*
Requirements	1 – Not defined		A
	2 – Not well documented		
	3 – Well documented but are incomplete		
	4 – Well documented and complete		
	5 – Well documented, complete, and anticipate future issues		
Specifications	1 – Not defined		B
	2 – Incomplete and/or not well documented		
	3 – Complete, well-documented, but significant mismatches with requirements		
	4 – Complete, well-documented, but minor mismatches with requirements		
	5 – Complete, well-documented, and exactly match requirements		
Approval	1 – Requirements and specifications are not approved and are not validated		C
	2 – Requirements and specifications are approved but are not validated		
	3 – Only requirements are approved and validated		
	4 – Only specifications are approved and validated		
	5 – Requirements and specifications are formally approved and validated		
Review	1 – No review procedures		D
	2 – Loose review procedures		
	3 – Reasonably detailed review procedures		
	4 – Well-identified review procedures; no contingency for modifications		
	5 – Well-identified review procedures; sound contingency for modifications		
Overall	Overall score is the sum of scores B, C, and D, multiplied by score A, and divided by 15, *i.e.*, A*(B+C+D) / 15		Final

Minimization of Technical Risk				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Skills	Do the technical staff have the requisite skills and experience?			
	Do the management staff have the requisite skills and experience?			
	Have the staff worked on projects requiring similar skills?			
Hardware Dependencies	Has the requisite hardware been used in similar applications in College already?			
	Has the requisite hardware been used in similar applications anywhere else?			
	Is evidence provided to show that the hardware proposed can be used for this system?			
Software Dependencies	Are the software dependencies straightforward, requiring little or no programming?			
	Do the requisite interfaces exist at present?			
	Can all modifications be made with currently proven solutions?			
Application Software	Can the application be purchased off the shelf?			
	Is the application highly parameterized?			
	How much effort will it take to install? Less than 1 man-week? Less than 3 man-months? Less than 6 man-months? Less than 1 man-year? Less than 2 man-years? More than 2 man-years?			
	Has a similar type of customization been accomplished in College before?			
	Has a similar type of customization been accomplished by other firms or institutions before?			
	Is the design complexity of new software minimal?			
	Has a design and implementation exercise of similar complexity been successfully undertaken by College staff in the past?			
Viability of Suppliers	Are the hardware suppliers likely to be in business in five years time?			
	Are the operating systems suppliers likely to be in business in five years time?			
	Are the application software suppliers likely to be in business in five years time?			

Scoring for Minimization of Technical Risk			
Domain	*Scoring Guidelines*	*Score*	*Label*
Skills	1 – Extensive new skills for technical staff and management staff		A
	2 – Extensive new skills for technical staff; some for management staff		
	3 – Some new skills for technical staff and management staff		
	4 – Some new skills for technical staff; none management staff		
	5 – No new skills for technical staff and management staff		
Hardware Dependencies	1 – Some key features are not available, or are not tested or implemented		B
	2 – Hardware exists but has not been tested in a live application		
	3 – Hardware is in use but in a different application		
	4 – Hardware is in use in a similar application		
	5 – Hardware is in use in a similar application in College		
Software Dependencies	1 – New features required and an advance in the state of the art is needed.		C
	2 – New features required together with complex software integration		
	3 – New software interfaces and integration; complex programming required		
	4 – Standard software is to be used but complex programming is required		
	5 – Standard software with straightforward or no programming required		
Application Software	1 – No programs exist; complex development required		D
	2 – Programs exist; very complex installation required		
	3 – No programs exist; simple development required Programs exist; moderately complex installation required		
	4 – Programs exist; minimally complex installation required		
	5 – Programs exist; very simple installation required		
Viability of Suppliers	1 – None are well established; no first-hand knowledge of track record		E
	2 – Some are well established; no first-hand knowledge of track record		
	3 – Some are well established; some first-hand knowledge of track record		
	4 – All are well established; some first-hand knowledge of track record		
	5 – All are well established; considerable first-hand knowledge of track record		
Overall	Overall score is the sum of scores A, B, C, D, and E, divided by 5 *i.e.*, (A+B+C+D+E) / 5		Final

Minimization of Risk to Information Systems Infrastructure				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Change	Have the implications for the commissioning of this system on the information system infrastructure been considered?			
	Are existing services and facilities sufficient to meet the needs of the proposed system?			
Capital Investment	Is the level of infrastructural capital investment required to support this proposal less than 10,000 pounds?			
	Is the level of infrastructural capital investment required to support this proposal less than 100,000 pounds?			
	Is the level of infrastructural capital investment required to support this proposal less than 500,000 pounds?			
	Is the level of infrastructural capital investment required to support this proposal greater than 500,000 pounds?			
Staff Investment	Is the level of infrastructural staff investment required to support this project less than one person-year (*i.e.* minimal investment)?			
	Is the level of infrastructural staff investment required to support this project less than two persons-years (*i.e.* minimal investment)?			
	Is the level of infrastructural staff investment required to support this project less than five persons-years (*i.e.* significant investment)?			
	Is the level of infrastructural staff re-deployment required to support this project less than one person-year (*i.e.* minimal investment)?			
	Is the level of infrastructural staff re-deployment required to support this project less than two person-years (*i.e.* minimal investment)?			
	Is the level of infrastructural staff re-deployment required to support this project less than five person-years (*i.e.* significant investment)?			

Scoring for Minimization of Risk to Information Systems Infrastructure			
Domain	*Scoring Guidelines*	*Score*	*Label*
Change	1 – Substantial and wide-ranging changes required to IS infrastructure		A
	2 – Substantial changes required to IS infrastructure		
	3 – Some changes required to IS infrastructure in critical areas		
	4 – Some changes required to IS infrastructure in non-critical areas		
	5 – No changes required to IS infrastructure		
Capital Investment	1 – Significant investment in the IS infrastructure; marginal use to other projects		B
	2 – Significant investment in the IS infrastructure; of clear use to other projects		
	3 – Minimal investment in the IS infrastructure; marginal use to other projects		
	4 – Minimal investment in the IS infrastructure; of clear use to other projects		
	5 – No investment in the IS infrastructure		
Staff Investment	1 – Significant investment in IS skills; marginal use to other projects		C
	2 – Significant investment in the skills; of clear use to other projects		
	3 – Minimal investment in IS skills; marginal use to other projects		
	4 – Minimal investment in IS skills; of clear use to other projects		
	5 – No investment in IS skills		
Overall	Overall score is the sum of scores A, B, and C, divided by 3 *i.e.*, (A+B+C) / 3		Final

Notes. The risks referred to by this criterion are those which arise from extensions to, and from increased loading of, the existing i
an investment in the information systems infrastructure as a prerequisite to project implementation, then provision must be made
be achieved in one of two ways: (a) include the infrastructure cost with the other project costs; or (b) prepare a separate project p
investment, noting the potential of the enhanced infrastructure to enable other benefits to be realized by College.

Criteria Associated with Financial Issues				
Domain	*Some Relevant Questions*	*Responses*		
		No	*Maybe*	*Yes*
Adequacy, Certainty, and Completeness of Analysis	Is the five-year cost of ownership detailed in the proposal? (See below for a definition of five-year cost of ownership)			
	Is a full analysis of this five-year cost provided?			
	Is the analysis adequate and complete?			
Cost-per-user Profile	Is the cost per current user less than 100 pounds?			
	Is the cost per current user between 100 and 1000 pounds?			
	Is the cost per current user greater than 1000 pounds?			
	Is the cost per potential user less than 100 pounds?			
	Is the cost per potenial user between 100 and 1000 pounds?			
	Is the cost per potential user greater than 1000 pounds?			
Internal Rate of Return	What is the internal rate of return *IRR*, computed in the manner identified in the text which follows this table.			

Scoring for Criteria Associated with Financial Issues			
Domain	*Scoring Guidelines*	*Score*	*Label*
Adequacy, Certainty, and Completeness of Analysis	1 – No analysis of 5-year costs		A
	2 – Inadequate and incomplete analysis		
	3 – Adequate analysis but major components missing and/or uncertain		
	4 – Adequate analysis but minor components missing and/or uncertain		
	5 – Thorough and complete analysis of 5-year costs		
Cost-per-user Profile	1 – High cost per user at present levels of usage		B
	2 – High cost per user at projected future levels of usage		
	3 – Low cost per user at projected future levels of usage		
	4 – Low cost per user at present levels of usage		
	5 – Low cost per user at both present and future projected levels of usage		
Internal Rate of Return	1 – less than 20%		C
	2 – 21% to 50%		
	3 – 51% to 100%		
	4 – 101% to 200%		
	5 – over 200%		
Overall	Overall score is the sum of scores A and B, multiplied by C, and divided by 10, *i.e.*, A * (B+C) / 10		Final

What is Knowing?
'Tis to see!
What is Feeling?
'Tis to be!
What is Love? But, more and more,
To See and Be! To be a Pour
And Avalanche of Being, till
Being ceases, and is still
For very motion – What is Joy?
- Being, past all earthly cloy
And intermixture! Being spun
Of Itself is Being won!
That is Joy – And this is God,
To be That, in cloud and clod:
And, in cloud and clod, to Sing
Of Everything, and Anything!

James Stephens
The Pit of Bliss