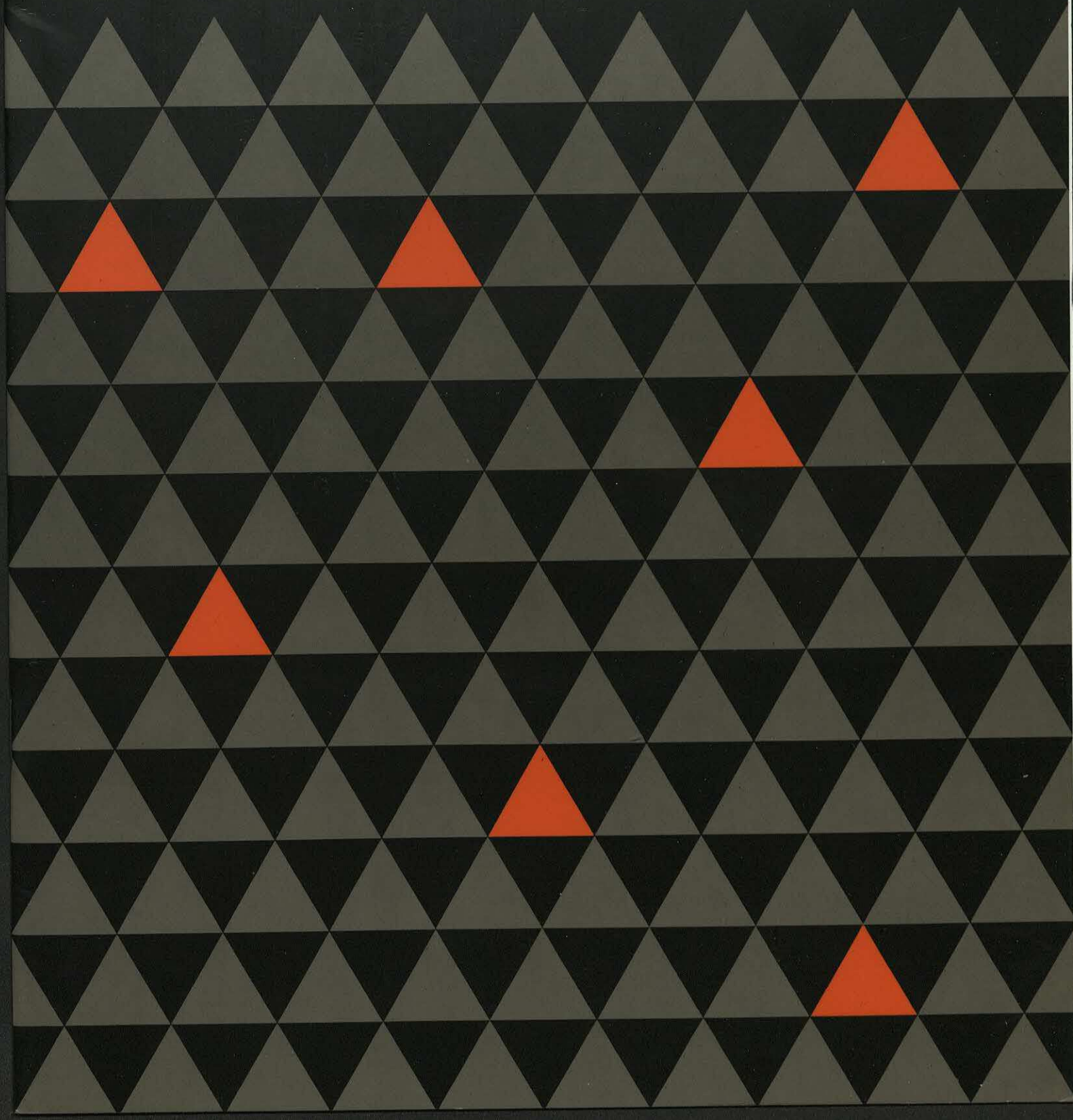
Using Technology to Improve Competitive Ability

BUTLER COX FOUNDATION

A Paper by William B Cook



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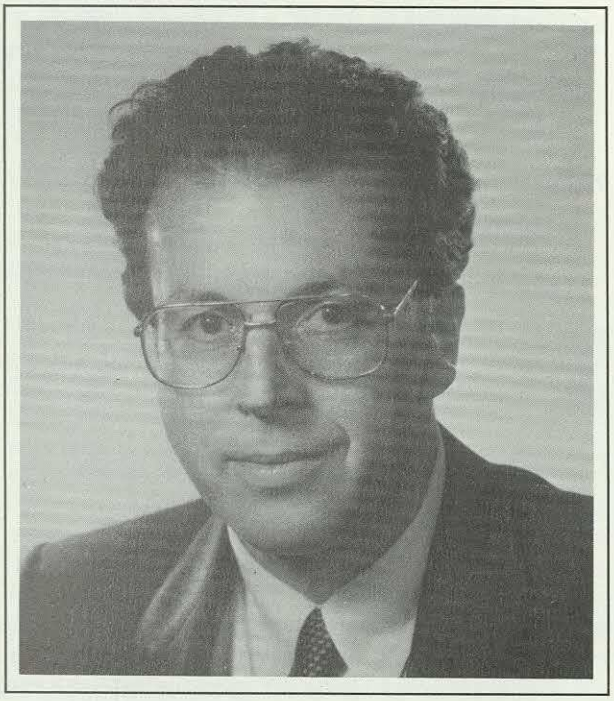

William B Cook is managing director of the international securities firm Morgan Stanley & Company. His responsibilities include technical businesses, analytic and quantitative systems, data processing, systems development, office automation, and telecommunications.

In October 1985, he addressed the Conference of the Butler Cox Foundation, held at Gleneagles, Scotland, when he described the role of information technology at Morgan Stanley. This paper reproduces the presentation in full and consists of two main parts: a description of a landmark MIS staffing experiment conducted by the bank and an examination of how MIS is organised to increase the penetration of information technology into the lifeblood of the firm's business. It also describes Morgan Stanley's plans for using information technology over the next few years and provides general lessons, based on Morgan Stanley's experiences, on how other organisations can improve their competitive ability through the use of information technology.

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Today, Morgan Stanley is a very active global trading firm providing a full product line in the financial services industry, with offices in Tokyo, London, San Francisco, Chicago, New York, Los Angeles, Australia, and Canada. Until the 1970s, Morgan Stanley was basically an investment banking firm (or merchant bank), providing services for most of the top 'blue chip' corporations in the United States. Since 1970, the firm has grown very rapidly as its business changed. In 1970, 400 people worked for Morgan Stanley; today the number is 3,700.

The growth in the business has been reflected in the growth of the MIS department (see Figure 1, which shows the growth between 1980 and 1985). Morgan Stanley is now a computing-intensive organisation, and the headcount shown in Figure 1 represents only the people involved in systems development. In addition, there are technical support staff, operations staff, and a group of quantitative analysts (rather like operations researchers) who study the financial markets. There has been an 18-fold growth in computing power (measured in terms of mips per development staff), which was an essential ingredient of the overall strategy of learning how to build systems quickly.

CRITICAL FACTORS IN 1979

Back in 1979, in discussions with the board we set down the critical factors influencing the success of the MIS department. Four factors were identified, two relating specifically to Morgan Stanley, and two relating to technical and economic factors:

Figure 1 MIS growth over five years

	1980	*1985*
Systems headcount	46	120
Mips	1.6	117
Bytes of disk (billions)	10	280
Mips for system development	0.4	22 +
Mips/developer	0.01	0.18

- Morgan Stanley is a young and growing organisation.
- Morgan Stanley has an unusual staff profile.
- Hardware costs are falling.
- The cost of technical people is increasing.

MORGAN STANLEY IS A YOUNG AND GROWING ORGANISATION

The growth in staff numbers from 1970, and the change from being an investment (merchant) bank to a global trading firm, has resulted in some dramatic changes for the firm. Morgan Stanley is a very young company with a continuously changing organisational structure and continuously changing people at the top. There have been two major reorganisations during the past five years. This type of business environment has significant implications for the MIS department. In an established single-product company, systems should be reasonably stable. But a young growing company with a continuously changing organisational structure creates a lot of work for the MIS department.

MORGAN STANLEY'S UNUSUAL STAFF PROFILE

Morgan Stanley has been recruiting the cream from the top business schools in the United States for the past 20 years or so. The firm has a slogan that says it employs "the brightest and the best". When I first joined the firm, this slogan bothered me — I thought it was very arrogant — but within two years it was on my MIS recruiting brochure. We reasoned that if we had unique people in the organisation, the MIS department had to be able to relate to those people. To do that we had to have MIS staff who had some of the same fundamental characteristics as the people in the mainstream of the business.

The situation I inherited at Morgan Stanley was typical of MIS departments all over the world. The MIS staff identified with the data processing community, and not with the firm. The front-office staff at Morgan Stanley joined the firm with the aim of becoming a partner. Our data processing staff did not share the same aspirations. Their

objective was to further their data processing careers. We argued that trying to get that type of data processing staff to relate to the business was like trying to mix oil and water. We knew it would not work, and we knew we were going to have to change the profile of the MIS staff.

FALLING HARDWARE COSTS, RISING PEOPLE COSTS

Everyone is well aware of the changing relationship between hardware costs and people costs. Today, you can buy an IBM PC/AT for about $5,000, which provides power equivalent to that of a 370/158 — the workhorse of ten years ago, which cost $1.1 million (equivalent to $2.5 million today). At the same time, the scarcity of technical staff has pushed up their market value, which means that we are all paid more.

In 1979, the accepted wisdom was that the changing relationship between hardware costs and people costs would mean that hardware costs would become a less dominant part of the total MIS budget. People costs would begin to predominate. Any businessman knows that in this situation you should plan to use more of the resource whose cost is decreasing and less of the resource whose cost is increasing. Consideration of this led us to identify our primary objective for the MIS department and our strategy for achieving that objective.

PRIMARY OBJECTIVE AND STRATEGY FOR MIS

We determined that, in order to contain the increasing cost of technical people while still being able to fulfill the requirement for new work, our primary objective had to be to learn how to build systems in the shortest possible time. We also determined that our strategy for achieving that objective would be to leverage people with technology. In this way, we would be able to make the necessary trade-offs between increasing people costs and falling hardware costs. To implement the strategy, we embarked on the set of technical and human-resources initiatives listed in Figure 2.

Figure 2 MIS initiatives, 1979

- *Technical initiatives*
  - — Fourth-generation languages
  - — Hardware per developer
  - — Sound basic system
  - — Prototyping
- *Human resources*
  - — College campus recruiting programme geared towards the top students at the top colleges and universities
  - — Aggressive compensation programme
  - — Up-or-out programme

TECHNICAL INITIATIVES

The technical initiatives were to switch development work to a fourth-generation language, to increase the hardware resources per developer, to develop a sound basic system for the business, and to use prototyping.

Use of fourth-generation languages

We decided in 1980 that we would build all of our systems in a fourth-generation language. This decision was resisted by the data processing staff at Morgan Stanley because they felt it threatened their career prospects. At that time, everyone wanted their career résumé to show extensive Cobol experience. There was not a great demand for Natural (which is the language we chose) programmers.

Increase the hardware per developer

Our second technical initiative was to increase the amount of hardware per developer. Our aim was to make each developer as productive as possible. I have already pointed out that we increased the mips per developer from 0.01 to 0.18. But we also gave each developer a microcomputer that could be used at home as a terminal. I reasoned that the cost of the micro would be paid for if I could get an extra four hours' work per month out of the staff. I believe that, to be really productive, every developer has to have a microcomputer or terminal on his or her desk.

Develop sound basic systems

The third technical initiative was to ensure that we had a sound basic system for the business. Every industry has basic, fundamental systems requirements that have to be met: in manufacturing, bill-of-materials and inventory-control systems are required; in distribution, order-processing systems are required. In our industry we have to have a securities (ie trade) processing system. We determined that we had to have an online database system on which we could build future systems. To achieve this we knew we were going to have to rewrite the existing systems, and that it would require a major investment. But we knew we had to make that investment to provide a strong foundation for our future systems.

So we embarked on a very significant investment that initially was justified to the board on the basis of improved systems development productivity, not on the basis of head-count reductions in the operations area (although significant reductions were achieved in this area). We also obtained

significant improvements in systems development productivity.

Use of prototyping

The fourth technical initiative was to introduce prototyping. Our strategy was to learn how to build systems as quickly as possible, and prototyping was the chosen method of achieving this. We have found that using prototyping has forced us to reconsider the way we measure systems development performance. One of the early debates we had was whether it was best to measure performance in terms of delivering systems on time and to budget. These are the traditional measures of development performance, but we reasoned that they were not the best ones because they require you to spend a lot of time and do a lot of work in defining precisely what you are going to do. You have to write the specifications before you can estimate the cost and time, and we questioned the wisdom of doing that. Does this approach really provide value to the organisation? Or does it simply provide the MIS department with an internal performance measure? We decided it was the latter rather than the former.

So we now measure performance as many factories do. We count our productive work. We are in the business of building programs, and we count the programs produced. We provide our customers in the firm with a ballpark estimate of the cost (somewhere between $150,000 and $225,000, for example), and we tell them approximately when the job can be done (''we think we can start in June, and we think we can finish somewhere between mid-October and mid-November'').

Although we do not commit ourselves to precise costs and dates, we do have a letter of understanding with our customers. This letter may well be modified as a project progresses, and this does cause some arguments. On the other hand, we do find this procedure to be highly productive.

HUMAN-RESOURCES INITIATIVES

In addition to the four technical initiatives, we also saw the need for three initiatives in the human-resources area. These initiatives can be summarised as:

— Recruitment of high flyers.

— An aggressive compensation programme.

— An 'up-or-out' career progression.

Recruitment of high flyers

The technical initiatives meant that we were going to invest heavily in providing our system developers with the best technical resources. We decided that to make the best use of these technical resources we required the most effective human resource we could find. Thus, we deliberately set out to build an unusually talented MIS department. This initiative, of course, blended well with Morgan Stanley's overall 'the best and the brightest' employment policy. We believed that it was just as necessary to have 'the best and the brightest' in the MIS department as it was to have them in any other area of the firm. We therefore decided to recruit precisely the same type of talent that our client, Morgan Stanley Investment Bank, recruits.

Our tactic was to copy what the major professional services firms (Arthur Andersen, Arthur Young, Booz Allen, McKinsey, etc.) do. All of these firms have a major presence on college campuses, and we decided to do the same. However, we did not focus our attention on computer science graduates. We realised that the technical initiatives we were taking would take much of the mystique out of building systems, and a computer science background might even be inappropriate for our needs.

We developed the proposition that an individual's effectiveness in business is determined most by his or her basic intellectual capacity, by commitment, by experience, and by communication skills. After the first year in business, effectiveness is rarely affected by what was learnt at college. Based on this proposition, we realised that our task was simply to identify the most undervalued degree on campuses in the United States, and to recruit the star performers. The degree we identified was 'liberal arts', and we set up a programme to recruit the top liberal arts graduates from the top colleges and universities.

We deliberately set out to recruit MIS staff who, in terms of raw intellectual power and academic achievement, equalled the investment bank's recruits. However, we also needed to work within the salary confines we are all subject to when we require dollars for activities that are still regarded basically as support activities. Hence our policy of recruiting from the most undervalued degree course. We cannot afford to pay the starting salaries demanded by graduates from the top business schools.

Aggressive compensation programme

Nevertheless, we do offer our college recruits a very aggressive compensation programme. Our current starting salary is about $30,000 per year; but we offer no security to our recruits. We tell them that either they will be promoted regularly, or they will leave. Those that stay (the best and the brightest) can expect very substantial salary increases.

'Up-or-out' career progression

Our 'up-or-out' policy means that an individual will continue to progress and be promoted each year,

continue to progress and be promoted each year, or will leave. We therefore retain the very best, and ask the others to leave. This policy gives us the opportunity to bring in a new batch of recruits each year, and it continuously improves the performance of the MIS department.

The policy also has another advantage in that it allows us to increase the salaries of those that remain by much more than the average. Suppose your MIS department has a static headcount and is organised as a pyramid. If, each year, you bring in a batch of new people at the bottom of the pyramid, and take out an equivalent number of people from each level of the pyramid, then you are replacing staff with people who will be earning less. You can then take the savings in salaries and distribute it amongst those who remain.

We carried out a study that showed that a department of 81 people could average an overall salary increase of 10 per cent, but could afford to increase the salaries of those that remained by an average of 28 per cent. Our investment in the top individuals would pay off because they would be less likely to leave us.

LESSONS FOR OTHER ORGANISATIONS

I fully accept that our strategy and the technical and human-resources initiatives we took may not necessarily be the right ones for other organisations. But I do believe that our approach of identifying the critical factors, setting the major objective, defining the strategy and then taking initiatives is applicable elsewhere. The approach will have to be customised for your own environment. For us, the key objective was to learn how to build systems quickly. I suspect it is also the key objective for many other MIS departments. Unless you can build systems quickly, you are never going to be able to get rid of the backlog that exists in many organisations, and you are not going to be able to develop the new advanced competitive systems that the business will be demanding.

RESULTS ACHIEVED 1979-1984

I have described our objectives, strategy, and initiatives. What actually happened? Today, we do have sound basic front-office and back-office systems. We have fully integrated online database-oriented systems serving the United States, Tokyo, and London. In our front-office systems we have internalised all of the quotation services (Reuters, Telerate, American Equity, etc.) by linking them into our SNA network environment. We now have extraordinary human resources in our MIS department. All the programmers who go through our training programme are registered representatives of the firm, which means that they are fully qualified investment brokers. Their training is as much oriented to the business as it is to the technology.

We now have the capability to build systems very quickly. In 1980, the cost per program developed was about $8,800. In 1984, it was somewhere between $1,600 and $1,700. This year (1985) it may even be below $1,000. As a consequence, we do not have a major applications backlog, nor do we have vast amounts of development work scheduled for months into the future. We can now handle most of the systems requests as they occur. In fact, the requirement for large-scale systems development has almost disappeared now that the basic business systems have been built. We are beginning to reduce our systems staff, not because the development is being put out to the users, but because we can now build systems quickly.

Another result of our technical initiatives is that we have been able to bring inhouse all timesharing activities.

Figure 1 showed that the growth in raw computing power in Morgan Stanley between 1980 and 1985 was quite extraordinary (from 1.6 mips to 117 mips). This growth was very expensive, very complex, and very difficult to manage and control. We contained the cost by adopting a PCM hardware strategy that requires us to switch suppliers at frequent intervals.

Back at the end of 1984, nearly all of our mainframes were Hitachi 980s, which at the time provided the lowest-cost computing. Then the IBM 3084 QX became available, and we shipped out some of the 980s and replaced them with 3084s. IBM then began to announce the Sierra series, and we feared this would cause a major drop in the price of the 3084s, so we sold them and reverted for a while to Hitachi machines. We then began to replace the Hitachis with the Sierra series. At present (October 1985) we are converting to almost all Sierras, but next April we will probably go back to Hitachi when its 55-mip processor is announced.

All of this switching back and forth may sound very confusing, but the strategy is very simple. We regard hardware as a commodity that should be bought and sold in accordance with its market value. In effect, we deal in computers. We try to assess which machine can provide the lowest cost per mip at any point in time. We purchase all of our machines because that provides us with the flexibility to sell them in the used market at the most advantageous time.

Adopting such a strategy has certainly reduced our computing costs. IBM's four-year lease rate has

fallen at a compound rate of about 6.7 per cent a year between 1980 and 1985. Morgan Stanley's cost per mip has fallen at a compound rate of 29.6 per cent during the same period. We have been able to build a significant computing centre without incurring too significant costs.

We have been successful in containing hardware costs, measured on a per-unit-of-work basis. Our up-or-out policy has resulted in a compound increase in compensation costs between 1980 and 1985 of just 2.28 per cent (adjusted for inflation). By getting rid of people at the top and bringing new people in at the bottom, and by providing them with lots of tools, we kept all of our costs under control. Our salary bill did not explode; in fact it grew in line with the consumer price index.

We also have one other vital asset, which we call 'air cover'. Air cover means that the president, chairman, and the chief planning officer supported what we were doing.

RISKS ASSOCIATED WITH THE STRATEGY

Nevertheless, there were risks associated with our strategy and initiatives. But I believe you have to take risks in order to achieve anything worthwhile. First, there was the risk of getting rid of the established systems development staff. We told the firm that the people who understood the existing systems would not fit in, and that, over a period of time, we were going to get rid of them. That was a very risky thing to do.

We also took a risk by deciding to get rid of all the computer operators. Instead of full-time operators, we give all of our college recruits a two-month stint in the tape libraries, the print pools, the tape pools and all the other mundane aspects of computer operations. Then they learn how to become console operators, and over a period of four months they progress from junior console operators to senior console operators. They work a full 40-hour week as computer operators, but they also spend an additional 20 hours a week learning how to build systems.

At the end of six months they move into systems development. We have trained the liberal arts graduates in systems development at no cost, because they have replaced the computer operators we used to employ.

Using these very bright college graduates in our data centres has provided us with some additional benefits. (Twenty-five per cent of our computer operators are Phi Beta Kappa graduates of the top universities in the United States.) Having that sort of intellectual horsepower in the data centre provides you with the ability to do things that would be much more difficult with a conventional operations workforce. It is one of the reasons why we can move machines in and out so frequently.

Another major risk was our decision to abandon Cobol in favour of a fourth-generation language. At the time, everyone used Cobol, and we made our commitment to a fourth-generation language before most of the other major user organisations in the United States.

Our decision to become a multi-vendor installation was also a risk. In the financial services industry in the United States, IBM is the dominant supplier, and MIS staff tend to rely on advice from IBM. However, we decided that, because of the significant growth we foresaw in our computing complex, we would not be able to rely on one supplier for support. Instead, we decided to hire some unusually competent technical individuals so that we could take on the support role ourselves. That also was a risky decision.

We took a risk in deciding to rewrite the basic business systems at a cost of $15 million. We could not get the users to support the case for the rewrite. The only justification was an internal MIS one — to lower the cost of system development.

Probably the biggest risk of all was our decision to internalise the price feeds on which the dealers make decisions about prices. Every dealing room is hooked up to a variety of price quotation services, which the dealers use to make decisions about prices. The data from the services is also fed into all sorts of analysis routines — operations research, linear programs, models, etc. The calculations are usually done on close-of-day prices, but any operations research analyst will tell you that the analyses will be much better if you have more data points. Because the supply of the data was controlled by the quotation service vendors, we did not have access to the required data points throughout the day. That situation did not make sense to us. We did not control the price feeds that were at the core of the dealing business. We therefore carried out a major rewrite of our systems so that we had access to the price feeds throughout the day.

Overall, our strategy was seen as aggressive and controversial in its early years. But today it is seen as a successful strategy, although there is some concern about the size of the computer complex that is required. Thus, by 1984 we had achieved the objectives we had set ourselves back in 1979, and we were ready to move on to the next era.

CRITICAL FACTORS FOR THE MID-1980s

We reviewed the factors influencing the success of the MIS department in the mid-1980s, and came up with the list shown in Figure 3.

Figure 3 Critical factors for the mid-1980s

- The technological revolution
- The changing role of MIS in the corporation
- The role of venture capital and the technical entrepreneur
- The importance of quotation systems
- The lag in technology utilisation versus its availability
- The return on corporate investment in MIS
  - — Do we do it well?
  - — Do we work on the right things?
- Difficulty in 'selling' expert systems
- The desire of MIS people to get into the mainstream of the business

THE TECHNOLOGICAL REVOLUTION

Clearly there is a technological revolution going on. I am not sure if we are on the eve of it, at the dawn of it, or some way through it. But I do know that it has been impacting our lives for the past 20 years and that it will make an even bigger impact over the next 20 years. The critical factor for us, as technologists in Morgan Stanley, is to understand the impact that the technological revolution will have on Morgan Stanley.

THE CHANGING ROLE OF MIS

The next critical factor we identified is the changing role of the MIS department within the organisation. Traditionally, the MIS department has developed systems for the user community. Almost certainly we will not still be doing that in five to ten years from now. Systems will be developed using natural-language interfaces; conventional languages, such as Cobol, Pascal, Ada, C, and PL/1, will no longer be used. Natural languages will be with us within five to ten years. Moreover, natural-language input combined with voice-recognition technology opens up the prospect of voice programming. If you combine that with the computer literacy that today's schoolchildren take for granted, it is clear to me that there will not be a systems development role for the MIS department in 10 to 15 years' time. So what will the role be? We believe it will be concerned primarily with corporate data and communications.

ROLE OF TECHNICAL ENTREPRENEURS

Corporate communications relates to the next critical factor shown in Figure 3 (the role of venture capital and the technical entrepreneur). In the United States, and I am sure it is the same in Europe, there is a continuous stream of new products from start-up companies being marketed directly to the user community. User departments are pressured by these suppliers to install their own local area networks and specialised machines. These products provide very high functionality, so they are very attractive to the user community. The problem is that they are not compatible with the existing networks.

All start-up companies are faced with the choice of building industry-compatible products or providing high functionality. Inevitably, they choose to go for high functionality. If they build compatible products, this generally implies IBM compatibility, and this means that they have to sell through the MIS department. Instead, they build products that can be sold direct to the user community; they play on the users' dissatisfaction with the MIS department; they tell the users that they have the solution to all of their problems. I believe we are going to see more and more of these types of products and of this type of marketing approach.

Some MIS departments have the authority to insist that any equipment installed in user departments conform to corporate standards, but I believe that authority will break down over time. You are just not going to be able to prevent people from buying highly functional equipment.

Our job is to connect all of the different equipment together, and not to let the situation get too far out of hand. That job is a highly technical one, and I wonder how well prepared the MIS community is for carrying out the job. Today, the high priests of technology in MIS organisations are the systems programmers. But if you examine what systems programmers actually do, can you really describe it as high technology? They take the vendor's code and they install it, and then they watch over it. When it breaks, they call the vendor and tell him how it has broken and make suggestions about what might be wrong. They then receive a fix from the vendor and install it.

If that is the leading edge of high technology in our organisations today, then I believe that we are totally unprepared for the problems of interlinking equipment with different protocols. We have to work out a human-resources strategy for five to ten years' time that will address this problem.

In our view, this means that we have to recruit technical staff of the same calibre as the MIS staff we set out to recruit in our 1979 strategy. To do this, we will have to compete with the major computer manufacturers (IBM, Hewlett-Packard,

Apple, ICL, etc.) for the top graduates of the best technical colleges. Unless we can, as users, recruit that kind of talent, we will not have the resources to solve the technical problems we will be faced with in the future.

TECHNOLOGY UTILISATION LAG

Another critical factor for the MIS department in the mid-1980s is the time lag between technology being available and being used to its full potential. This applies equally to MIS departments not using system generators or high-level generators, to factory managers resisting the introduction of robotics, CAD/CAM and CAE, and to the introduction of microcomputers into businesses. Early forms of microcomputers were available in about 1972, but they did not begin to be used as a business tool until about ten years later. Perhaps the only area where technology is adopted as soon as it becomes available is in weapons systems.

This technology-utilisation lag creates a problem for MIS departments, because they need a strategy for eliminating the lag. Such a strategy has two components. First, you have to identify the key technologies for your organisation and convince the organisation that the technologies are so important that they must be adopted as early as possible. Second, you have to work out how to introduce the new technology. Who should champion it? Top management? The user community?

RETURN ON CORPORATE MIS INVESTMENT

The next critical factor is the return on corporate investment in MIS. This topic was the subject of a high-level planning meeting at Morgan Stanley. The question being asked was "How do we know we are getting a return on our investment?" We debated this issue within the company, and we agreed that in terms of performance we were doing pretty well. However, there was concern about whether we were working on the right things.

I argued that the MIS workload is determined by the user community; I have no control over what we actually work on. That is the responsibility of the user community. My responsibility is to ensure that, given the workload, we do it in the best possible way and at the best price. My job is to control the cost of computing and the cost of developing systems. My opinion was that everything we were working on was of value to the company. I believed that our educated user community was asking us to do the right things.

However, we identified a problem. The business people do not understand the technology, and the MIS people do not understand the business. This meant that, in the main, we were working on systems that were marginal to the success of the business. We set out to change that situation, and to ensure that we were working on systems that were absolutely key to our company.

THE DIFFICULTY OF 'SELLING' EXPERT SYSTEMS

This approach led us to begin considering the use of expert systems, which we found to be a very difficult concept to 'sell' to the user community. One group of experts in our business are the traders, so I asked them how we could use technology to help them. A trader's basic commodity is information. When I asked what a trader does with the information he receives, I was told to mind my own business. A trader earns a great deal of money for what he does with that information. He quite likes that sort of salary, and the last thing he wants is for me to automate his expertise. From his point of view, this makes sense, but it is yet another barrier to utilising new technology.

However, I was convinced that we should be building systems to enable us to trade electronically, so I went direct to the president of the firm. He identified one of the partners who he thought would be receptive to my ideas, particularly in the area of relative-value trading.

With relative-value trading you track pairs of stocks in the same industry. For example, suppose that Butler Cox is a public company and that its stock trades at $50 a share. Suppose also that the stock of a similar company trades at $10 share, so there is a 5 to 1 relationship between the share prices. Over a period of time, the actual values might be $100 and $20, or $25 and $5. You track the relationship between the two values over time, and if there is any significant deviation from the normal pattern, this triggers a buying and selling decision.

Thus, if Butler Cox began to trade at $120 and the other company at $20 we would sell Butler Cox short and buy the other long. We would expect either Butler Cox to drop back to $100, in which case we would make money on the short, or the other to rise to $24, in which case we would make money on the long. Alternatively, a combination of the two might occur.

I sat down with the partner and the traders who tracked various industries and realised that we could build a computer system to do this job for them. All that was required was to analyse the correlations between different time series of data and notify the traders when exceptions to the norms were occurring. We built a system and demonstrated it to the traders. They thought that it was tremendous because it provided them with information to help them improve their trading.

Sometime later, I questioned the traders about how they were using the system. One of the traders showed me the 10 or 15 trades currently under way and how the computer system had said that these were good trades to do. However, none of the top ten trades recommended by the system was being carried out. Nine of these ten turned out to be money-making trades, so I challenged the dealer about why he had not carried out any of these trades. His reply made me realise what the difficulty was. The system was threatening his very existence. There was no way he was going to use the system as an automatic means of trading because that would mean he would not have a job. All he was prepared to do was to use the system to verify his own judgements.

Nevertheless, we believe that automated trading has a future and is the area where the MIS department can have the biggest impact on the firm. However, the time is not yet right for placing such technology in the user environment because it requires a fundamental change in the roles of staff in a securities trading firm. For the time being, this type of technology will be positioned as part of the MIS area.

I believe that this type of argument is fundamental to the question of whether to centralise or decentralise computing resources. Other speakers at this conference have emphasised the need to move development work into the user community. There is no doubt in my mind that dispersing the central development group into the user organisation is the most cost-effective way of automating the existing business processes. But I would argue that the real key to profitability is to understand both the technology and the business sufficiently well so that you can change the fundamental business processes. Only by doing this will you be able to make the best use of technology and use it as a competitive tool. That is the target we have set ourselves for the mid-1980s.

THE DESIRE OF MIS STAFF TO MOVE INTO THE MAINSTREAM BUSINESS

The final critical factor we identified was the desire of MIS staff to move into the mainstream of the business. The bright graduates I was recruiting were itching to get out into the revenue-earning side of the business and make a name for themselves. I found this enormously frustrating because I was telling them that technological excellence was the key to future business success. I was trying to convince them that in a few years' time, MIS staff would be at the core of the business.

I am convinced that to survive in the future, a firm like Morgan Stanley will have to have extraordinary technology. The real winners from the mid-1990s onwards will be the firms with the very best technology. Successful use of technology will be the key to competitive success.

OBJECTIVES FOR THE MID-1980s

Morgan Stanley can only compete on the basis of the quality of its people and the quality of its technology, and that means it is necessary to invest in technology. With this in mind, we have set two main MIS objectives for the mid-1980s.

First, the MIS department must become a technology profit centre. We will not be able to attract the very best technologists unless we are a top technology centre, and we intend to be just that. We believe that this will improve our recruiting and improve our retention of staff. A further benefit from this approach is that we anticipate we can make a profit, thereby contributing capital for the future expansion of technology in the business.

The second objective is for the MIS department to become an experimental automated brokerage firm, blazing the trail for Morgan Stanley as a whole. Eventually, the automated brokerage operation will be integrated into the firm, but we will be the pioneers. Already, we have installed a pilot program that manages money extraordinarily well. We have one of the best trading returns in the whole firm; we have never lost money in a month; we are well hedged. And we do it all with clerical staff. All of the trading decisions are made by the computer systems.

LESSONS TO BE LEARNT FROM MORGAN STANLEY'S EXPERIENCES

Let me close by generalising the lessons we have learnt. The two key lessons, I believe, concern the role of the technologist in the organisation, and the conflicts that have to be faced.

THE ROLE OF TECHNOLOGISTS

The technological revolution currently under way will change many aspects of private and business life. Home shopping, changes in the workplace, competitive-edge systems, expert systems, and corporate communications networks are just some of the profound changes now in progress. The technologist must help his organisation to define the impact these changes will have on its business by the year 2000, and must help the organisation to work out how to exploit those changes before others in its industry. I believe you cannot do this until you have done what we in Morgan Stanley did between 1979 and 1984. You have to develop your own technical strategies; you have to be able

to articulate them at board level; and you have to have a successful track record with those strategies. Only then can you move on to begin to ask the questions: "How is my organisation going to change? How is my industry going to change?" You need to have the people who can address those issues.

You also need to identify high-visibility, high-value business areas where you can experiment with new technology. And the experiments must have a good chance of being successful. We chose automated trading because it did not involve high risk. Once we had defined the statistical formulae, the system stood a very good chance of being successful.

I believe that these are the key roles for us as technologists. They also provide us with great opportunities. Those who take advantage of the opportunities will be amongst the key players in their organisations in five to fifteen years' time. The time of the technologist is coming, just as the marketeer, the financial expert, and the manufacturing expert have in the past all been crucial to the success of the business.

THE CONFLICTS THAT HAVE TO BE FACED

Morgan Stanley's experience has highlighted two areas of conflict: the risk-reward mentality of technologists, and users' expectations. Traditionally, MIS departments have not been rewarded for taking risks. MIS is a service function. Users may have complained about the level of service, but MIS managers were told to keep their costs under control. We are all aware of these problems, which stem from top management's lack of understanding of our problems and the communications gap between the MIS department and the rest of the business.

Despite these problems, MIS managers have a tremendous opportunity, but only if we change our mentality, and are more willing to take risks. Only by doing this will we ever be able to reach out to, or even become part of, the top management of our organisations. Every successful marketing manager has taken significant risks when introducing new products or a new advertising strategy. Technologists have not had to take the same kind of risks, and therefore have not received the equivalent rewards. The impending technological revolution changes all of this. We have to learn to take risks on behalf of our organisations.

My final point is that there is a conflict between what users expect of technology and the performance that can be achieved in practice. (I call this "the computer must be right" syndrome.) Let me illustrate it by a story. A few months ago I received a telephone call from one of our traders. He was extremely angry because a report scheduled to arrive on his desk that morning was late. (We had made some systems changes, and there were some technical difficulties.)

He proceeded to tell me that it was inconceivable to him that the computer would not work correctly. It so happened that on that day, the United States had unsuccessfully tried to launch a space satellite. I pointed out to the irate dealer that even with the huge sums of money spent on testing satellites, satellite launches were sometimes unsuccessful. I reminded him that he accepts that sometimes his car or television breaks down, that light bulbs burn out. Yet he believes that a computer will always work all the time.

Everyone here is familiar with this type of attitude and the problems it causes for MIS departments. We have to improve users' understanding of the technology and get them to appreciate the fact that, initially, technology does not always work correctly. It takes time to do that, but you can point out examples from everyday life. Users have to be educated to expect the same degree of reliability from technology as they expect from consumer products.

BUTLER COX FOUNDATION

Butler Cox

Butler Cox is an independent management consultancy and research organisation, specialising in the application of information technology within commerce, government and industry. The company offers a wide range of services both to suppliers and users of this technology. The Butler Cox Foundation is a service operated by Butler Cox on behalf of subscribing members.

Objectives of the Foundation

The Butler Cox Foundation sets out to study on behalf of subscribing members the opportunities and possible threats arising from developments in the field of information systems.

New developments in technology offer exciting opportunities — and also pose certain threats — for all organisations, whether in industry, commerce or government. New types of systems, combining computers, telecommunications and automated office equipment, are becoming not only possible, but also economically feasible.

As a result, any manager who is responsible for introducing new systems is confronted with the crucial question of how best to fit these elements together in ways that are effective, practical and economic.

While the equipment is becoming cheaper, the reverse is true of people — and this applies both to the people who design systems and those who make use of them. At the same time, human considerations become even more important as people's attitudes towards their working environment change.

These developments raise new questions for the manager of the information systems function as he seeks to determine and achieve the best economic mix from this technology.

Membership of the Foundation

The majority of organisations participating in the Butler Cox Foundation are large organisations seeking to exploit to the full the most recent developments in information systems technology. An important minority of the membership is formed by suppliers of the technology. The membership is international with participants from Australia, Belgium, France, Italy, the Netherlands, Sweden, Switzerland, the United Kingdom and elsewhere.

The Foundation Research Programme

The research programme is planned jointly by Butler Cox and by the member organisations. Each year Butler Cox draws up a short-list of topics that reflects the Foundation's view of the important issues in information systems technology and its application. Member organisations rank the topics according to their own requirements and as a result of this process members' preferences are determined.

Before each research project starts there is a further opportunity for members to influence the direction of the research. A detailed description of the project defining its scope and the issues to be addressed is sent to all members for comment.

The Report Series

The Foundation publishes six research reports each year. The reports are intended to be read primarily by senior and middle managers who are concerned with the planning of information systems. They are, however, written in a style that makes them suitable to be read both by line managers and functional managers. The reports concentrate on defining key management issues and on offering advice and guidance on how and when to address those issues.

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