Waves of Change: Business Evolution through Information Technology *by James L. McKenney with Duncan C. Copeland, Richard O. Mason* (Harvard Business School Press, Boston, MA, 1995), pp. xiv + 230, A$54.95, ISBN 0-87584-564-9

"*Waves of Change* focuses on the development by innovative managers of an evolving strategy to exploit the potential of information technology (IT)" (p. i) . The book contains five case studies of companies in different industries, which managed to gain sustained competitive advantage from the innovative usage of IT. The historical evidence presented which covers the years 1950 to 1993 is intended to give a guide for management practice in IT development. Of those case studies, the managerial manoeuvres and activities of two pioneering firms, Bank of America and American Airlines are described in detail.

In the first part of the book a general framework is presented of the various phases of an evolving IT strategy which eventually results in a dominant IT design. Three key figures - the Chief Executive Officer (CEO), the (technology) maestro and the technical team - are identified which fulfil different tasks in each of the five phases of what the author calls "cascade". The first phase of the cascade and also the origin of the evolving IT strategy is identified as an information-processing crisis and search for an IT solution. Following this, IT competence is built within the company which typically results in a prototype or limited application. If the system works and yields satisfying results, the IT effort and the scope is expanded. Phase four is identified as "using IT to enable structure and drive strategy". During that phase IT becomes an integrative and strategic force in the organisation. Continuing the evolution of the organisation's IT strategy and competitors' emulation of the new system design constitutes the fifth and last phase of the cascade. It is emphasised that in order to arrive at a dominant information processing design which eventually transforms the competitive basis of the industry, the management involvement and leadership is crucial and it takes several years until the design evolves.

The information-processing crisis, the first phase of the underlying framework, was exemplified in the Bank of America case by the increase in cheque usage and paper handling which limited the growth of the bank. With the assistance of a research institute the existing operations were analysed and the first automated operations implemented in 1955. The actions of the key players and what functional and organisational changes had to occur for the new dominant design to evolve are described in detail. Special emphasis is devoted to the persons who fulfilled the different roles over the period observed, what measures they took and how this influenced the evolution of a dominant information-processing design. It is shown how the new system helped Bank of America to manage the growing demand for banking services and at the same time lower their costs. Moreover, with the new system, new services could be offered (like payroll for stores) leading to a broadening of the product line. However, Bank of America almost lost its leadership position (it was estimated at that time, the bank was at least two years ahead of it's competitors) by losing momentum. It underestimated the complexity of the system and the conversion efforts to new computer systems failed. Also at the same time, senior management support weakened and the strategic use of IT was no longer seen as important. System competence was lost and after the management focus on an IT leadership strategy returned, it took a lot of investment to regain that position.

Similar to the bank case, American Airlines had to face an upcoming crisis of handling the reservation system with the growing number of flights and passengers after World War II. At that time American Airlines also had a CEO who believed in competitive advantage of being first and saw the potential of an electronic system to perform airline reservations. The same pattern as in the case of Bank of America could also be observed - successful creation of an innovative IT design, especially in respect of the underestimated complexity of the job

and the expansion of the system beyond the original reservation problem. With the functional enhancement, the original system which was dedicated to reservations was transformed to a passenger service system and ultimately into a sales distribution system. As American Airlines developed its reservation system SABRE, all competitors quickly initiated a reservations development program which indicates that American Airlines achieved a "dominant design" with this information-processing innovation. The attempt of other airlines to coordinate the development of a common computer system failed. Knowing the needs of travel agencies and designing their system accordingly combined with a strategy of limited control over the system expressed by offering other airlines a co-host program, American Airlines managed to position it's terminals at the travel agencies. In doing so it gained control over a big portion of the industry's distribution channels. This strategy helped American Airlines to capture in the 1990's the biggest share of automated travel agent locations, even considering deregulation during that time. It turned out that this system was the catalyst for changes to American Airlines strategy and structure.

The analysis of the two pioneering companies shows evidence of the framework presented at the beginning. Typically the origin is an information-processing crisis, which most importantly is recognised by a CEO. With its promotion, partial solutions are realised. This provides valuable insights and with the sequences of different projects, competence is expanded. Despite the CEO's vision, partial solutions are accepted. The design is seldom well understood at the beginning, which emphasises the terminology "cascade" for the model suggested. Due to the continuing expanding processing power it is crucial to stay on top of technological development.

The following part of the book addresses how well the model holds for companies attempting to innovate in the context of the prevailing technology as opposed to the two pioneering companies described. For this purpose three other cases are presented of companies which have established, or are in the process of establishing, the dominant design for information processing in their industries. The cases presented are American Hospital Supply addressing an ordering problem, United Services Automobile Association, lagging in state-of-the-art claims processing and Frito-Lay, dealing with a logistics problem. Most striking for all three cases is the evolving nature of the system that can be observed. For American Hospital Supply the system evolved from an order entry to a managing inventory system. Frito-Lay's development of an IT based system to solve its logistic problems evolved in a networked on-line agent management decision support system that links agents to product specialist. Finally, the United Services Automobile Association system development evolved in a decentralised IT with a single, customer focused database with intelligent terminals able to support all products and services. In all cases considered, the system design evolved gradually and it took always a minimum of seven years from the start, actively managing IT to achieve a dominant role. Most crucial was not the technology but the training of individuals and adapting roles to exploit the potential of IT. With the advances in IT and the availability of system components, the time to achieve a dominant role could be shortened. However the time required to tailor management tools to the business and to gain the acceptance and understanding of the organisational team with a more complex system might offset this. All the systems considered proved profitable (one important reason being the elimination of personnel) and could be used for marketing strategies. Moreover, after successful implementation by the pioneers, this became a necessity.

In order to sustain an evolving IT strategy - the topic of the last chapter of the book - the most challenging part is seen as mastering the organisational shifts which are necessary to take advantage of the IT potential. As the case studies show, suppliers like IBM proved to be effective technology agents. Given the necessary implementation and adaptation of the organisation, a successful technology transfer is also considered to be possible. The emerg-

ing designs in the future will depend upon the needs of the industry, its history and the innovativeness of the firm. The driving force of progress in new industry design is not seen as technology but rather market needs. Future challenges are seen in maintaining IT competence and in the reorganisation, implementation and improvement of the overall process. A trend is identified in turning over decision making more and more to the customer with an IT architecture which extends back until the beginning of the value chain. Overall, the cases are presented in a detailed and interesting way. This might even be considered as going sometimes too far for the purpose of getting the message of the book across. The authors intention is to give a guide for management practice regarding IT development. Certainly the presented framework of the author, the 'cascade' model seems to be a good and intuitive tool for capturing and analysing the process of an evolving IT strategy which eventually results in a dominant IT design. It provides a perspective on the different key persons and their roles for and during this process. The model presented seems capable of capturing the described cases to a certain extent. However, the authors mention from time to time that there are differences between the cases presented. This suggests that there might not be a unique way - as the steps in the model might suggest - to get to a dominant design which results in competitive advantage. More cases ought to be discussed for that purpose and with this some constraints of the model might be found. The text is not clear on the extent to which the model is applicable to arriving at dominant designs in IT in general. One would wish a deeper discussion of this issue regarding the authors intention instead of lengthy discussions of the case studies. In order to get there, it seems that the case studies ought to be better focused towards the objective of the book.

Regarding the overall picture of the presented case studies, the authors show quite nicely how the design and the necessary organisational changes which are needed to exploit the potential of IT evolved eventually into a totally new structure of the company, often engaging in new fields of business. However, there is a lot of redundant information which is not really necessary. As already indicated, to fulfil the book's objective, the analysis should be deeper. It should not be the reader's duty - as with case studies - to condense the relevant information and analyse them in order to arrive at some conclusions. Nevertheless, if this in conjunction with the presentation of a guide for management practice was the authors' real intention, then they have succeeded. However, some shortcomings are still evident. After the presentation of the case studies the authors draw from the analysis recommendations on how to exploit IT potential in the future. Certainly from an organisational point of view some recommendations are drawn from the analysis. What is missing is to consider more the future development of IT, especially those in the area of communications and their implications. How extensively things change is indicated by the announcement that American Airlines consider selling SABRE to a computer or telecommunications company. This is what they tried to avoid with the development of their system! This might give a hint, that in the future, businesses might reconcentrate on their core business and rely on specialised IT suppliers. However fulfilling this intention would be a very challenging task, although making the book a "must" read for managers. Despite the criticism, the book is worthwhile and interesting to read, but not if you are looking for an executive style of recommendation on how to exploit the IT potential in favour for your company. Rather one should take the time and enjoy reading the very detailed case studies as an inspiration for further studies in this interesting area.

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