A Strategic Integration Of Information Technology and Business Strategies: A Structured Methodology

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ABSTRACT

It is anticipated that the future role of IT in the construction industry will be consolidated. Construction firms will move away from traditional ad-hoc IT investments and go towards well planned strategies. This paper reports on a proposed structured methodology to integrate business with IS/IT strategies. Factors such as mission, objectives, critical success factors, information technology, information systems are defined and assessed in an overall framework. The amalgamation of business objectives and IS/IT strategies is highlighted as being vital prerequisite for successful IT investments. Finally, the paper explains how the proposed structured methodology will be implemented on a private practice.

Key Words

Information systems; information technology; business strategies; critical success factors; information technology strategies

Introduction

It is anticipated that IT will play an important role in the 90's to improve the efficiency and productivity of construction firms(CICA, 1991). Firms will rely more and more on IT, as a cost effective solution, to maintain their market place in a competitive environment. Previous experience has shown that ad-hoc investments on IT have caused a wide spread of isolated applications with no communication strings. Benefits have become transparent to management as new sets of managerial problems have risen as a result of the implementation of such systems. It is therefore become apparent that there is a need for structured methods where by well planned and managed IT investments can be delivered. The aim of these methods would be to enhance business objectives to enable firms to absorb new types of pressures created by market conditions. Several large construction firms have restructured their internal IT policies/departments and have adopted new polices to enable them to be more efficient and productive. Others, especially small to medium firms, do not have the experience/resources to examine their current IT status and/or to improve on them.

In their recent strategic paper, RIBA has stated that the biggest IT problem facing larger practices is effective management of IT investments. Traditionally, IT investments are either driven by:

1. demands generated at operational levels in order to satisfy particular needs i.e. bottom-up pressure or by
2. requests issued by senior managers to meet some business requirements i.e. top-down pressure.

In either case senior managers usually approve the request and leave further matters for "technical staff" to solve. This management attitude towards IT usually leads to the development of technology driven solutions which are likely to be either unacceptable by users or non-supportive to business objectives. Full participation of management, in establishing strategic policies for IT investments, is therefore required in order to identify strategic information and work practices required by the business. This exercise is by no mean "technical". It is a strategic/managerial exercise which is likely to lead to business driven IT solutions.

The issue of integrating IT with business objectives has to be considered seriously by senior management. Without a clear vision for the future direction of IT applications, investments in this field will prove to be very difficult. Such a vision can be achieved through well planned business and IT strategies.

This article addresses the significance of merging Information Systems (IS) and their associated IT strategies with business objectives. It highlights the importance of information and information systems in the construction industry, defines some terminology used in this article and then discusses a framework for achieving a successful IT strategies.

The Construction Industry and Information Systems

The construction industry is highly dependent on gathering and presenting information in a useful and logical manner. However, the amount of information involved in any construction project from start to finish should not be underestimated. Within one construction firm, different types of information are required by various people in various formats at various stages of a project. Senior managers making strategic decisions demand quick access to strategic information while junior managers require basic information at the project level. The accuracy of strategic or non strategic decisions depends highly on the quality of the available information. The process of maintaining access to high quality information is costly and time consuming especially if it is to be presented in a consistent manner. Manipulating information in a dynamic environment like construction cannot be effectively undertaken by manual means. Information needs to be managed electronically so that it can be, shared, summarised, queried, presented, and transferred at any required level of detail with minimum effort. This automation will provide organisations with a

critical source of information.

The inadequacy of ad-hoc approaches to automation of complex systems has been recognised. Traditional, non-structured, approaches in this field deal primarily with specification of models which are concerned with a targeted computer-based system. They often failed to adequately capture the business concepts, rules, constraints and knowledge. The requirements and considerations of the present-day large, complex systems are beyond the full understanding of one person. This necessitates a team approach to the development task and thus the need for a well defined steps to ensure proper co-ordination and control of teams. This recognition has resulted in the emergence of methods of engineering-like approaches to the development of information systems.

Successful implementation of information systems demand the recognition of the business environment first and then the systems required to achieve its objectives. This approach would enables firms to use the corporate information as a main resource to maintain its competitiveness and responsiveness in a fast changing environment. Accurate and timely information can be accessed to support decision making process through the identification of precise data and practices (Ward 1990). Such outcome can be materialised through a well planned IT strategy. The later will define the necessary hardware/software which is required to achieve the goals set for IS strategies.

This amalgamation of business, IS and IT ensures business oriented solutions to business problem along with planned and successful IT investments. Future interactions between construction professionals will be highly influenced by successful implementation of such strategies. They could provide;

1. a dynamic base of information
2. quality assurance
3. management oriented value added services
4. advanced information and communications and
5. progression towards integrated practices.

This paper illustrates an approach to a structured framework to link IS/IT strategies to business strategies based upon a strategic top-down approach. Other new approaches to managing information such as object oriented approach is considered to be under development and will not be discussed. This paper focuses on associations which exist between elements of business and those of information systems, and link them in a logical and general manner according to their relationship with each other. In order to clarify the contents of this article, the terminology used are defined to familiarise readers with their concepts.

Definitions

Business Strategy is the primary mission of a firm along with its objectives that

satisfactorily define the overall performance of the firm. Strategies can also be defined as the directions in which the firm wishes to go to achieve its objectives.

Information Systems (IS) are defined as a combination of information, processes (work practices), people and information technology which are organised to achieve business objectives. Information is manipulated in a structured format by people, technology, or both to achieve a number of pre-defined goals.

Strategic Information Systems are those that play a major role in satisfying strategic objectives i.e. objectives which have to be achieved in order for the business to survive.

IS Strategy is a set of actions required to specify ISs and their priorities over a defined period of time. IS strategy explicitly addresses business needs for the foreseeable future based on the analysis of the business environment. Such strategies might need to be adjusted over time in order to meet the dynamic nature of the business.

Critical Success Factors (CSF) can simply be defined as those things that "must go right" if the business is to be successful i.e. have a major influence on whether or not the firm will meet its objectives. They also can be defined as an interim target which are essential to the achievements of the long-term goals.

Business Analysis is the process of identifying the business main data, functions, and their inter-relationships. The purpose of this analysis is to analyse the consistency of objectives, CSFs, goals and business priorities at either level; strategic or operational. It will also evaluate information needs and priorities for business functions.

Information Technology (IT) is defined by the hardware and software that perform data processing tasks, such as capturing, transmitting, storing, retrieving, manipulating, or displaying data i.e. IT is the tool by which information is manipulated.

IT Strategy is a set of actions required to specify the technology required to materialise information manipulation. It also outlines the rate by which the technology is implemented and their priorities over a defined period of time.

Linking Business Strategies to IT Strategies

The amalgamation of business objectives and IS is a vital prerequisite for successful IT strategies. This exercise will again emphasise the role of senior management in this process. If information is regarded as important as labour and capital by a management team, management activities within that organisations should not only address traditional management problems but also the issues relating to the development and maintenance of its information base. Thus, high quality IT strategies can only be delivered when senior management fully participate in establishing frameworks for IS/IT strategies. Their role will be to assist the development team, an external consultant or in-house experts, in

outlining the business objectives and thereafter its associated information and requirements. Such involvement is a strategic task and should not be delegated to technical staff.

The following sections outline a top-down structured approach to a successful IT strategy, (Figure 1):

Figure 1: Diagrammatic representation of the proposed method

1. Business Strategy

Establishing a business strategy is a vital prerequisite task to a successful IT strategy (JMA 1988). It allows management, as well as the development team, to focus towards enhancing business activities and to work within clear boundaries. A business strategy should clearly define the primary mission and objectives of a firm based on the analysis of its strengths and weaknesses. "Where we are now?", "Where we want to be?" and "Where we could be?" are questions which have to be answered (Betts 1992). As an example of a business objective is "To diversify a company's services i.e. looking into project management opportunities". Traditionally, business objectives are vaguely defined with no clear measurable parts which makes the interpretation process of these objectives, by the development team, very difficult. This could result of equally vaguely focused IS/IT strategies which in turn could become subject to ad-hoc changes. This could possibly lead to a major disturbance to planning and implementation of key systems(Edwards et al 1991). Therefore, objectives must be clearly defined with no ambiguity and with clear measurable components.

2. Critical Success Factors (CSF)

It is a systematic review of a firm's objectives, by management, to identify what is critical to achieving them. Emphasis should be placed on establishing measurable factors in order to enable management to monitor the progress of achieving the established objectives. Such factors will also provide management with a guide to identify specific information needs and thus critical application areas where business will benefit most. Moreover, CSFs could assist in establishing a portfolio for systems implementation, i.e. differentiating between systems that required immediate attention and those which can be delayed, based on the business priorities. CSFs should not be more than a reasonable number otherwise the objectives will not be achievable. Examples of CSFs are; increasing client base, reducing services time while maintaining quality, etc.

3. Strategic Business Analysis

The business is first analysed at a strategic level to identify its information needs and processes (work practices). Such analysis must be focused on what the business does rather than on how it is being done i.e. the analysis must be independent from the firm internal structure. This allows analyst to examine consistency of objectives, CSFs and business priorities. Key processes and their key data requirements are identified and evaluated along with their inter-relationships. Several techniques can be used at this stage to ensure quality and consistency. One such technique is the data/process matrix. This technique shows which key process uses which key data and whether data is used, created or updated. Areas (systems) for potential automation can then be highlighted with their relevant implementation priorities (Alter 1992). The output of this process could have a great impact future systems implementation.

This analysis is important to be carried out first and at a strategic level in order not to get lost in a mass of paper of system analysis. Such process would require structured and comprehensive methods to ensure consistence and efficiency. Over the last decade, this has been proven to be impossible to be carried out manually specially for large organisations. This has necessitated the development of computerised tools, CASE, to support the work of the development team. A CASE (Computer Aided Software Engineering) tool is a software environment that assists system analyst and designers in specifying, analysing, designing and maintaining information systems. The main aim of these tools is to improve productivity and quality of the resulting systems by assisting the developers throughout the different stages of development process. Upper CASE tools are those which support the upper diagrammatic analysis techniques such as Entity-Relationship Diagrams, Data Flow Diagrams, and Structure Charts. Lower CASE tools, on the other hand, are those which employ mapping algorithms to transfer formal specification automatically into an executable form. Integrating CASE tools are beginning to emerge with a functionality of providing facilities throughout the life cycle of an information system i.e. combined Upper and Lower CASE tools. Examples of commercially available integrated CASE tools are; PTech (ADT 1992), object oriented based, and IEF (Texas Instruments 1990), information engineering based.

4. IS Strategy

Based on the strategic business analysis and the CSFs, the development team, along with senior management, will be able to identify critical information needs along with their associated systems (application areas). Using clustering techniques of the data/process matrix, potential business area can be identified. Management's attention must be drawn to these areas to enable the development team in establishing an effective and business oriented strategy. Such a process usually produces well defined and powerful portfolios for IS applications i.e. priorities of implementing ISs over a defined period of time and in accordance with the firm's available resources. This exercise will allow management to:

1. identify the role of information and its automation in enhancing the business main stream,

2. evaluate creative ideas about the use of information against business information model
3. ensure that all investments are driven by the business, and
4. evaluate existing systems in a future rather than historical context.

5. Detail Business Analysis

Detail business analysis is carried out on those areas of the business which have been identified critical to the business as a whole. The main aim of this step is to establish a conceptual model of a business area which then can be mapped onto a machine level at a later stage. Business functions and processes along with their relationships are identified and analysed at the operational level. Questions like "Where data originates from?", "Who

use it and Why?", "Who manage it and What for?", "Which process is carried out first?", "What technology is currently being used?", "How effective is the current system?", "What improvements are needed?", etc. should be answered. A successful completion of this task required a structured analysis techniques such as Data Flow Diagrams, Entity Relationship Diagrams, and Process Dependency Diagrams. These techniques are necessary at this stage to ensure that the analysis is carried out correctly and that it reflects the real working conditions.

6. Information Technology Strategy

The IS portfolio established previously should be translated into technology-based solutions i.e. the technology required to deliver the IS strategy. This implies that IT can only be used effectively for a business if it is utilised as part of the IS strategy that contains the work practices, people and information. Consequently, understanding IT is not equivalent to understanding IS. "Technical staff" usually focuses on the technology leaving the identification process of information needs to end users. This hampers communication between system developers and end users and is a major factor in many systems failure (Edwards et al 1991).

IT strategy describes the infrastructure and other related services required to satisfy the business needs. Such a strategy requires an understanding of the current use of technology in the business environment, as well as the developments in the technology field and the economics of using it. An associated implementation strategy is also required to be developed along side the IT strategy to ensure successful implementation of the new technology.

If efficiently defined, IT strategy can be used to identify the following:

1. opportunities for IT that best meet the business needs

2. existing utilisation of IT resources can be examined and evaluated in terms of its benefits to the business
3. the rate at which new IT applications are adopted i.e. a rational investment policy

4. the level of impact of IT within firms. This important issue will allow management to balance new IT investments with the necessary organisational change within the internal structure of firms.

Case Study

The above methodology will be implemented on a private practice, a chartered quantity surveyor, to examine its effectiveness. The practice has two offices which are located in the north west of England. The study will be carried out in two stages. The first stage will be a strategic analysis of the business with aim of establishing business Strategic Information Systems. This stage will

cover the first part of the structured methodology which will include; business mission and objectives, critical success factors, inhibitors, goals, strategies, performance, and strategic information needs. These factors will be analysed to ensure measurability and consistency. The second stage will be to carry out a detailed system analysis on area(s) identified by the business IS strategy. Recommendations will then be drawn regarding the IS and the necessary IT strategy required for the practice.

Conclusions

It is anticipated that the future role of IT in the construction industry will be consolidated. Construction firms will move away from traditional ad-hoc IT investments and go towards well planned strategies. Structured methodologies, which allows the establishment of an effective and concise IS/IT strategies, are beginning to emerge. Future implementation of such methods will be enhance by the recent developments of CASE tools. Development teams can produce conceptual models for the business, at various levels i.e. strategic or operational, and present them graphically to users. This can greatly enhance the communication efforts of the development team with end users. By doing so, large, as well as small, organisations would be able to identify opportunities for IT investments, evaluate their existing systems, identify the rate at which new IT applications are adopted, and work out the level of impact of IT on their firms.

Finally, it is vital that senior management in the construction industry look at IS/IT as a strategic and managerial tool and not as a "necessary evil". This change of attitude would require further commitment from senior management towards proper participation in setting up IT strategies in order produce business oriented and realistic solutions.

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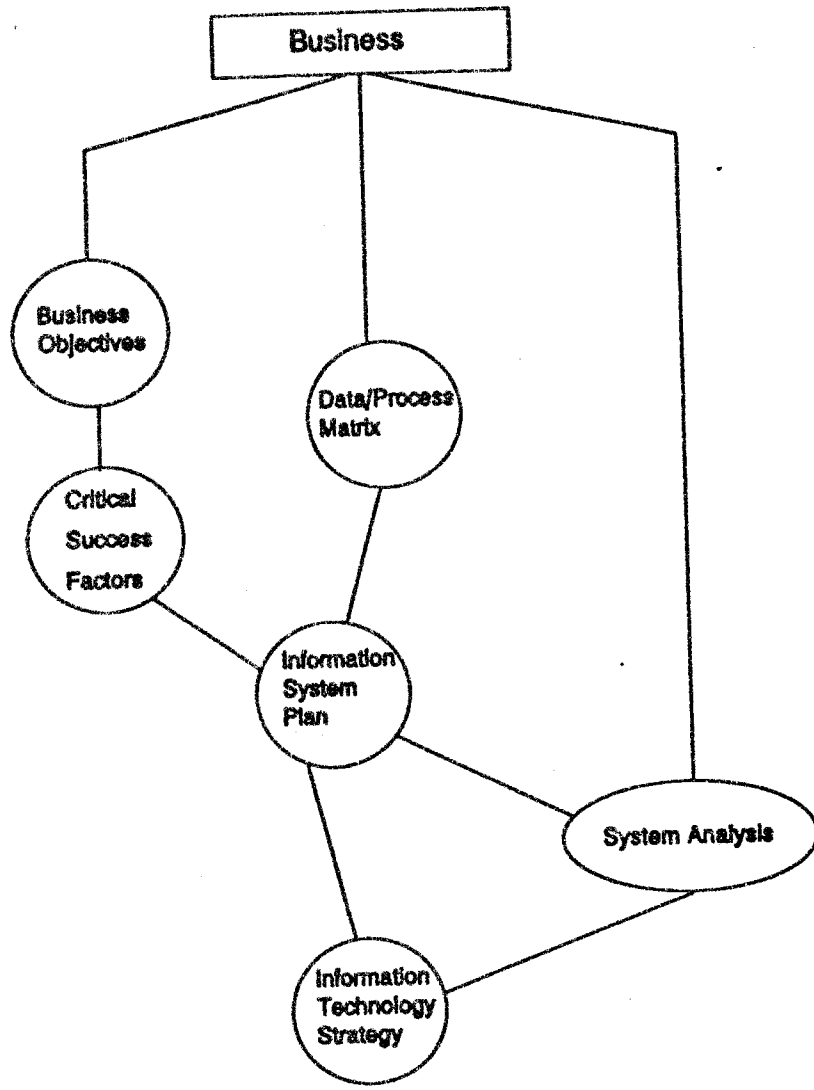Ward J., Griffiths P, Whitmore P (1990), Strategic Planning for Information Systems, John Wiley & Sons.

Figure 1: Diagrammatic representation of the proposed method