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A Categorization of Computer Based Information System

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Abstract: The expanded utilization of registering offices and the use of ideas and speculations from an abundance of various controls have brought about the improvement of diverse sorts of PC based data frameworks (CBIS) with unmistakable useful qualities. The surveys and orders of CBIS found in the writing more often than not center on one of these sorts and furthermore on classes of utilizations. There is a requirement for an expansive grouping with an attention on the utilitarian attributes for CBIS that consider issues of hierarchical help and portrayal of business-related procedures. The present paper endeavors to give the essential structure for such a utilitarian scientific classification by grouping CBIS on three unmistakable process components: data process bolster; choice process bolster; and correspondence process bolster. The point is more prominent exactness in frameworks arrangement also, to upgrade the helpfulness of CBIS inquire about by lessening equivocalness in the attribution of research comes about. Ten unique sorts of CBIS are analyzed and ordered. The constituent components of these CBIS composes are additionally examined.

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I. Introduction

The increased use of computing facilities and the application of concepts and theories from a wealth of different disciplines (such as operational research. management science, artificial intelligence, etc) have resulted in the development of various types of computer-based information systems (CBIS). These types of CBIS exhibit distinct functional characteristics and aim to provide support in separate parts of the organizational environment; e.g. executive information systems focus on the executives of organizations, decision support systems aim at providing support for decision-making activities, etc.

The reviews and classifications of CBIS found in the literature have two important limitations. First, they focus on only one of the various types of CBIS, aiming to limit the scope of analysis into manageable scale; see, for example, Rainer et al and Watson et al for reviews of executive information systems.' Second, they either focus their analysis on all kinds of applications of a specific type of CBIS* or restrict their scope even more to a particular class of applications (i.e. a particular problem domain).

Ten different types of CBIS are examined: management information systems; executive information systems; executive support systems; decision support systems; group decision support systems; electronic meeting systems; organizational decision support systems; expert systems; office information systems; and intelligent organizational information systems. The latter category constitutes an attempt to synthesize research towards the goal of competent and intelligent aid in organizational settings.

The paper also examines the constituent elements of CBIS. The CBIS examined here include the following elements: database management systems (DBMS); model management systems (MMS); knowledge based management systems (KBMS); cooperation management systems (CMS); and dialogue systems (DS).

The next section presents the general framework for a functional taxonomy of CBIS and reviews the various type of systems. Next, an attempt is made to map the different types of systems to the taxonomy, identify and discuss their technological elements and characterize the CBIS in terms of the support they provide to the individual, group and organizational levels. The final section provides the conclusions and directions for further research.

Classifying CBIS

Elements of the taxonomy

In order to classify the CBIS we use an approach similar to the one adopted by Cotter man and Kumar. We attempt to classify CBIS on three distinct elements:

- Information process support, ie the provision of online support for the extraction, filtering and tracking of data critical to the organization.
- Decision process, ie the use of information in order to provide intelligent support for reaching decisions on semi-structured, or unstructured problems.
- Communication process support, ie the provision of support for sharing and exchange of information between multiple users.

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Information process support, decision process support and communication process support are the three key dimensions that allow us to distinguish between the various types of CBIS. Figure I provides a convenient way of visualizing the various possibilities. In Figure 1 the x-axis is information process support, the y-axis is decision process support and the z-axis is communication process support. The corners or nodes of the cube represent the extremes of each dimension. Node (1,0,0) for example, represents the case of an individual CBIS that provides information process support without explicitly supporting either the decision-making or the communication requirements of an organization.

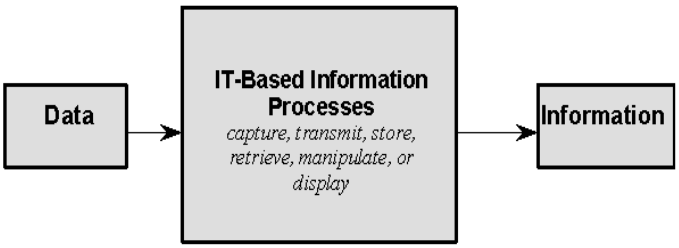

Figure.1 Classification of Computer based Information System

Several types of computer-based systems have been developed; from an analysis of the most-used terms in the literature the following 10 types can be identified:

- management information systems (MIS);
- executive information systems (EIS);
- executive support systems (ESS);
- decision support systems (DSS);
- group decision support systems (GDSS);
- electronic meeting systems (EMS);
- organizational decision support systems (ODSS);
- expert systems (ES);
- office information systems (OIS);
- intelligent organizational information systems (IOIS)

Management information systems

The literature abounds with accounts of what is, or is not, a management information system (MIS):" the definitions range from the extreme of those who believe that MIS is a computer-based system that produces an expanded set of reports and has a query capability, to those claiming that an MIS serves all the information needs of an organization.

Hence, it can be considered that the role played by MIS refers only to the first level of Ackoff's cIassications i.e. MIS have failed to support semi-structured and even unstructured decision making; see also Watson and Hill" who attribute this failure to the following reasons: MIS personnel are unfamiliar with the decisions that need support; MIS personnel are overworked with backlogs measured in years; managers cannot specify their information requirements except through an interactive process; and managers' information requirements are subject to change with changes in the decision-making environment. The use of computer-based systems that would support and enhance the decision maker's judgment in areas of unstructured and semi-structured decision making-is where decision support systems come in.

Executive Information System

There is a growing need for timely information needed by senior managers for issues about critical aspects of an organization. Executive information systems (EIS) have been created to monitor the decision environment, evaluate the captured information for opportunities and/or problems, and present timely analyses to top-level managers. An EIS can be defined as 'a computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors'.

Executive support systems

Both the terms EIS and ESS (executive support systems) appear in the literature. According to Rockart and De LongI an ESS usually refers to a system with a broader set of capabilities than an EIS, including: support for electronic communications (eg e-mail, computer conferencing and word processing, etc); data analysis capabilities (eg spreadsheets, query languages, etc); and organizing tools (eg electronic calendars, etc). Hence ESS appear to support features not only related to information-support, but also to communication process support.

Decision support systems

As Keen has put it, ' right from the start of the DSS movement, and even now, there has been no established definition of DSS ,For example, according to Sprague DSS are 'interactive computer based systems, which help decision makers utilise data and models to solve unstructured problems'. " An alternative definition of decision support systems (DSS) is given in Edwards: a decision support system is a 'system which enables the user to access data and/or models so that he or she may take better decisions'." This definition is neutral with respect to issues that are discussed extensively within the DSS field; eg whether a DSS must be computer-based, whether it must include a normative mode, etc.'" The DSS literature has seen a wealth of research efforts; hundreds of DSS have been constructed, in order to facilitate decision making in a variety of situations; see, for example, Eom and Lee" for a

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survey of applications and Eom et al" for an analys is of the intellectual structure of DSS.

Group decision support systems

It has been argued that group activities are economically necessary, efficient as means of production and reinforcing of democratic values.'" DeSanctis and Gallupe provide the definition of a GDSS as 'an interactive computer-based system that facilitates the solution of unstructured problems by a set of decision-makers working together as a group'.'" Operationally this means increasing the speed at which decisions are reached without reducing, and hopefully enhancing, the quality of resulting decisions. Shaw, for example, concluded that groups produce more and better solutions to problems than do individuals, particularly on judgemental tasks.2' The classification of the technology basis for GDSS proposed by Kraemer and King distinguishes between six 'technological systems': electronic boardroom; teleconference facility; group network; collaboration laboratory; information centre; and decision conferences.'2 On the other hand, Mentzas has identified the following (conflicting) options in the design and development of group systems: specification and implementation of coordination; use of synchronous and asynchronous working phases; information exchange and information sharing; support of sequential and concurrent processing; support of negotiation and conflict solution; support of analytical modelling; and description of the organization environment.

Electronic meeting systems

Electronic meeting systems (EMS) provide an information systems infrastructure to support the work of participants in groups and the activities in their meetings.*" According to McLeod and Liker the main features of EMS systems are the following: parallel communications (the ability of group members to input and receive ideas simultaneously with other members of the group); anonymous communication (ie that group members are not able to attribute ownership to any ideas); shared software (ie software that is equally available to all group members); shared view (ie all group members have equal access to the same view of their work); decision tools (which refer to software that is designed to support a particular decision task); process tools (software specifically intended to include a particular approach to working on a group's task).'" Of course, the last two features are expected to be found in GDSS (high-structure environments) rather, than in EMS (low-structure environments).

Organizational Decision Support System

The fact that information technology has a significant effect on organizational structure has been discussed extensively in the literature. It seems unquestionable that the typical organizational structure has changed in past decades.'" The organizational tasks or activities that affect several organizational units have been the focus of organizational decision support systems (ODSS). These systems support people from different groups and provide information which is used across multiple independent activities or decisions, ie the range of their users exceeds any specific group."

Expert systems

Expert systems (ES) have been defined as systems that embody knowledge, offer intelligent advice or take intelligent decisions about a processing function.'" The major issue in expert systems is that they 'replace' the human expert, by embodying his/her expertise within an electronic expert.j' It has been argued that expert system development is quite different from that of conventional systems; the reasons for this difference can be summarized in the following: conventional programs deal with problems that have been solved beforehand, hence they try to change known procedures or algorithms into code in an efficient manner, while ES determine and encode expert knowledge, based upon knowledge acquisition with repeated interviews of human experts.

Office information system

A Office information systems (01s) aim at supporting the documentrelated, procedural and communication issues of office work.'" They have been modelled as encompassing three domains: passive office objects; office procedures; and office task.'" Office objects are the primitive office elements; examples of office objects are documents, files, printers, etc; hence, office objects metaphors that represent their actual counterparts in the physical office. Office procedures can be considered a set of mappings among office objects; office procedures are routine sequences of operations that are used to manipulate office objects. They model the event-driven behaviour of office work and are triggered upon completion of some awaited event, eg the arrival of a message, the completion of a form, or the modification of a document. Finally. Office tasks are goal-directed and cannot necessarily be encoded to a precise procedure to be followed. Their intention is to model cooperation among many office agents, negotiation among parties, confrontation and argumentation, and the abilities to learn and reach goals.

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Intelligent organizational information systems

There are two main problems facing all of the above types of systems. First, none of them satisfies in an adequate manner all the decision-, information-, and communication-related processes of an organization. The second major problem of existing systems is that none of them covers explicitly the needs of large-scale organizations; eg support of parallel work; intelligent assistance in group communication; negotiation and conflict; distribution of processing and reasoning facilities; techniques for multi-participant planning; organizational learning facilities; etc. Hence, there is clearly a need for systems that would support in an intelligent manner the whole spectrum of organizational activities; such systems are called intelligent organizational systems.4' With the term intelligent organizational information systems (101s) we label the research direction towards systems of intelligent software entities, that are organized in loosely coupled, distributed architectures, and include communication, control, and task-sharing facilities, with the addition of effectuation and advanced modelling capabilities. 101s aim to relieve the burdens and assumptions imposed within other types of CBIS.

Analysis of components

The CBIS examined here include a number of constitutent elements, which in turn are built using fundamental theoretical techniques drawn from such fields as operations research, computer programming, artificial intelligence, etc. We can distinguish among five such constituents: database management systems (DBMS); model management systems (MMS); knowledge management systems (KBMS); cooperation management systems (CMS); and dialogue systems (DS).

II. Conclusions

The taxonomy presented allows the classification of existing CBIS and feature the systems in the three-dimensional scale. The three dimensions include: information process support; decision process support and communication process support. Based on the taxonomy, more precision and control can be introduced in the development and use of CBIS and the attribution of research findings can be more easily traced to specific system functions.