ABSTRACT: This paper provides an overview of the current design of TEIES (Tailorable Electronic Information Exchange System). This system is intended to provide sufficient tailorability to allow it to support a wide range of applications in the areas of Collaborative Systems and Group Decision Support Systems. It is also intended to allow complete integration of communication and information services for users and groups.

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INTRODUCTION AND HISTORICAL REVIEW

Increasing tailorability seems to be a fundamental characteristic of the evolution of technology. As individuals and groups, we use our technology to adapt to a wide diversity of configurations. In the early days of a technology (e.g. cars, homes, personal computers) we are happy to have the model-T's and the log cabins. As a technology becomes more developed and offers more options we develop a diversity of versions that are tailored to different preferences and objectives and serve different functions. Hardly anyone today would be satisfied with an automobile dealer who offered only Model-T's or with living in a one-room log cabin. Even if houses all have bathrooms and kitchens, there are many choices in architecture and furnishings.

While this might seem a perversity of human nature, the careful investigation of this diversity usually finds its root cause in Zipf's principle of "Least Human Effort" [1]. Humans adapt their physical environment to minimize both physical and mental efforts to accomplish their tasks and objectives.

With respect to Computer Mediated Communication (CMC), the current state of the technology is still largely one of the Model-T era where the common perception is the "message system" or "electronic mail" metaphor. However, we have always advocated that the ultimate objective of CMC systems is "collective intelligence" [2] which can be achieved through the ability to utilize the computer to create communication structures that will allow a group to act more intelligently than any one individual acting alone. The new TEIES (Tailorable Electronic Information Exchange System) has been designed specifically to facilitate that long term objective. This paper describes the design of TEIES in terms of its fundamental objective of tailorability and the associated objective of integration with other computer based tools.

The design of TEIES has combined aspects of earlier conference systems that have been utilized and evaluated. The resulting synthesis attempts to capture the useful features and to develop a foundation design that can overcome the principal problems and limitations of these earlier systems.

In the decade following the first computerized conferencing system [3] there were only about ten general purpose systems implemented. Among the early systems were EMISARI, FORUM, EIES, ROM, NOTEPAD, PARTI, CONFER, and EQUAL [2], [4]. These systems were distinguished from message systems in that their primary orientation was toward communications to support group tasks, and their internal design was based upon central data bases of these group communications.

Despite significant design differences among the earlier systems, they had many application successes [4]. Design differences included such fundamental considerations as how to organize and deliver new discussion comments to the individuals in the group. For example, three very different forms of delivery were linear chronological transcripts (e.g. EIES, FORUM, KOM), tree structured transcripts (e.g. PARTI, EQUAL), and inquiry-response structuring (e.g. CONFER). In general, these delivery design choices produced significant differences in the behavior of communicating groups and in the types of applications for which the systems were best suited [4]. Just as there are many different communication structures used in face to face communication, there is also a need for different CMC structures to serve different communication objectives.

THE GOALS OF TEIES

Since the early 80's the evolution of Computer Mediated Communication can be characterized by two trends. One is the proliferation of new systems
to take advantage of changes in the technology. This includes systems which operate on powerful micros and minis and in network environments. As micros become more powerful, bulletin board systems are beginning to evolve into conferencing systems. As message systems become popular, there is a natural tendency to try to extend them to incorporate group support. However, message systems represent one highly specialized structure whose metaphor and resulting internal design does not lend itself to full support of group activities.

Another significant trend is the incorporation of communication functionality into highly specialized or tailored application-oriented systems. This is, for example, a growing number of Hypertext systems, designed for very particular applications [6], [7], [8], which have incorporated structures for contributions of material to the data base by groups of individuals. In fact, a recent hypertext implementation for policy analysis [9] replicates the first computerized conferencing system [3]. The area of Group Decision Support Systems [10], [11], [12] also illustrates specialized tailoring. In summary, traditional systems designed for databases and text processing are adding communication features to support group activities.

As a result, "collaborative systems" are being developed either as systems oriented toward generalized communication, or as highly specialized systems tailored for specific applications. We have always felt that group oriented systems need to be tailored to the nature of the group and its application [2], [13], [14], [15], [16], [17]. However, users cannot deal with numerous systems to match different communication objectives. An approach in which the user must shift to a different system for each communication task is doomed to failure. The challenge for the next generation of collaborative systems is integrated systems that provide tailorability of communication structures directly to the user. The traditional computer facilities of data bases and analysis routines must become subservient to a common communication system rather than to an operating system.

The challenge we have faced with the design of TEIES has been to provide tailorability and an interface that allows the user to take advantage of that tailorability. The detailed goals of our project can be summarized as follows:

**General CMC Objectives**

- Service for the frequent user who uses the system as the primary medium of day-to-day communication activities in an organization.
- Honesty in communications, to encourage the establishment of explicit norms and values by groups to govern communications.
- Learning by trial and error so that new capabilities can be acquired by users when they need them.
- Open ended user interface design metaphors that will allow the evolution of facilities to support a wide variety of applications.

**Tailorability Objectives**

- Alternative group communication structures and protocols for different group communication needs, based upon the application, size of the group and the nature of the group.
- Alternative methods of organizing, tracking and integrating the resulting database of communications on an individual and group basis.
- Specific software support for alternative human roles that are required for facilitating group communication processes.
- Integration into the communication processes of any required type of computer resource or support.
- Tailorability of the interface to satisfy individual cognitive and collaborative metaphors.

**TEIES SYSTEM OBJECTS**

TEIES is internally an object-oriented database. The objects are those that have been common to a number of conference systems: members, groups, messages, conferences, comments, and a directory. There are also two new objects that have not been present in earlier systems: notifications and activities. We first present an overview of the principal characteristics of these objects and will return later to some unique properties that provide enhanced tailorability.

**DIRECTORY:** A database of primary objects

- lists: members, groups, and conferences
- indexes: names, locations, ownership, roles, interest keys for members and groups, topic keys for conferences

**MEMBERS:** An authorized user of the system

- owner of: conferences and groups
- author of: messages, conference comments
- creator of: activities and notifications
- possessing: private files, indexes, lists of marked and authored items
- indexed by: interest keys, description, addresses, roles and memberships

**GROUPS:** A set of members that may act as a "super" member for the purposes of collaboration.

- owning: conferences and group mail
- having: membership and special roles for group members
- allowing: shared group files, indexes, and lists
- indexed by: topic keys, description and membership

**MAIL & MESSAGES:** A central cyclic database of messages sent between and among members and groups.

- allowing: attachment of activities, modification, retrieval, copying
CONFERENCES & COMMENTS: A structured discussion space treated as a database.

ACTIVITIES: Executable programs and forms that may be attached to text items to carry out an open ended variety of collaborative procedures or to serve as interfaces to other computer and information resources.

TEIES INTERNAL FEATURES

The ability of TEIES to be tailor able and to be integratable with other computer resources is largely a function of the internal structure. It is the foundation facilities described below which make TEIES representative of a new generation of Computer Mediated Communication Systems.

The degree to which this power can be brought to the user and put under his control depends upon the user interface. The TEIES interface provides a metaphor which minimizes the cognitive differences between the understanding of the system by the user and the way the system actually operates.

TEIES is composed of four virtual machines (i.e. Master, Data Base Server, User & Network). A single TEIES system consists of one Master and any number of other machines. Each machine may reside anywhere on a network of independent computers and workstations. This means complete tailorability, in a system sense, of what is at any processor in the network. The master server only verifies authority to establish communication channels between different machines.

The Master machine contains an index of all objects within a given TEIES implementation so that the overall database may be distributed on a number of different machines. Since no user machine has an access to any database machine until authentication has occurred, there is a high degree of security. The master indexes function by unique id, author or owner of an object, date/time of creation and key words.

The TEIES database contains access and utilization privileges as a form of linkage attribute between users and the objects they are working on. Thus, no application program or interface tailoring has to be concerned with the protection and security of the data involved. The database can internally determine the rights or privileges of any user request regardless of its source. This also means that an application written in any language as an independent application can call on or be interfaced to TEIES.

Privileges in TEIES are also collected into groupings that define human roles in the communication process. The process of defining both privileges and human roles is open ended and may be accomplished by someone with a command of the C programming language.

TEIES incorporates its own forms subsystem which utilizes the proposed Standard Generalized Markup Language (SGML). The forms subsystem has extensions that contain all TEIES interfaces as forms. These forms are stored as regular TEIES text items with public privileges. This reduces the design of interfaces to more of an editing task than a programming task. Forms may also be used to call up and execute programs available through the executive system in which TEIES resides. As a result special activities can be created by designing forms to provide the interface to the computer resources they call up.

All system and help messages exist as text within the TEIES system. One may create alternative interfaces and system messages and selectively provide these alternatives to individuals and groups. For example, different users of the same system can use interfaces in different languages.

Activities are designed in forms and may be attached to any text item. Activities can include executable programs or procedures. Users of TEIES can "do" any of these activities as well as "viewing" the text object to which they are attached. Activities, as a general extensible concept, can be used to integrate any application tool from any language or database into a given collaborative system design. Associated with activities is "notifications," which is a general transaction tracking and alerting system that can be linked to any activity.

TEIES provides two-way linkages among data objects. Therefore, if a user wishes to link another user's material into an item, the original author will have references to that linkage in his data. This allows for experimentation with many protocols to handle the sharing of material among groups and is critical to working with collaborative Hyper text applications.

A TEIES user object and group object are equivalent in that they both have the same functionality. As a result groups may share any of the functionality provided to an individual.

Personal TEIES is a workstation-based graphics editor and display system. Graphics are coded in NAPLPS and linked to other objects in TEIES via
GML. The result is that any graphics produced by one individual on the system may be manipulated and edited by another at a macro level as opposed to dealing with bit mapped representation. Icons in PERSONAL TEIES are higher level objects that may link in text and programs. Individuals and groups may create and share icons and what they link to. The result is that any icon may become a window or direct manipulation link to anything in PERSONAL TEIES or TEIES.

All software development work is in C and all systems are designed to isolate and restrict hardware and executive system dependencies to an OSI kernel (Operating System Interface). Programming standards have been imposed to make the code operational across a wide range of C compilers. This makes the system software easily transportable to different hardware and operating systems. The first version of TEIES is being created for the IBM/VM environment. However, it is planned to port it to other environments including broadband LAN configurations. Likewise the first version of Personal TEIES operates on IBM PCs or compatibles.

Figure 1 summarizes the primary tailorability features of the system based upon the internal features and the characteristics of the basic objects that make up the system. The ability to specify any configuration of conferences, groups, memberships and roles, together with the classification of private and public access, means that just about any desired organizational structure can be reflected within a given TEIES implementation.

INTERFACE: DIRECT AND INDIRECT METAPHORS

We agree with Carroll and Thomas [19]; [20] that metaphors are not merely a method of facilitating learning, but must also be viewed as a psychological model that underlies user interface design. It is quite natural to utilize the human communication metaphor for a collaborative system; however, we have extended this to utilize the communication metaphor to incorporate the utilization of any computer resource or functionality made available to the group or the individual. The same processes whereby individuals communicate with other humans provide the ability to utilize data bases, models and other computer based resources. Use of the same metaphor cuts through the problem of "system opacity" [21]. The merger of many computer facilities into the Collaborative System means complete tailorability of both communication and information resources into a single integrated interface. For example, within TEIES the metaphor of "activities" provides a single focus for direct integration of any special computer based facility. The operations of "viewing" or "doing" an activity apply uniformly to all types of integrated facilities.

The user of TEIES deals with choices of the type of object, modifiers (which result in a limited subset of the objects, or a "list"), and of a "generic" action (which establishes a "work mode" for the user). The result of the three simultaneous choices is a list of specific objects to process (e.g. VIEW NEW MAIL). The user is then provided a tailored set of alternative process actions that can be applied to any entry on the list or to all entries. The system is designed as a one-level system with respect to the use of commands. Therefore, experienced users may use any commands they are aware of at any time, rather than just those provided by the standard action mode menu.

Internally, the user has chosen a user state that produces a list and a set of processing alternatives to act on the list. It is possible for the more knowledgeable user to directly evoke the concept of list processing. Different lists from different user states may be manipulated in a general list processing framework.

The "list processing" metaphor is an underlying capability for which we wish the user to evolve an understanding. In part, this understanding is initiated by providing each user and group with the ability to "mark" items, which results in a stored list that may be called up for later processing. The benefit of this approach is the ultimate ability of users to manipulate and organize both their communications and the results of use of other computer facilities.
through a single interface structure. Besides commands to operate on lists, there are a large set of MODIFIER terms (e.g. NEW, DONE, PUBLIC, URGENT) that are available to directly manipulate a given list in terms of what is to be included or excluded.

This focus on list processing is based upon the hypothesis that it ultimately provides the user with a more powerful interaction tool than alternatives such as direct manipulation. Once a user has mastered list processing as an abstraction, there is a considerable degree of leverage available for the control and processing of communications.

**STRATEGIC CONTROL INTERFACE SCREENS**

The primary interface to TEIES is provided by either the HOMEBASE (See Figure II) screen which is the top level list of OBJECTS, MODIFIERS and ACTIONS available to the user, or by a CASUAL user's screen which presents most of the day to day tasks of a user. Both screens provide versions of a 'control panel' approach which enables the user to specify a strategy to accomplish a task.

The HOMEBASE menu presents the top level set of choices for the categories of objects, modifiers and actions. Making a specific top level choice always results in the system inferring a specific default choice for the user. Therefore, the new user does not have to know all the options that are available and their meanings. The sub-menus for each top level choice are intended for the more experienced user who wishes a higher degree of tailoring in their interaction. Each of the three menus exhibited on the Homebase screen provides approximately 100 alternative choices if one includes the three possible levels for each. In a sense, the full list of each of these menus presents a hierarchical index to the planned capabilities for TEIES, much like a book index. Therefore, the Homebase screen can be used to explore the system for new features or features one wishes to learn about, in the same way one would use a book index. Help may be obtained on any menu choice and any of the hidden submenus through this index aspect of the menus. These three menus can be tailored for any specific installation of TEIES and provide a way of configuring the system for structuring a very unique version of the system.

The CASUAL screen will provide most of the common options a user needs the majority of the time. However, for the experienced user it provides an ability to structure quickly very detailed and powerful requests through a single control screen. For example saying 'yes' to find conferences and placing the word 'public' in the modifier option will produce a list of all the public conferences. Therefore a user who knows specific modifier terms can tailor many more strategic choices than appears obvious from the screen itself. In addition, logic about what a user most likely wishes to do is incorporated as a mini-expert system in support of the CASUAL screen.

**GENERIC COMMANDS AND ACTION MODES**

The user is provided seven generic commands [22] which may be applied to any object or collection of objects. The exact meaning of each command is a function of the state the user is in and the type of objects it is applied to. For each generic command, there are available more specific commands that carry out very specific actions. However, the system always picks the expected default if the user chooses the generic version. This set of generic commands is:

<table>
<thead>
<tr>
<th>Command</th>
<th>Generic Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIEW</td>
<td>Display individual objects or lists of objects.</td>
</tr>
<tr>
<td>FIND</td>
<td>Provide search options appropriate to the object type.</td>
</tr>
<tr>
<td>REVIEW</td>
<td>Provide summary information such as distribution of items and activity.</td>
</tr>
<tr>
<td>CREATE</td>
<td>To create new objects.</td>
</tr>
<tr>
<td>MODIFY</td>
<td>To modify existing objects.</td>
</tr>
<tr>
<td>DO</td>
<td>To trigger an execution of a process.</td>
</tr>
<tr>
<td>ORGANIZE</td>
<td>To perform various housekeeping functions provided for objects.</td>
</tr>
</tbody>
</table>

The use of a generic action approach means the user does not have to learn a new functionality to be able to deal with tailored and specialized capabilities.

**MODIFIERS**

A large number of "modifiers" may be applied directly to a given list or by choosing them from the HOMEBASE menu. They are meant to supply the experienced user a great deal of selectivity on the contents of a list. Some examples of modifiers are:

- PUBLIC will reduce the list to those groups or conferences that can be joined by any member on the system.
- URGENT will reduce the list to those comments or messages that have been designated as 'urgent' by the author.
- UNDONE would reduce a list to only those activities that had not yet been done by a user.
- MARKED would condense the list to only those items that had been marked.

Using the personal index that each member and group has, it is possible to designate index terms that are classified as categories. These may then be used as personal or group modifiers to match against the keys that are on lists of messages or comments, in much the same way as one uses the above system-wide modifiers. Since a list may be made up of different types of objects it is then possible to collect communications and other information into topic lists that are specialized to the group and what it is working on. It is expected, for example, that various project and task labels would be used by a working group as categories to set up their personal set of modifiers.
INDEXES AND CATEGORIES

An important object for the experienced user is indexes, which may be associated with individuals, groups, conferences, and the directory. Indexes can be set up to allow free entry of keys on a collaborative basis or to restrict use of index terms to a fixed set of keys specified by an individual acting in the role of "indexer" for the group or conference. Indexes may also have multiple levels (e.g. train.education, train.transportation).

The generic commands can be used to operate on an index just as they can be used to operate on any other object type in TEIES. Individuals may choose to use a group index if they are members of the group. The group index provides a powerful way of sharing information since any text item linked into the group reference keys by a member makes that item viewable by the other members of the group.

The directory has a number of index types, including interest keys and topic keys. Any individual may specify interest keys to indicate their interests. Any member of the system may address a message to an interest key and it will be sent to all the members who have associated themselves with that interest. Members may also choose to remove their association with an interest key. Topic keys indicate the topics that groups are interested in and that conferences are concerned with.

There is a system wide index and in it are a large number of category keys that are available for use on messages and comments. Through the modifier submenus one may select new, marked, or old items by these categories. These may, of course, be modified for any installation of TEIES. Currently the following system wide categories are planned:

- FYI, Inquiry, Request, Problem Proposal,
- Decision, Assignment, Announcement Respond,
- Investigate, Do, Take-care-of Consider, Hold,
- Follow-up, Action Urgent, Business, Formal,
- Personal

The ability to provide indexing and control of the indexing by the individual members and groups is considered very critical to the utility of these systems for work oriented tasks. Most successful applications of this technology to project management do result in very large conference databases (e.g. thousands of comments) and the need to regularly review what has occurred in the past. This is particularly critical when there are changes in the membership of the project group or unforeseen problems arise. Conferencing systems for organizational use must deal with the classical information retrieval problem for text data files.

NOTIFICATIONS

Notifications are short one or two line messages that serve a wide variety of objectives intended to reduce the amount of effort necessary to communicate about complex tasks. These objectives are to:

- Generate automatic alerts based upon transactions that have taken place. For example, a reply to an "urgent" item might notify the readership of that item that a reply exists. Most automatic alerts are optional in nature.
- Provide a direct manipulation handle, since one may point to a notification and retrieve the material it is referring to.
- Provide a data base to the member for tracking the actions associated with a particular task. Each member has a cyclic file of the notifications delivered to him or her.
- Provide the interface function of "closure" on processes that the member or group has triggered. Each activity defined for the system may incorporate its own set of tailored notifications and the conditions under which they are triggered.
- Reduce the need for messages by the use of "canned" notifications. A member may point to an item and trigger a standardized notification expressing any of a large number of common communication tasks such as expressing agreement or disagreement, desirability or undesirability, responsibility for taking care of something, etc. These notifications may be incorporated as attachments to the original message or comment.
- Enhance communication awareness through notifications, such as information about new members added to a private conference or the introduction of new classification categories for use by the group.

Notifications represent a general open-ended concept that provides a great deal of flexibility as to how they may be used in association with groups, conferences and activities. Through extensions to the forms subsystem on TEIES, individual users can create tailored notifications triggered by actions on a text item, such as viewing it, creating attachments such as "delta edits," or by triggering hypertext linkages. The importance of the concept of notifications is that a wide variety of applications for alerting, closure, and tracking is served by one interface metaphor and not by a variety of interfaces for different applications.

ACTIVITIES

Activities may be formulated out of any facilities in the computer system or broadband network in which TEIES operates. Ultimately the types of activities available will depend on the particular installation and the evolution of facilities to support collaborative tasks such as education, project management and composition. The general categories of activities we have already designed include:

- APPENDAGE activities which allow users to append information to existing objects (e.g. delta edits, approval notifications, etc.)
- CONDITIONAL activities which allow the user to receive additional information based upon the
The first set of about ten activities we have been implementing are those tied to support of the Virtual Classroom Systems, and Collaborative Systems. It appears to be desirable from prior work in Computer Mediated Communications, Group Decision Support Systems, and Collaborative Systems.

The activities planned are based upon our own assessment of what appears to be desirable from prior work in Computer Mediated Communications, Group Decision Support Systems, and Collaborative Systems. The interfacing for a specific activity may be designed (Standardized General Markup Language: ISO/DIS 8879) and may trigger programs written in any application programmer integrating any existing user oriented version of SGML that will allow users to do some degree of personal activity creation. There should be no difficulty with any language. We will be introducing, in the future, a user oriented version of SGML that will allow users to do some degree of personal activity creation. However, there should be no difficulty with any application programmer integrating any existing computer applications in the organization into tailored activities that may then be directly embedded in the TEIES communication process.

PRIVILEGES, ROLES, AND TICKETS

The definition of a role on TEIES is based upon a combination of the fundamental internal privileges allowed for the role and the object to which the role is linked. There are over 25 privileges defined which are based upon the types of conditional communication actions individuals can take in day-to-day situations (e.g. placing material in someone's file without being able to see what is there). Roles are defined to be meaningful metaphors at the user level and are open-ended in that it is quite easy to introduce new roles and privileges as needed.

Tickets are a mechanism whereby any member may transfer specific privileges to another member. For example, a ticket may be issued by an author to allow the modification of a text item by someone who does not normally have that editing privilege. A ticket may be made conditional on such parameters as number of times it can be used or the time period during which it is valid. The person issuing the ticket may also withdraw it at any time.

The associated concepts of privileges, roles and tickets are completely open-ended and allow for the future expansion and tailoring of the human communication protocols.

CONFERENCES

The core of any collaborative system is the shared group discussion space. Over the years, many specific computer mediated conferencing structures have been evolved for specific purposes. A great deal of the variation among these structures can be accounted for by such parameters and functionality as the sizes of allowed root items and replies, organization and conditions placed upon the entry and delivery of text items, voting procedures, roles of humans within the group and conference, indexing alternatives, and the incorporation of specialized data structures and hypertext-like linkages among text items. In TEIES all of these features have degrees of tailorability which may be selected by the person creating a conference for a specific application.

There are seven default conference structure choices that a beginning user may select from when establishing a conference, which will automatically set parameters according to system-wide choices. These are:

- Discussion Conference: Structured to optimize general purpose discussion by active groups of up to fifty or more individuals.
- Seminar Conference: Designed to facilitate learning oriented seminars and the "Virtual Classroom" [15]. It will include such special activities as "question branches" where a member cannot see the answers of others to a question until he or she has supplied an answer or opinion.
- Information Exchange: Optimized for very large groups (hundreds) engaged in unpredictable information exchange. It allows a high degree of branching, controlled indexing, and self selection of what sub-branches to track.
- Project Management: Incorporates various tracking, selection, and organizing features to maintain awareness of modifications, milestones, status, and task assignments that are taking place.
- Composition Notebook: Allows a high degree of selective roles in different designated portions of the conference, and tracks the updates and changes being made to the generation of a collaborative document.
- Data Collection Conference: Designed for the organization of structured data, and the tracking and validation of data changes for a group building and utilizing a collaborative database.
- Simulation-Game Conference: Structured to allow a group to carry out a role playing, event-oriented scenario game. It allows the game director to control allowed communication channels and the conditions and timing for events to occur and actions to be taken.
The above default conference types preset the many structuring options that are available for the design of a conference. More experienced users can choose their own combinations of tailoring options for conferences they own. This provides very detailed tailoring of the fine parameters of a conference structure (e.g. the size of the comment allowed at any response level).

Key to any conferencing activity is the ability of any member of the conference to be able to find out the status of the other members as to what they have read and what they have done. TEIES will enhance this aspect considerably over prior conferencing systems. Summary reviews will be available on both the activity and the resulting structure of the discourse.

**SUMMARY**

The TEIES effort represents a new generation of CMC software that will allow the design, development and evaluation of tailored collaborative systems. The ability of application programers to integrate other computer resources and systems with TEIES without any concern for the problems of security and access privileges is the principal key element to facilitating this objective. TEIES provides the toolbox to overcome the tremendous programming bottleneck present in the development of collaborative systems. Everything has been done to minimize the human effort needed to create a tailored system. The forms based interface for TEIES and the open ended concepts of privileges, roles, activities, group sharing, and notifications allow the incorporation of tailored facilities without any fundamental change to the interface or to the basic metaphor of the communication process and associated list processing.

Undoubtedly the planned design we have laid down for the development of TEIES will undergo much evolution and change based upon the feedback from its utilization. Based upon our experiences with the evolution of the original EIES system since its inception in 1976, we strongly believe that the use of CMC systems in an organizational setting has to be viewed as an evolutionary process. The CMC, itself, should serve as the vehicle for the users to provide feedback and to allow them to participate in the evolving design of the system. We have attempted to design TEIES as a tool for that process. Furthermore, the ability of TEIES to be a primary interface to other computer based resources would allow the evolutionary approach to be applied to all the information systems within the organization.

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**Figure 11: HOMEBASE AND CASUAL SCREENS**

<table>
<thead>
<tr>
<th>TEIES HOMEBASE</th>
<th>Screen 1 of 1</th>
<th>Screen code: 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Notifications:</td>
<td># 1. New items</td>
<td></td>
</tr>
<tr>
<td>2. Mail/Messages:</td>
<td># 2. Marked items:</td>
<td></td>
</tr>
<tr>
<td>3. Conferences:</td>
<td># 3. Item categories</td>
<td></td>
</tr>
<tr>
<td>4. Directory</td>
<td># 4. Reception categories</td>
<td></td>
</tr>
<tr>
<td>5. Member information</td>
<td># 5. Distribution categories</td>
<td></td>
</tr>
<tr>
<td>6. Group information</td>
<td># 6. Types of items</td>
<td></td>
</tr>
<tr>
<td>7. Control information</td>
<td># 7. Status of items</td>
<td></td>
</tr>
<tr>
<td>8. Special systems</td>
<td># 8. Parts of items</td>
<td></td>
</tr>
<tr>
<td>9. Special systems</td>
<td># 9. Ordering of lists</td>
<td></td>
</tr>
<tr>
<td>OBJECT CHOICES?</td>
<td>MODIFIER CHOICES?</td>
<td></td>
</tr>
<tr>
<td>Actions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View Find Review Create Modify Do Organize Help (7/f1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. 2. 3. 4. 5. 6. 7. Quit (-/quit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTION CHOICE?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEIES CASUAL</th>
<th>Screen 1 of 1</th>
<th>Screen code: 000.C</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>View: NEW notifications ? y.</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>NEW mail      ? y.</td>
<td>#</td>
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<tr>
<td>NEW conferences ? y.</td>
<td>#</td>
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<tr>
<td>MARKED items ? n.</td>
<td>#</td>
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<tr>
<td>UNDONE activities ? n.</td>
<td>#</td>
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</tr>
<tr>
<td>Enter: conference ? n.</td>
<td>Optional fill in: Member/group(s) ?</td>
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</tr>
<tr>
<td>Create: notification ? n.</td>
<td>Message ?</td>
<td></td>
</tr>
<tr>
<td>message ? n.</td>
<td>Conference ?</td>
<td></td>
</tr>
<tr>
<td>comment ? n.</td>
<td>Comment ?</td>
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<tr>
<td>draft ? n.</td>
<td>Scratchpad ?</td>
<td></td>
</tr>
<tr>
<td>Modify: any item ? n.</td>
<td>Index key ?</td>
<td></td>
</tr>
<tr>
<td>members ? n.</td>
<td>Name/label part ?</td>
<td></td>
</tr>
<tr>
<td>groups ? n.</td>
<td>Modifier ?</td>
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<tr>
<td>messages ? n.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>conferences ? n.</td>
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</tbody>
</table>

ESC/PaJ = get control menu
Command? Screen PgUp/PgDn (77/f8)
REFERENCES


