

Characteristic of enterprise collaboration system and its implementation issues in business management

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Abstract

Collaboration is an extremely useful area for the most of the enterprise systems particularly within Web 2.0 and enterprise 2.0. The collaboration provides help in Enterprise Collaboration System (ECS) to achieve a desired goal by unifying completed tasks of employees or people working on a similar or the same task. Thus, the collaboration systems have witnessed significant attention. The ECS provides consistent and off-the shelf support to processes and managements within organizations. Management techniques of the ECS may be useful to a community which manages ECS systems for collaboration. In this context, this paper focuses on enterprise collaboration system and answers critical questions related to ECS including: (i) what does collaboration really means for an enterprise system, (ii) how can the collaboration help to improve internal processes and management of the system, and (iii) how it is helpful to improve interactions with customers and partners?

Keywords: Enterprise Collaboration System, Web 2.0, Enterprise 2.0, Management Techniques, Enterprise System.

1. Introduction

A group of business and technology experts that unite all the aspects of an enterprise to support procedures and management is commonly known as Enterprise Systems (ES) [1-3]. Due to the absence of off-the shelf application software, ES needs to be suitable for users of an organization [4]. Enterprise Collaboration Systems (ECS) is an unprejudiced category of the information system. It is an association of groupware, the Internet, tools, extranets, and additional networks used to manage enterprise-wide communications, mainly the giving documents and information to the particular teams and individuals in any enterprise. Some models of enterprise communication tools comprise video-conferencing, e-mails, collaborative document sharing, project management, and others. The aim of an ECS is to support each user with tools for controlling communications, documents and, other information that singly need to regulate their individual business efficiently in their departments. ECS can collaborate many things. Figure 1 shows the combinations of the ECS.

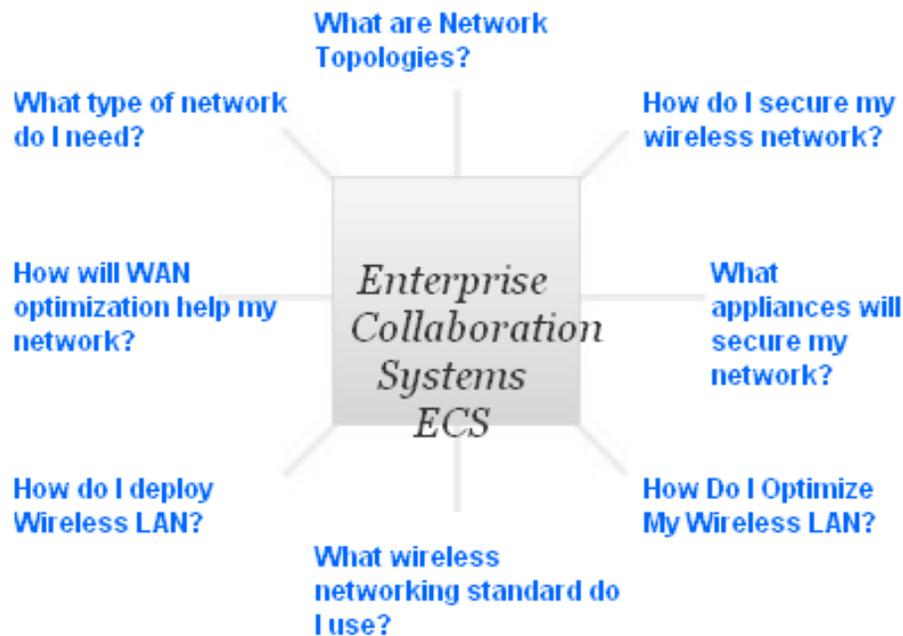


Fig1. ECS model

A collaboration system addresses the exertion of an organization by promoting the sharing and diffusion of information. An IT-based collaboration is a tool that creates a workflow of information to a specific team and representative, and allows exchanging ideas. Several factors suggest that a collaboration system is beneficial however; there are two essential features that need to be customized and taken into attention when it comes to corporate fashion according to goals. These two features are as follows.

(i) **Unstructured Collaboration**

It is also known as information collaboration. It contains records exchange, discussion forums, shared whiteboards, and e-mails. It tries to find answers to the not known questions, utilizing IT tools for sharing information about issues at stake, and enhancing personal productivity.

(ii) **Structured collaboration**

It is also known as process collaboration. It covers shared presence in business processes that is a workflow in which information is hard-coded according to fixed rules. It shares common information, structured, written rules, and set workflows that do not change with time.

Now a day's, collaboration is an important part of almost all the enterprises to complete the process and achieves the target with good output but in past Zachman and Mike Rosen defined different collaboration modeling frameworks on behalf of enterprise modeling. These involve, viz., the Architecture of Integrated Information Systems (ARIS) [12] and the Framework for Information Systems Architecture [11].

2. Enterprise Collaboration System and Architecture

Enterprise collaboration systems are knowledge systems that use several information technologies which provide good communication, coordination, and collaboration in organizations. The collaborative software is generally named as groupware and it can be categorized as enterprise communication, collaborative, enterprise conferencing, and work management tools. Figure 2 shows the different types of dependency and collaboration of different systems.

An enterprise collaboration is the capability of a system to grind with another system by making use of a common information base. The definition of the collaboration on IEEE emphasizes explicitly the information flow aspect. That is collaboration means the capability of two or more systems to share and use the knowledge that has been exchanged. In the case of enterprise collaboration, this means seamless integration across organizational boundaries between dispersed operational units of a number of organizational entities. The results are highly distributed system architectures. The sharing of knowledge in enterprise collaboration, in addition, raises the issue of codification and management of knowledge. Only codified knowledge can be transferred between different organizational entities, as discussed in [5].

Collaboration between different enterprises can be different according to uses. Collaboration can be single sided or both sided. Figure 3 shows essential outlines in which business document discussion and its processing takes place. Moreover, the formation of variants can be noticed. As the Figure3 shows that collaboration space (CS) includes terms made in among partners pertaining to their collaborations, e.g. the frequent cross-organizational business processes CBP and exchanges business documents. The compromise of the collaboration framework and the successive configuration of the partners' ECS trail three dissimilar patterns. In case A, each partner commits to the Collaboration Space. This means that both of them organize input in a form of, viz. process interfaces, business documents, and expected or provided messages. At the end, both partners outline the agreements made in CS to their internal Enterprise System ES and set up them where necessary. In case B, external sources which are standards or preminent practices are used for input in the CS. This means that partners wish to accept details and negotiate to conclude a common understanding. For implementing a standard, both partners must

configure their systems so as to make suitable business documents and processes imposed by the standard.

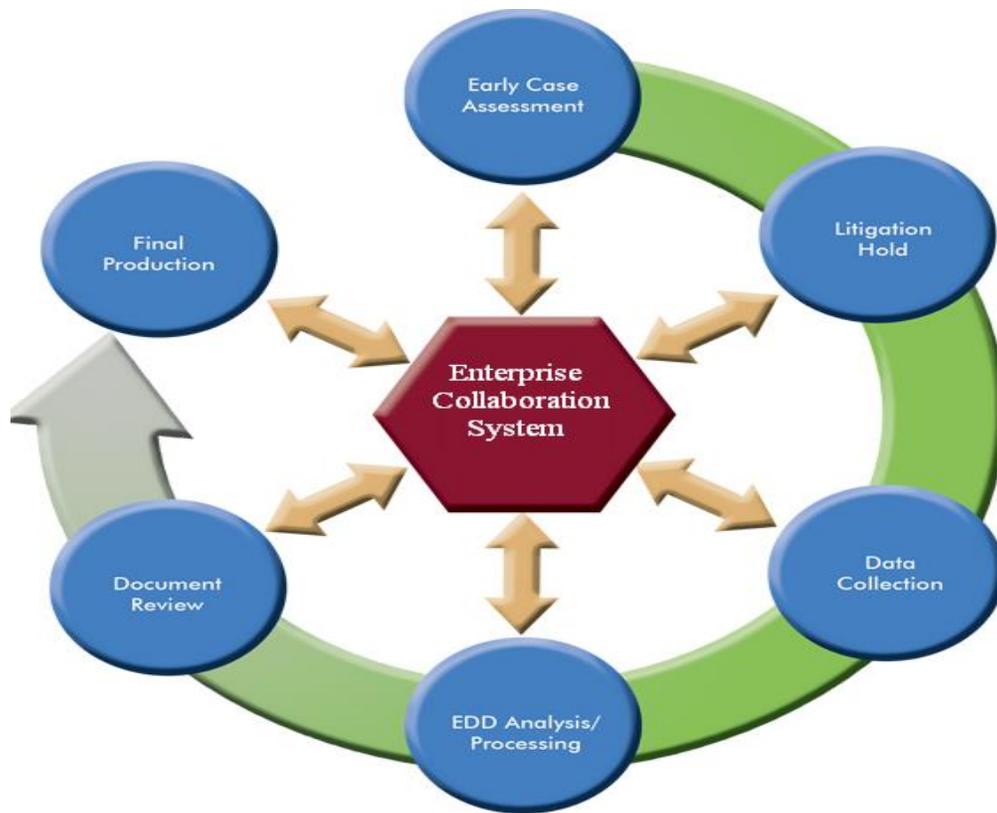


Fig2. Collaboration system

Case C mention a situation where only one partner provides details to the CS. If that partner is, viz. a controlling authenticated equipment manufacturer this might even occur with not any negotiation. In this case, usually, the minor partner mainly to organize its systems to implement the CS. In the modern era, all the business process management [6, 7] and configuration [8-10] have gained much attention in academia business document configuration and the interdependence of process configuration remains largely not examined.

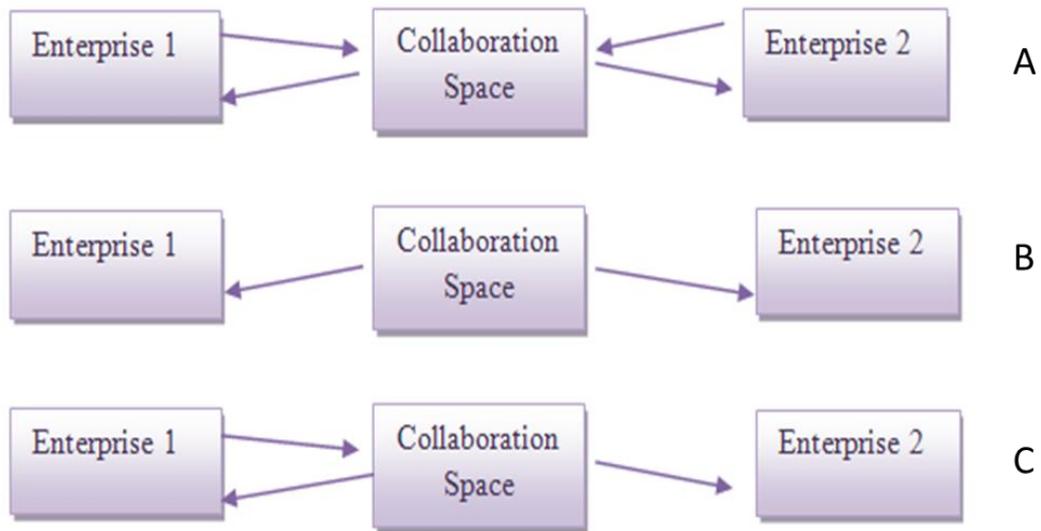


Fig3. Collaboration Pattern of Enterprise System

3. Proposal and Implementation

An enterprise collaboration plan is the mainstay of phase 4 of collaboration readiness and adoption. Figure 4 shows the all 5 phases of Enterprise Collaboration System. The major set of challenges that are being faced while designing and implementing Enterprise Information System

Table 1: Grant Challenge and related question (Source: Kadiri et al. , 2016)

Grant Challenges	Related Questions
(a). Data Value Chain Management	How to allow data and information analysis, mining, integration, sharing, and security?
(b) Context Awareness	How to offer contextual capabilities in complex business environments?
(c) Usability, Interaction and Visualization	How to deliver new and intuitive ways for interacting with EIS?
(d) Human Learning and Continuous Education	How to support the development of professional competences triggered by new scientific and technological advances?

3.1. Phases of Enterprise Collaboration System

Phase I: Traditional collaboration. This type is limited if any collaboration technologies and tools are in operation. Collaboration occurs in person, through the phone, or by emails.

Phase II: Experimentation.

The process includes customization of the overall solution as per user requirement. The Collaboration tools are adopted, customized and later standardized on collaboration platform.

Phase III: Proliferation. It includes making people aware and building their capacity about the collaboration tools. People practice several non-interoperable tools, some of which have overlying or replicate functionality.

Phase IV: Standardization. A firm simulates an enterprise collaboration methodology and systematizes on a collaboration platform. Many of organizations are in Phase 2 or Phase 3, though in the first half of 2005 we have seen an explosion of Phase 4 activities.

Majority of enterprise-class firms today	Phase 1: Traditional collaboration	<ul style="list-style-type: none"> • Face-to-face, phone, email
	Phase 2: Experimentation	<ul style="list-style-type: none"> • Point products; departmental basis • Prompted by specific user needs
	Phase 3: Proliferation	<ul style="list-style-type: none"> • Tools in use on widespread basis • Lack of interoperability; duplicate functionality
	Phase 4: Standardization	<ul style="list-style-type: none"> • Enterprise strategy in place • Standardization on collaboration platform
	Phase 5: Information workplace	<ul style="list-style-type: none"> • Information workplace strategy in place • Standardization on information workplace solution

Fig4. Five Phases of Collaboration

Phase V: Information workplace. This method is in place and the organization has systematized for its platform. Forrester knows a number of organizations those have information workplace visions and alike some that have starts to implement such information workplace concepts. But Forrester knows just a few that have starts to embrace the complete information workplace on an enterprise large basis.

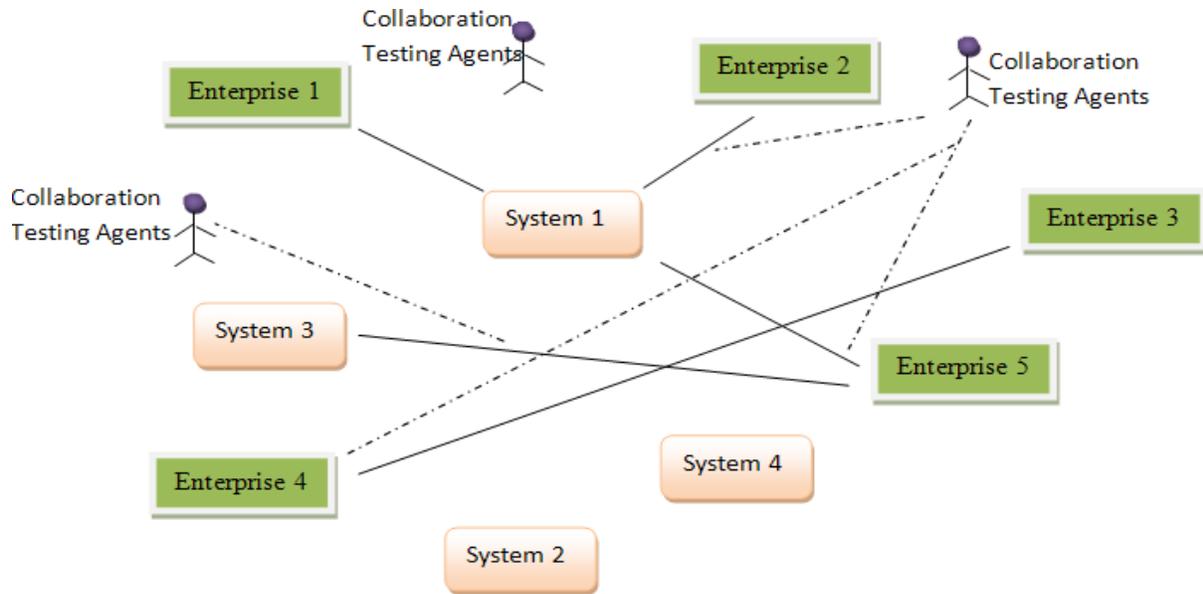


Fig5. Testing process of Enterprises system

3.2 Phase Selection for Enterprises

Most of the Organizations use the phase 2 and 3 and it is the reason of a big blast at phase 4. To avoid such kind of situations, first test the phase with the requirement of enterprise and then apply the required phases separately so we can avoid such kinds of situations in future. Endeavor joint effort frameworks give instruments to help us work together - to impart thoughts, offer assets, and direction our agreeable work endeavors as individuals from the numerous formal and data process, venture groups, and workgroups that make up a hefty portion of today's associations.

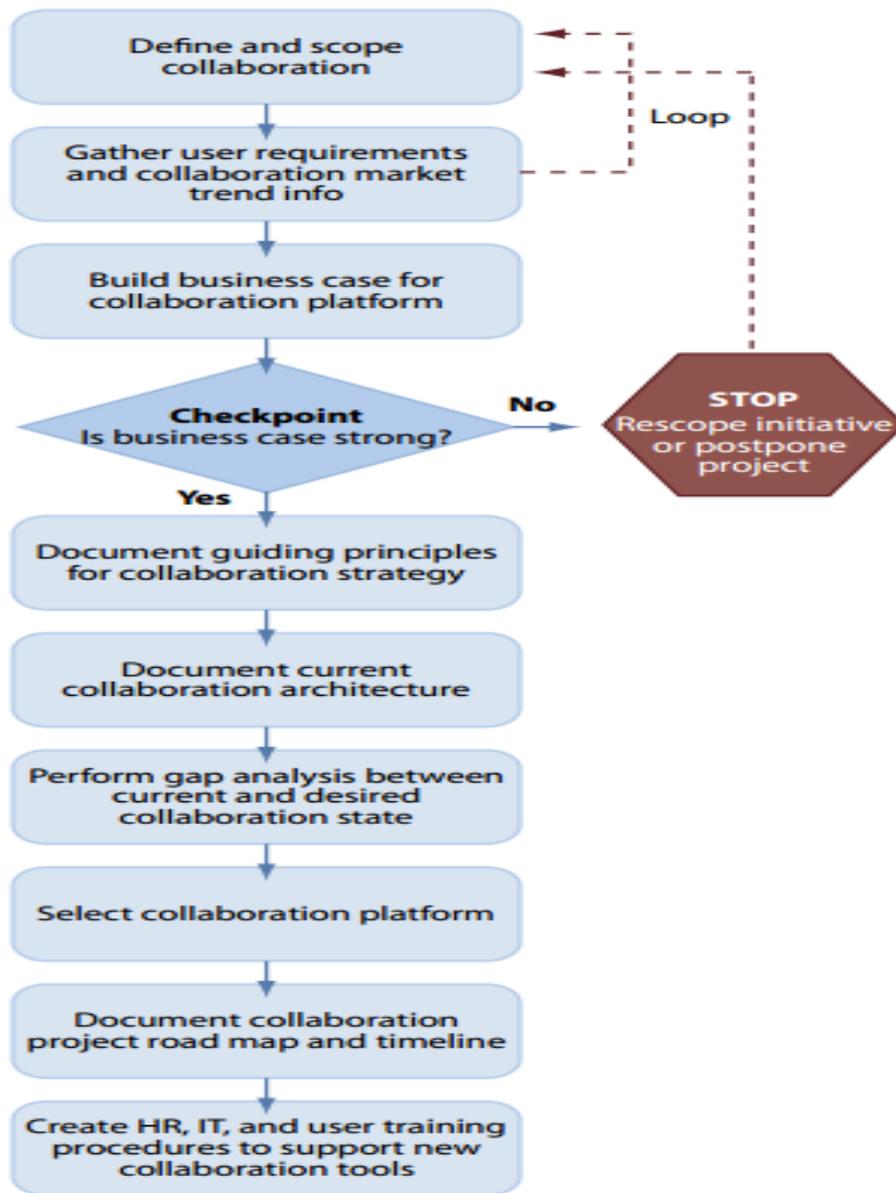


Fig 6. Collaboration Strategy

The objective of big business joint effort frameworks is to empower us to cooperate all the more effortlessly and adequately by pushing us to do followings:

- **Communicate:** Offering data to each other
- **Coordinate:** Organizing our individual work endeavors and utilization of assets with each other

- **Collaborate:** Cooperating helpfully on joint activities and assignments

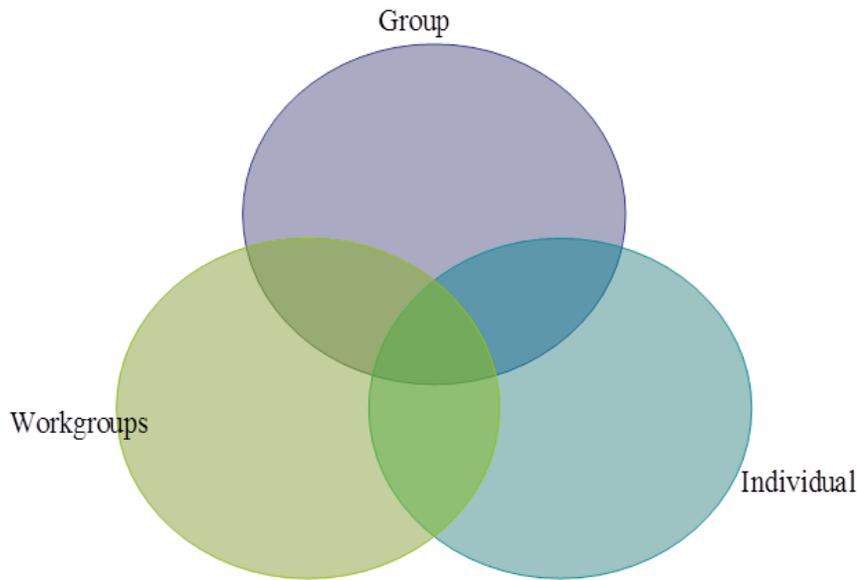


Figure 7: Dynamics in Enterprise Collaboration System

There are numerous sorts of groups and workgroups, each with its own particular work styles, plans, and registering needs. Table II depicts the scope of various elements of Enterprise Collaboration System

3.3 Qualities of groups and workgroups:

- Teams and workgroups can be as formal and organized as a customary business office or office. Then again they can be less formal and organized like individuals from procedure groups in an assembling domain.

Table II: Components of Enterprise Collaboration System

Workgroup	Set of two or more individuals cooperating for common goals and objectives
Team	Synergistic workgroup, whose individuals are committed to joint efforts

- Teams and workgroups can be as casual, unstructured, and brief as an impromptu team or an undertaking group whose individuals work for various associations in various parts of the world.
- Members of a group or workgroup don't need to work in the same physical area. They can be individuals from a virtual group, that is, one whose individuals are joined by the errands on which they are working together, not by topography or enrollment in a bigger association.

- Synchronization between various components including equipment, programming, information and systems to align individuals, groups and workgroups

4. Groupware for Enterprise Collaboration

Groupware can be characterized as coordinated effort programming that helps groups and workgroups cooperate in an assortment of approaches to finish joint ventures and gathering assignments.

Groupware is intended to make correspondence and coordination of workgroup exercises and collaboration among end clients altogether less demanding, regardless of where the individuals from a group are found. Groupware helps the individuals from a group team up on gathering ventures, at the same or diverse times, and at the same spot, or at various areas.

Numerous industry investigators trust that capacities and capabilities of the Internet, and in addition intranets and extranets, are driving the interest for big business joint effort apparatuses in business. Then again, it is Internet advancements like web programs and servers, hypermedia archives and databases, and intranets and extranets, which are giving the equipment, programming, information, and system stage for a considerable lot of the groupware devices for big business coordinated effort that business clients need. Groupware gives programming instruments to the following:

- Electronic correspondence
- Electronic conferencing
- Collaborative work administration
- Electronic Communication Tools

Electronic specialized instruments incorporate electronic mail, voice message, announcement board frameworks, and faxing. They empower you to electronically send archives and documents in information, content, voice, or interactive media structure over PC systems. This helps you share everything shape short voice and instant messages to duplicates of venture reports and information documents with your colleagues.

(i) *Electronic Mail*

Email has turned into an essential, quick, and advantageous approach to impart and assemble vital associations with each other in business. Email has additionally turned into an imperative medium for transporting electronic duplicates of archives, information documents, and sight and sound substance.

The cut back of the E-mail wonder is:

- The data over-burden
- The deluge of spontaneous garbage E-mail (called spamming)

(ii) *Web Phone and Fax*

You can utilize the Internet for phone, voice message, faxing, and paging administrations. All you need is an appropriately prepared PC and programming, for example, Internet Phone by Vocal-Tech, or Netscape Conference or Microsoft NetMeeting. The base PC prerequisites are a 75 MHZ Pentium microchip, 28.8 KBPS modem, 16 megabytes of memory, a sound card, speaker and receiver, and Windows 95 or Windows NT.

(iii) *Web Publishing*

Web distributed can be seen as a vital electronic specialized instrument for big business coordinated effort. Application programming suites and different projects now empower you to distribute hyperlinked records in HTML straightforwardly to Internet or intranet sites. Intranet web distributed has turned into a considerably more proficient and successful method for imparting among groups and workgroups than past paper or electronic strategies.

Electronic conferencing instruments people groups impart and team up while cooperating. An assortment of conferencing strategies empowers individuals from groups and workgroups at various areas to trade thoughts intuitively in the meantime, or at various times whenever the timing is ideal. Electronic conferencing choices additionally incorporate electronic meeting frameworks, where colleagues can meet in the meantime and spot in a choice room setting. Electronic conferencing instruments include:

- Data and voice conferencing
- Videoconferencing
- Chat frameworks
- Discussion discussions
- Electronic meeting frameworks

(iv) *Information and Voice Conferencing*

Voice conferencing can be proficient with Internet phone programming and groupware that backings phone discussions over the Internet or intranets on ECS.

Information conferencing is likewise famously called white-boarding. In this strategy, a groupware bundle interfaces two or more PCS over the Internet or intranets so a group can share, mark up, and survey a whiteboard of drawings, records, and other material showed on their screens.

(v) *Videoconferencing*

Videoconferencing is an endeavor coordinated effort apparatus that empowers real-time video/sound meetings among:

- Networked PCS, known as desktop videoconferencing
- Networked gathering rooms or halls in various areas, called remotely coordinating.

(vi) *Qualities of videoconferencing*

- Team and endeavor coordinated effort can be improved with a full scope of intelligent video, sound, record, and whiteboard correspondences among the online members.
- Desktop videoconferencing can now happen over the Internet, intranets, extranets, and additionally open phone and different systems.
- Videoconferencing over the Internet, intranets, and extranets is ended up being a proficient, conservative, and powerful method for supporting correspondences and joint effort among physically uprooted groups and workgroups.
- Reduces travel time and cash to go to gatherings results in expanded group efficiency and additionally cost and time reserve funds.

(vii) *Impediments of desktop video conferencing*

- Jerky movements of video pictures and the absence of nonverbal correspondences from "talking heads" showcases of videoconference members
- Remotely coordinating is a vital type of big business cooperation.

(viii) *Attributes of remotely coordinating*

- Team and undertaking coordinated effort can be upgraded with a full scope of intuitive video, sound, record, and whiteboard correspondences among the online members.
- Sessions are held continuously, with significant members being broadcast while members at remote locales may just participate with voice contribution of inquiries and reactions.

- Teleconferencing can likewise comprise of utilizing shut circuit TV to achieve various little gatherings, rather than utilizing TV to achieve vast gatherings at numerous destinations.
- Several noteworthy correspondences transporters offer video chatting administrations for such occasions as deals gatherings, new item declarations, and worker instruction and preparing.

(ix) *Restrictions of remotely coordinating*

- Some associations have found that video chatting may not be as successful as eye to eye gatherings, particularly when imperative members are not prepared in how to impart utilizing their frameworks.
- Cost of giving remotely coordinating administrations and offices can be generous and make video chatting not as practical obviously.

(x) *Talk Forums*

This class of joint effort devices incorporates Internet and intranet newsgroups, dialog gatherings, and exchange databases.

(xi) *Attributes of exchange gatherings*

- Are an expansion of the prior idea of online announcement board frameworks (BBS) which permitted clients to post messages and download information and project documents shape the online administrations, organizations, and individual BBS administrators.
- Are an outgrowth of the long time and across the board utilization of newsgroups to give a gathering to online content talks by the individuals from unique interest client bunches on the Internet and the major online administrations.
- Can be utilized by organizations to make or empower groups of interest or virtual groups.
- Discussion gathering groupware can monitor the exchange commitments of every member, sort out them by an assortment of catchphrase discourse points, and store them in an examination database (strung dialogs, virtual talk bunches, talk following, and dialog databases). This makes strings of talk commitments on every subject over a timeframe that can be followed and recovered from the dialog database for investigation.

5. An Affective Parameters of Collaboration Strategies:

Collaborative strategies can be affected with various parameters. The affective parameters as follows:

- (i) **Remote Access of Data:** The I/O data quantified by a network user might be stored at remote places. Therefore, users need to provide the location of the remote data. If a ubiquitous wide-area file system is in operation on the network, the user would only have to care about the location of files and data with respect to some root location under which they are stored.
- (ii) **Specification of Resource:** The user might specify its own requirements for the specific resources necessary in optimizing the execution times and costs of scheduling and computing tasks. The user may wish to target particular types of resources (e.g. SMP nodes), but should not be concerned with the type of resource management on the Network, nor with the resource management systems on individual resources on the Network.
- (iii) **Resource reliability:** In some cases, the nodes within the Network system could be unavailable due to high system dynamics or special policies of the resource owners. The user should be informed about the resource reliability in order to reduce the cost of possible resource failures or the abortion of executed tasks. In the case of resource failure the system administrators can activate re-scheduling or task migration procedures, and pre-emption policies.
- (iv) **Resources Trustfulness:** The user might be required to assign its job in the supreme trustful resources. So the user must be able to authenticate the trust values of the resources and approximation the security loads for its jobs on the available resources. Therefore trust values can be handled by fuzzy recommendation system (FRS) [23]. The whole system takes as input as the trust matrix and produced as outputs of predicted ratings matrix. The FRS chooses from matrix data. In order to give recommendations to the active users. For this purpose Certainty Factor (CF) implements three phases: 1. the comparisons with the active user's and other users in the dataset. It computed similarity among users using Pearson formula [23] then predictions of ratings for unseen items is performed. This recommends items to the user with highest predictive ratings. Furthermore; it can be incorporated fuzzy trust in this problem. Because the presence of data sparsity, in many cases neighborhood size is tiny and hence precise predictions cannot be performed.
- (v) The successful execution of collaborative tasks submitted to web may be impossible (or interrupted) if such requirements are very strong and the access to the resources is limited. On the other hand, the Network cluster or the Network resource may be not accessible to the global meta-scheduler or Network user when being infected with intrusions or by malicious attacks. It means

that some, even simple, authorization and authentication protocols and some anti-viruses protection mechanism are needed for efficient scheduling especially in the dynamic environment. In such cases the nodes and task should be additionally characterized by the trust level (TLi) and security demands (SDj) parameters. Multi-objective optimization which considered energy, trust and security aware NSGA II with fuzzy and QGA [13-22] can be applied. The motivation of Network computing is to aggregate the power of widely distributed resources to provide nontrivial QoS to users and security as an important QoS.

To offer security as QoS, security choices must be presented to the user/application in the form of security level (SL), and in turn user/application may request a level of security in the form of security demand (SD). The underlying mechanism must be equipped to enter into an agreement for the services delivery at the requested security level. There are many applications that specify their security demand and the service provider fulfils it. Irvine and Levin, in their work, have emphasized the importance of quantifying the security services [6, 7]. One of the key factors behind the growing interest in Network computing is the evolution of standards such as TCP/IP and Ethernet in networking. For the TCP networking model IPsec, TLS/SSL and SSH are the popularly used security protocols operating on its network, transport and application layer respectively [12]. These protocols offer security to any Network application by the common security services of key exchange, authentication, confidentiality, and integrity. Each protocol is further configured to match differing security requirements through cipher suites negotiations where cipher suite is a named combination of key exchange, authentication, encryption, and integrity algorithms used to negotiate the security settings for a network connection. In next section, Public Switched Telephone Network (PSTN) has been elaborated.

6. PSTN Connectivity

PSTN [24] is a very important network used in commutation area. This network is based on the concept of cellular telephony. In this network initially, they used twisted pair. After that when technologies are evolved then they used coaxial cable. Finally, in the recent times, they are using optical fiber cable. The concept of transmitting and receiving is the core part of the PSTN network. This concept is varied as the type of technology changes in PSTN. PSTN networks are suffered from Hand-over (handoff) issues. The 'hand-over depend on the generation of the mobile technology. In the first generation, mobile technology suffers from hard had over. The hard hand over has more call dropping probability. Afterward from the first generation of mobile from the second generation onwards, it suffers from soft handover. In soft handover has very low call dropping probability. Later

mobile assisted hand over came to existence in which mobile station help to mobile switching center (MSC) to take handover decisions. In the mobile technology of the PSTN, frequency reuse factor is very important. In first generation mobiles, has frequency reuse factor is 7. Later onwards it becomes 3 and 4 which increases the efficiency of the technology. In the first generation mobile PSTN, we can send only analog voice. Afterward, in PSTN we can digital voice and short message service (SMS) in the second generation PSTN. Now days we can send digital voice and multimedia message (MMS). Recently, PSTN [22] connectivity enables images, audio and video communications to Telecom carrier networks. The PSTN connection can be achieved in multiple ways: Through an IP trunk to a Telecom carrier, usually for voice-only services. This connectivity is provided by the Cisco Unified Border Element (CUBE) on an Integrated Service Router (ISR) G2/G3 or Aggregation Services Routers (ASR). Cisco Unified Border Element should be deployed to a central site where the Telecom carrier's network communicates with the enterprise network. For telecommunication services electronic commerce (e-commerce) is very important. E-commerce can be defined as sales and purchase by using electronic devices. If an electronic device is a mobile device then e-commerce referred as m-commerce. In the case of business to business (B2B) both seller and purchaser are a business.

Therefore, Integrated Services for Digital Network (ISDN)[24] which is a set of communication standards for simultaneous digital transmission of voice, video, data, and other network services over the PSTN. The voice gateways, Gateways include analog and ISDN interfaces on a variety of router platform, such as Cisco Integrated Service Routers (ISR) G2/G3. In this document, only ISDN voice interfaces are considered. Voice gateways should be deployed locally in the sites where a PSTN connection is required Through Cisco TelePresence ISDN Gateways 3241 or MSE 8321, which enable legacy H.320 video access to PSTN. TelePresence ISDN gateways should be centralized anywhere an ISDN video connection is required. Due to the nature and cost of TelePresence ISDN gateways, they can be shared through multiple locations. There are cost savings associated with deploying Internet communications for video calls (Expressway) and IP PSTN connections for audio-only calls (CUBE). However, it is worth noting that: Not all companies have enabled Internet communications for video systems (B2B).

If some of the partners and customers are using ISDN only for video communications, video gateways are still recommended. Although IP network reliability is increasing over time, network connectivity problems might prevent remote sites from accessing centralized IP PSTN services. If such sites are heavily relying on PSTN connectivity to run daily business, a local PSTN connection used as a backup for the centralized access is recommended. The recommendations for PSTN are

Centralize PSTN, which will help to reduce operational costs and expenses. Local PSTN connections maintained only for those sites highly relying on PSTN to run daily business. In these cases, the number of ISDN channels should be reduced because they will be used only in those situations where central PSTN access is not available.

This would help save money by reducing hardware costs and simplifying the management. Based on the above considerations, IP trunk [24] connections to the PSTN for voice, with local PSTN breakout used as a backup and the Internet for video satisfy the vast majority of connectivity requirements. However, to provide full connectivity, ISDN video gateways are also recommended to reach partners and customers that are still not reachable on the Internet. Cisco Collaboration Edge includes scenarios where users have access to the following options: Mobile and Remote Access (MRA) for teleworkers and mobile connectivity B2B video communications between organizations PSTN for cellphones and access to landlines ISDN video access for communications to existing H.320 standard video systems Under these scenarios any corporate user inside the company or on the Internet has access to PSTN voice calls, ISDN video calls, and business-to-business communications as if they were inside the enterprise. Services such as hold, transfer, and conference are also available in most cases. Independently from who is calling whom, the Collaboration Edge solution enables interconnectivity between mobile and remote access, B2B, PSTN voice, and video services.

7. Conclusion

ECS plays an important role to achieve the desired output in any enterprise. Many organizations make good collaboration with the different organizations or systems and sometime many enterprises try to achieve a single system. In such cases the system can be hanged or blast. Thus, to avoid such situations, testing is very useful before make collaboration between different systems of different enterprises. Future work therefore shall be dedicated to the further investigation of benefits of collaborating aspects of Enterprise System within composite systems. We intend to undertake deeper research into the appropriate collaboration of interfaces according to the field of application and the determination of components and interfaces that will benefit from more specific localization of Enterprise System aspects.

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