
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 the 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 organisations. 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: 1) what does collaboration really means for an enterprise system; 2) how can the collaboration help to improve internal processes and management of the system; 3) how it is helpful to improve interactions with customers and partners?

Keywords: enterprise collaboration system; ECS; Web 2.0; Enterprise 2.0; management techniques; enterprise system.

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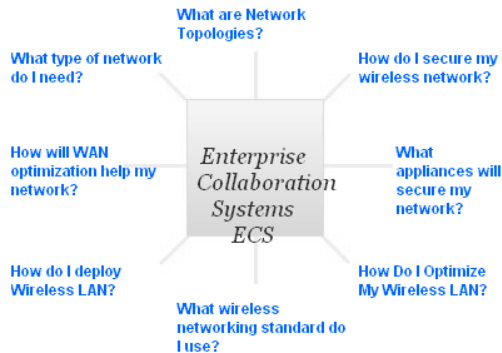
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1 Introduction

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) (Davenport, 1998; Klaus et al., 2002; Ragowsky and Somers, 2002). Due to the absence of off-the-shelf application software, ES needs to be suitable for users of an organisation (Markus and Tanis, 2000). Enterprise collaboration system (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, sharing of a collaborative document, project managing, and others. The purpose of an ECS is to support each user with tools to control communications, documents and, additional 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.

Figure 1 ECS model (see online version for colours)



A collaboration system addresses the exertion of an organisation by promoting the sharing and diffusion of information. 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 customised and taken into attention when it comes to corporate fashion according to goals. These two features are as follows.

1 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, utilising IT tools for sharing information about issues at stake, and enhancing personal productivity.

2 Structured collaboration

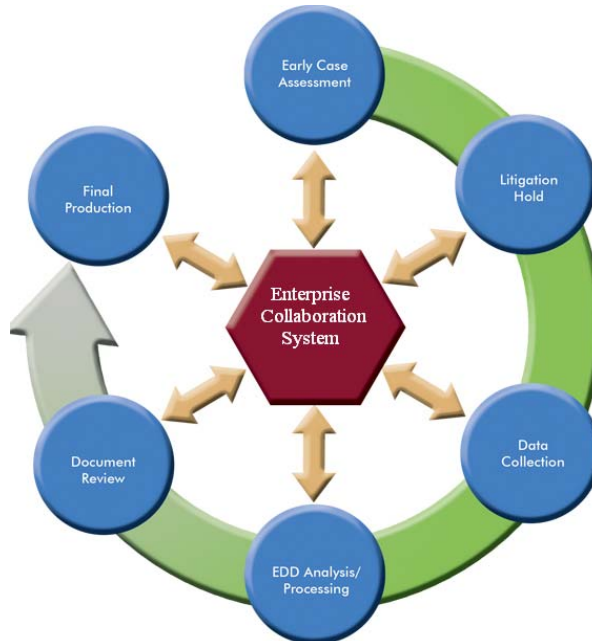
It is also known as process collaboration. It covers shared presence in business processes that is a workflow in which information is hardcoded according to fixed rules. It shares common information, structured, written rules, and set workflows that do not change with time.

Nowadays, 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 Rosen defined different collaboration modelling frameworks on behalf of enterprise modelling. These involve, viz., the architecture of integrated information systems (ARIS) (Scheer, 2000) and the framework for information systems architecture (Zachman, 1987).

2 Enterprise collaboration system and architecture

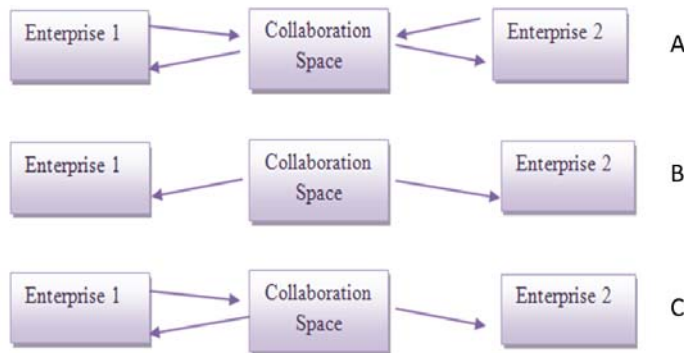
ECS are knowledge systems that use several information technologies which provide good communication, coordination, and collaboration in organisations. The collaborative software is generally named as groupware and it can be categorised as enterprise communication, collaborative, enterprise conferencing,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

Figure 2 Collaboration system (see online version for colours)



The 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 emphasises explicitly the information flow aspect. That is collaboration means the capability of two otherwise more systems to share and use the knowledge that has been bartered. In the case of enterprise collaboration, this means seamless integration across organisational boundaries between dispersed operational units of a number of organisational 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 organisational entities, as discussed in Jastroch (2003).

Figure 3 Collaboration pattern of ES (see online version for colours)



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 Figure 3 shows that collaboration space (CS) includes terms made in among partners pertaining to their collaborations, e.g., the frequent cross-organisational business processes CBP and exchanges business documents. The compromise of the collaboration framework and the successive arrangement of the partners' are ECS trail three dissimilar patterns. In the case A, each partner commits to the collaboration space. This indicates that both of them organise input in a form of, viz. process interfaces, business documents, and expected or provided messages. At the end, both partners outline the agreements prepared in CS to their internal ES and set up this ES system where required. In the case B, external sources which are standards or preeminent practices are used for input in the CS. This means that partners wish to accept details and negotiate to conclude a collective considerate. For implementing a standard, both partners must configure their systems so as to make suitable business documents and processes imposed by the standard.

The case C mentions 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 partners mainly to

organise their systems for implementation of the CS. In the modern era, all the business process management (Scheer, 2002; Zachman, 1987) and configuration (Becker et al., 2004; Rosemann and van der Aalst, 2005; Soffer et al., 2005) have gained much attention in academia business document configuration and the interdependence of process configuration remains largely not examined.

3 Proposal and implementation

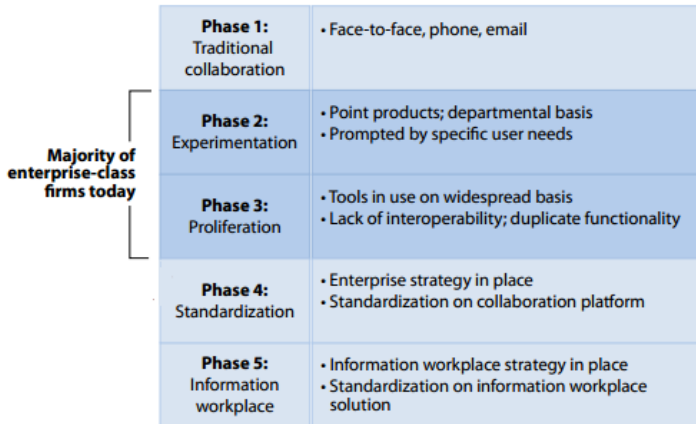
An enterprise collaboration plan is the mainstay of phase 4 of collaboration readiness and adoption. Figure 4 shows the all the five phases of ECS. The major set of challenges that are being faced while designing and implementing enterprise information system is shown in Table 1.

Table 1 Grant Challenge and related question

<i>Challenging issues</i>	<i>Correlated questionnaires</i>
a Chain management of the data value	How to permit data and information analysis, data mining, data integration, data sharing and security?
b Awareness of context	How to deal contextual competences in the complex business environments?
c Visualisation, interaction and usability	How to convey novel and intuitive techniques for interacting through EIS?
d Learning based on human society and continuous education	How to care the development of experts by novel scientific and technological improvements?

Source: El Kadiri et al. (2016)

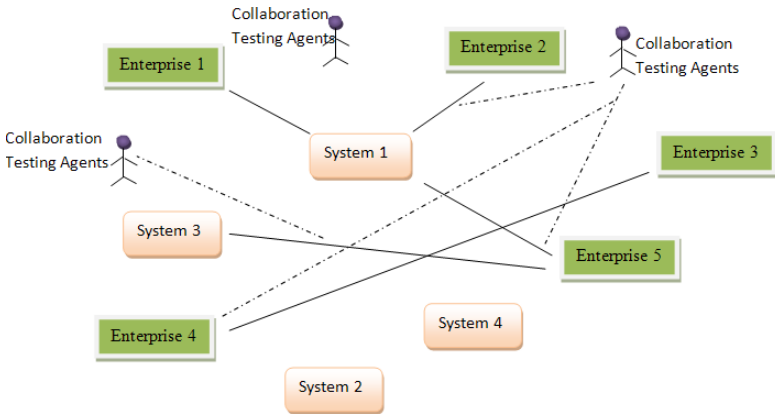
Figure 4 Five phases of collaboration (see online version for colours)



3.1 Phases of ECS

- Phase 1 *Traditional collaboration*: this type is limited if any collaboration technologies and tools are in operation. Collaboration occurs in person, through the phone or by e-mails.
- Phase 2 *Experimentation*: the process includes customisation of the overall solution as per user requirement. The collaboration tools are adopted, customised and later standardised on collaboration platform.
- Phase 3 *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 4 *Standardisation*: a firm simulates an enterprise collaboration methodology and systematises on a collaboration platform.
- Phase 5 *Information workplace*: this method is in place and the organisation has systematised for its platform. Forrester knows various organisations those provides information workplace visions and alike some that have started to implement such information workplace concepts. But Forrester knows just some that have started to embrace the complete information workplace on an enterprise large basis.

Figure 5 Testing process of enterprises system (see online version for colours)

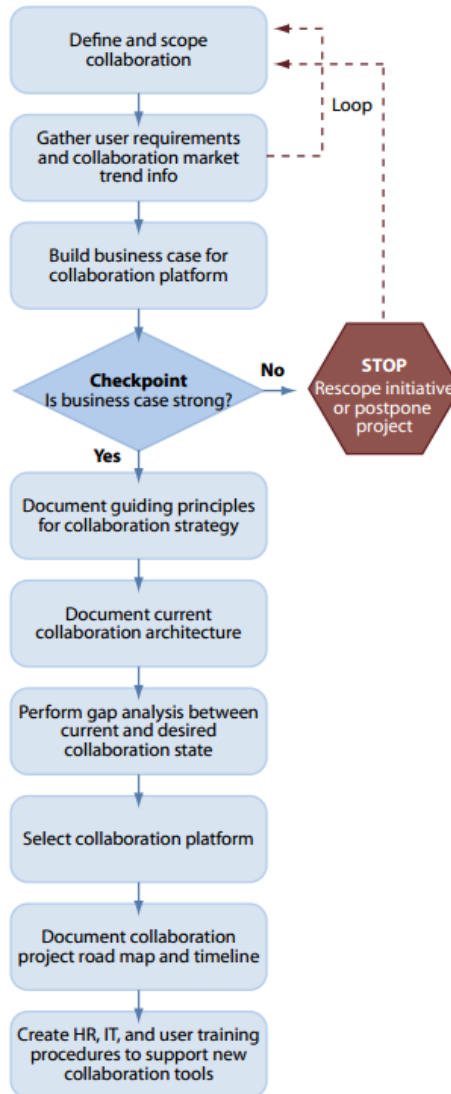


3.2 Phase selection for enterprises

Most of the organisations 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. Endeavour joint effort frameworks provide tools to help us work together – to impart thoughts, offer assets, and direction our agreeable work happenings

as those from the many formal and data process, groups of the venture, and workgroups which structure a hefty portion of today's associations.

Figure 6 Collaboration strategy (see online version for colours)



The objective of big business joint work structures is to enable us to collaborate every of the additional effortless and adequate by insisting us to do followings:

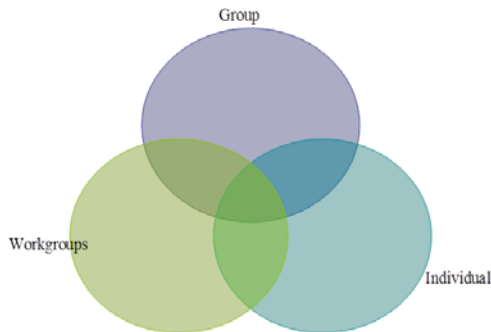
- *communicate*: offering data to one another
- *coordinate*: organising our specific work endeavours and utilisation of assets with each other
- *collaborate*: cooperating helpfully on joint activities and assignments.

There are numerous sorts of groups and workgroups, everyone with specific work styles, plans, and registering needs. Table 2 depicts the scope of various elements of ECS.

Table 2 Components of ECS

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

Figure 7 Dynamics in ECS (see online version for colours)



3.3 Qualities of groups and workgroups

- Teams and as well as workgroups may be as formal and structured as a customary business office or an office. Then again they may be less formal and organised like individuals from procedure groups in an assembling domain.
- Teams and as well as workgroups may 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 need not 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 enrolment in a bigger association.
- Synchronisation between various components including equipment, programming, information and systems to align individuals, groups and workgroups.

4 Groupware aimed at enterprise collaboration

Groupware may be characterised as coordinated effort programming that benefits groups and workgroups cooperate in an assortment of approaches to finish joint ventures and gathering assignments.

Groupware is intended to make correspondence and management 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, by the similar or diverse times, and in the similar spot, or at various areas.

Numerous industry investigators trust that capacities and capabilities of the internet, and furthermore intranets and extranets, are driving the concern for big business joint effort apparatuses in business. Then again, it is internet advancements similar web programs and servers, hypermedia records, databases, 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 are Electronic correspondence, conferencing, and collective work management and communication tools.

Electronic specialised instruments incorporate electronic mail, voice message, announcement board frameworks, and faxes which empower us to send electronic archives and documents in information, content, voice, or interactive media structure over PC systems. These benefit you to share all shape short voice and instant messages to duplicates of venture reports and information documents with our colleagues.

4.1 Electronic mail

E-mail has turned into an essential, quick, and advantageous approach to impart and assemble vital associations with each other in business. E-mail 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 electronic mail (named spam).

4.2 Web phone and fax

Anyone may utilise the internet for phone, voice message, faxes, and pages administrations. This is an appropriately prepared PC and programming, for example, internet phone by Vocal-Tech, or Netscape conference tool or Microsoft NetMeeting tool. The base PC prerequisites are a microchip, 28.8 Kbps modem, 16 megabytes random access memory (RAM), a soundcard, speaker, 75 MHZ Pentium and receiver, and Windows 95 or Windows NT.

4.3 Publishing of webs

Web distributed may be seen as a vital electronic specialised instrument for large business coordinated effort. Application programming suites and different projects now empower you to distribute hyperlinked records in HTML straightforwardly to internet or intranet websites. Websites of intranet 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 conferencing of data, voice and video; chat frameworks, discussion discussions and electronic meeting frameworks.

4.4 Information and voice conferencing

Voice conferencing may be proficient with internet-web phone programming and groupware that backings phone discussions over the internet or intranets on ECS.

Information conferencing is likewise famously known as white boarding. In this strategy, a groupware bunch of interfaces with two or additional PCS over the internet or intranets so a group may participate, mark up, and survey a whiteboard in drawings, records, and supplementary material presented on their screens.

4.5 Video conferencing

Video conferencing is an endeavour coordinated effort apparatus that empowers real-time video/sound meetings among:

- networked PCS, laptops, handheld devices are known as video-conferencing devices
- networked gathering rooms or halls in various areas, called remotely coordinating.

4.6 Qualities of video conferencing

- Team and endeavour coordinated effort may be improved through a complete scope of intelligent video, sound, record and whiteboard correspondences among the online members.
- The desktop video conference may now happen over the internet, intranets, extranets, and additionally open phone and different systems.
- Video conferencing over the intranets, extranets and internet, 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.

4.7 Impediments of desktop video conferencing

- Jerky movements of video-pictures and the absence of non-verbal correspondences from 'talking heads' showcases in video conferencing members.
- Remotely coordinating is a vital type of big business cooperation.

4.8 Attributes of remotely coordinating

- Team and undertaking coordinated effort may be upgraded with a complete scope of intuitive video, sound, record and whiteboard correspondences among the online members.
- The sessions are detained 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 utilising shut circuit TV to achieve various little gatherings, rather than utilising 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.

4.9 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 utilising their frameworks.
- Cost of giving remotely coordinating administrations and offices can be generous and make video chatting not as practical obviously.

4.10 Talk forums

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

4.11 Attributes of exchange gatherings

- These are an expansion of the prior idea of online announcement board frameworks (BBS) which permitted clients to post-messages and transfer information and project documents shape the online administrations, organisations, and individual BBS administrators.
- These are an effective for long time and across the board utilisation of newsgroups to give a gathering to online content talks by the individuals from unique interest client bunches on the internet and the most important online administrations. These may be utilised by organisations 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 dialogues, virtual talk bunches, talk following and dialogue 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:

- 1 Remote access of data: the I/O data quantified by a network user might be stored at remote places.
- 2 Specification of resource: the user might specify its own requirements to the specific resources essential in optimisation.
- 3 Resource reliability: this parameter is very useful and it is defined as that resource is functional for collaboration in given period of time.
- 4 Resources trustfulness: the user might need 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) (Adomavicius and Tuzhilin, 2005).

The fuzzy recommendation system as input as the trust matrix and produced as outputs of predicted ratings matrix. The FRS chooses from matrix data with consideration in order to give recommendations to the active users. For this purpose certainty factor (CF) implements three phases: the comparisons with the active user's and other users in the dataset. It computed similarity among users using Pearson formula (Adomavicius and Tuzhilin, 2005) 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 neighbourhood size is tiny and hence precise predictions cannot be performed.

- 5 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, authorisation 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 characterised by the trust level (TLi) and security demands (SDj) parameters. Multi-objective optimisation which considered energy, trust and security aware NSGA II with fuzzy and QGA (Kaiwartya et al., 2015; Victor et al., 2011; Prakash and Vidyarthi, 2011a, 2011b, 2012, 2013, 2015; Zadeh, 1965; Ying, 2010; Prakash and Vidyarthi, 2014) can be applied. The motivation of

network computing is to aggregate the power of widely distributed resources to provide non-trivial QoS to users and security as an important QoS.

In next section, public switched telephone network (PSTN) has been elaborated.

6 PSTN connectivity

PSTN (Forouzan, 2006) 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 fibre 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 hand 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 centre (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 analogue 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 messages (MMS). Recently, PSTN (Prakash and Vidyarthi, 2014) connectivity enables images, audio and video communications to Telecom carrier networks. 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. Centralise 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 (Forouzan, 2006) 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 organisations 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 B2B 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 Conclusions

ECS plays an important role to achieve the desired output in any enterprise. Many organisations making good collaboration with the different organisations 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 ES 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 localisation of ES aspects.

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