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Beyond Technology Acceptance Models: A Case Of Collaborative Technology

by

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BEYOND TECHNOLOGY ACCEPTANCE MODELS: A CASE OF COLLABORATIVE TECHNOLOGY

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Abstract

A central theme in information systems research is the study of user acceptance and use of information technology. Robust theories have been proposed and revised in attempts to enhance our understanding of the phenomenon of technology use. Technology Acceptance Model (TAM), theories drawing upon the classic Diffusion of Innovations theory (DoI) and more recently the Unified theory of Acceptance and Use of Technology (UTAUT) attempted to explain the phenomenon using various influencing factors and facilitating conditions. This paper emphasizes the need to go beyond restrictive factors of such theories and fine tune such generic theories in the context of specific technologies and applications, using collaborative technology as a case in point. The paper proposes four constructs including information intensity of task, collaborative orientation, technology drive and performance pressures as factors influencing use of collaborative technology. Further, two constructs for measuring use of collaborative technology – scale and sophistication are presented. The paper describes possible measures of the various constructs and presents some preliminary conclusions from a set of exploratory cases. Some suggestions for managing collaborative technology use and possible future research directions are also discussed.

Keywords: Use, Acceptance, TAM, Collaborative Technology.

1 INTRODUCTION

A central theme in information systems research is the study of user acceptance and use of information technology. The importance of this stream of research can hardly be exaggerated. Increasing access to various information technology applications without adequately understanding the task requirements and the potential change in the way of work may lead to information overload, frustrations with the technology and thus may not benefit the user. Information technology has become an important medium of task execution especially in the last ten years or so, mainly due to the proliferation of personal computers and the rapid dissemination of network based technologies, especially the internet. As end-users of this technology, we vary in our expectations from it and our use of it. The opportunities it offers are plenty. Yet, many users we see around, do not utilize the technology to even its minimum potential, leave alone, utilizing it to support critical organizational tasks.

Generic, robust theories have been proposed and revised in attempts to enhance our understanding of the phenomenon of technology use. Technology Acceptance Model (TAM), theories drawing upon the classic Diffusion of Innovations theory (DoI) and more recently the Unified theory of Acceptance and Use of Technology (UTAUT) attempted to explain the phenomenon using various influencing factors and facilitating conditions. However, it is important to examine the constructs in such theories in the context of specific technologies and applications. This is further essential when one considers either infrastructural technologies such as collaborative technology or complex task-related applications such as ERP or CRM.

This paper emphasizes the need to understand individual, group, task and organizational factors which impact use of technology and at the same time fine tune generic IT acceptance and use theories in the context of specific technologies and applications, using collaborative technology as a case in point. We propose four constructs including information intensity of task, collaborative orientation, performance pressures and technology drive as factors influencing use of collaborative technology. The paper also describes possible measures of the various constructs and presents some preliminary conclusions from a set of exploratory cases.

2 LITERATURE REVIEW

An attempt to look at information technology, its adoption and use by organisations clearly requires drawing insights from various disciplines, especially behavioural and organisational, specifically for four main reasons. One, information technology is increasingly permeating every function in today's organisations and influencing almost all parts of organisations, thus clearly forcing IS researchers to draw extensively upon the OB literature to understand organisations, their form, function, control and management. Second, IT has become more than a support function and is moving towards becoming a strategic resource, thus calling for understanding of strategic responses, strategic resource management, organisational strategy, etc. Third, adoption of information technology, as agreed to by many classic authors and thinkers, is a complex socio-technical phenomenon, thus driving us to take a look at psychology, sociology and related disciplines. Finally, albeit, IT is still a 'technology', allowing us the leeway to draw upon traditional technology adoption, diffusion and management theories.

2.1 IT use

Benefits from IT investments by an organisation can be reaped only if the individual users' unwillingness to accept and use available systems is mitigated (Igbaria, Guimaraes and Davis, 1995). While much research has focused on primary adoption, acquisition or one time use of complex

technologies few have paid attention to secondary adoption, continued use and assimilation (Gallivan, 2001; Burton-Jones and Gallivan, 2007; Van den Hooff, Groot and de Jonge 2005). It is therefore important to examine extent of use of IT and the factors which influence such use. However, authors cautioned researchers that evaluating people using technology is "a complex socio-technical phenomenon defined by the **interaction** of people and technology in an organisational context" (emphasis added) (Doll and Torkzadeh, 1998).

If one were to present a quick overview of the predominant themes in IT use research, over the last few decades, it would be close to the following. IT use research till early 1980s has dominantly focused on motivation and perceptions regarding the technology and its potential (Trice and Treacy 1986). With the coming of a simple yet presumably powerful Technology Acceptance Model (TAM) in the mid 80s, the shift to technology characteristics and the attitudinal and behavioral effects of perceptions gained predominance (Davis, 1986). The coming of the networks in early 90s and the active use of them in organisations, forced IT use researchers to give more importance to the overall organisational environment, the task related factors and the IT management issues (Goodhue and Thompson, 1995). The late 90s and the early 2000s have initiated the use of descriptive case studies and development of multi-level (individual, group and organization level) constructs-based theories, user-driven functionality extensions and work system interventions while attempting to explain technology adoption and use (Burton-Jones and Straub, 2006; Jasperson, Carter and Zmud, 2005).

Improvising TAM and other associated theories based on attitudes and beliefs, Venkatesh, Morris, Davis and Davis (2003) presented a unified view of user acceptance of IT through their Unified Theory of Acceptance and Use of Technology. In doing so, they developed a theory using performance expectancy, effort expectancy, social influence and facilitating conditions, as predictors of behavioural intention and use behaviour. They also included gender, age, experience and voluntariness of use as moderators. Performance expectancy is an individual's perceptions regarding the gains in job performance through the use of a system. Effort expectancy relates to the ease associated with the use of a system. Social influence refers to "degree to which an individual perceives that important others believe he or she should use the system". Facilitating conditions include perceptions regarding availability of technical and support infrastructure available in the organization. While constructs from UTAUT and its parent theory, TAM have been validated in various studies (see Legris, Ingham, Collerette, 2001 for a review), applicability of a theory is enhanced when constructs which can be easily manipulated through management mechanisms are created from the theory. An attempt is made in this paper to go beyond the constructs formulated in the UTAUT in the context of collaborative technology use and relate them to management mechanisms that can be used to support and/or control use of collaborative technology.

2.2 Collaborative Technology Use

Models developed for technology adoption and use in general and IT use in particular have been variedly applied in the context of collaborative technology. TAM, for instance has been applied and tested for collaborative technology such as intranets, emails, courseware management tools, negotiation support systems. It has also been argued that external variables in TAM are likely to have a direct influence on use of the technology and the level of such influence may also vary across different external variables depending on the technology used. Burton-Jones and Hubona (2003) found that system experience (total elapsed time using the application) had a direct effect on frequency and volume of usage in the case of email whereas both system experience and age had a direct effect on frequency in the case of word processing.

Van den Hooff, Groot and de Jonge (2005) presented a meta-analysis of various studies and theories on adoption and use of communication technologies. They included contingency theories such as social presence theory, media richness theory, subjectivistic theories such as critical mass theory TAM, situational theories such as channel expansion theory amongst others. Use of constructs from

the DoI theory in the context of collaborative technology has also been quite common (Turner and Turner, 2002; Sarker, Valacich and Sarker, 2005).

In order to gain from a technology it is important that the purposes or the structure of the tasks underlying the technology and the hidden assumptions be understood. It is important to examine the emotional, cultural and symbolic assumptions underpinning the group's interaction and the process of task execution, in a study of technology meant to support groups (McLeod, 1999).

Task characteristics including complexity of task, nature of the task and uncertainty of the task (in respect of the consequences of the decision task and/or in the information required to make the decision) have been examined in the context of technology support for group tasks (Pinsonneault and Kraemer, 1990). Munkvold (2002) presented an analysis of five case studies to help understand the alignment of organisational change and collaborative technology adoption and demonstrated that users are likely to adopt (and therefore use) collaborative technology only when there is sufficient pressure for them to do so.

Kang (1998) used the twin concepts of internal personal belief and external social belief to extend existing models of individual level technology acceptance to a group level behaviour. Kang also highlighted the importance of network externality and complementarity effects. Zack and Mckenney (1995) highlighted the importance of the social context, reinforced by the manner in which technology is used. Contrary to general findings that open, organic information culture encourages use of collaborative media support, Jarvenpaa and Staples (2000) found that people who have a "structured hierarchic culture", use electronic media more. They also found that when task interdependence (measured by both direct dependence among members of the group and degree of equivocality of the information used) was high, users used collaborative technology more. Li, Lou and Day (2003) explore the impact of "affiliation motivation" (or the need for people and the need to 'belong'), on the use of groupware through the framework of TAM.

Studies have thus included characteristics of the group task, the technology and the group in examining use of collaborative technology by groups. Based on the literature reviewed above, we present here a framework for use of collaborative technology.

3 FRAMEWORK

3.1 Information Intensity of Task

'Information Intensity of Task' (IIT) refers to the level of information processing required to perform the task (based on the concept of information intensity of product and process discussed by Porter and Millar, 1985). Certain organizational group tasks may be more information intensive than others. Information intensity of task can be measured using three dimensions – complexity, uncertainty and ambiguity of task performed (Wood, 1986 and Campbell, 1988). In the context of group task, IIT can be treated as an aggregate construct consisting of task complexity - defined as 'the level of cognitive demands placed on the person, to engage herself in the performance of the task'; task uncertainty defined as the difference between the amount of information required to perform the task and the amount of information already possessed by the decision maker; equivocality or task ambiguity - refers to the multiplicity of meaning conveyed by the information cues.

Similar use of complexity, uncertainty and ambiguity has been seen recently in the context of perceived website complexity (Nadkarni and Gupta, 2007). Sources of information intensity of group task may include level of resource sharing in the organization, level of interdependency, and dispersion of information amongst group members.

When different functions or departments share resources commonly procured or maintained by the organisation, there is a pressure to coordinate with each other. Such pressures to coordinate translate

into a need for collaboration among members of different departments or members of the same department who share some physical resource. Such resource sharing also results in an increased complexity of the coordinating task.

Different parts of the organisation may depend on each other (for reasons other than resource sharing), for execution of their respective tasks. In such cases, there is a definite need to coordinate and communicate. This requires the various personnel to collaborate in order to ensure smooth operations. Such a need to coordinate may also arise from inter-dependencies across tasks of multiple individuals in the organisation resulting in increased task complexity and uncertainty (Kwon and Zmud, 1987).

When information in the organization is dispersed among many individuals and such information needs to be gathered and collated, groups are likely to be used as coordination mechanisms (Cummings, 2004). Such information dispersion gives rise to certain task ambiguities and complexities.

When groups engage in information intensive tasks, it is imperative that they look for tools and technologies that either enable them to perform such tasks, thus resulting in the use information technology especially collaborative technology. Thus,

> *Proposition 1: Greater the information intensity of the group task, greater is the use of collaborative technology.*

3.2 Collaborative Orientation

Unlike technologies and applications used by individual's for supporting their own tasks such as word processors, spreadsheets or applications used at the organizational level such as ERP, CRM, collaborative technology is a network-based technology where the extent of use is also determined by the existing or potential members on the network. A group's use of such technologies is therefore influenced by peers' and superior's use of it (Kang, 1998; Turner and Turner, 2002; Lerouge, Blanton and Kittner, 2004). This construct is akin to the social influence (Venkatesh et. al. 2003) and subjective norm (Taylor and Todd, 1995) constructs that exist in literature but in the context of collaborative technology.

Considering a task group within an organizational environment, the tendency of the group to be collaborative in their approach to task execution will have an impact on their extent of use of collaborative technology to execute the group task (Li, et. al., 2003). Some groups have a tendency to be more collaborative in their approach to task execution than others. While the group sub-culture has a more dominating influence, Collaborative Orientation is influenced also by the culture of the organisation in which the group is embedded.

The primary factor that influences the collaborativeness of the group is the group's culture. There are many aspects to a group's culture such as the level of cohesion and trust among the members of the group, innovation and risk taking behaviour, attention to detail, task vs. people orientation, aggressiveness, openness to information sharing and preference for stability.

A group's orientation towards collaborative work is not determined solely by the group's own characteristics. It is also affected by the environment in which the group functions, especially the organisational environment. Certain organisational factors, especially the cultural environment — including the formal and informal incentives for collaboration — are likely to impact the orientation of group members towards working together on the group task.

The role of leadership of a group can be described as the ability to influence a group towards achievement of group goals. Behaviour of individuals in groups is influenced by the power commanded by the group leaders within the organisation in general and the group in particular. To that extent, such leader's orientation towards collaboration is likely to condition the group members' tendency to collaborate. A group leaders' power as perceived by group members, plays an important role in determining the group's orientation towards collaboration, especially if the leader's orientation

is not identical to the group members' orientation. How the group perceives the group leader's influence or power, along with the group leader's orientation towards collaboration and collaborative technology (Jones and Kochtanek, 2004), thus determines whether the group has a positive orientation towards collaboration, especially for the specific task.

A group's propensity to collaborate is reflected in the extent of collaborativeness exhibited by the group in a natural manner, the group leader's preference towards encouraging or discouraging collaboration to execute the task and the culture of the organisation in which the group is embedded. This Collaborative Orientation thus impacts the behavioral intention to use collaborative technology to support the group task. Hence,

> *Proposition 2: Greater the collaborative orientation of the group, greater is the use of collaborative technology.*

3.3 Technology Drive

A group's orientation towards information technology depicts the general tendency of the group to apply and use information technology for various organisational activities. This tendency affects the group's propensity to use collaborative technology. Apart from the individual users' positive orientation towards IT use, top management orientation towards IT can also result in a positive orientation of groups towards IT. Further, long term factors such as positive orientation of the organisation towards IT in general — especially due to effective IT management — can also lead to a positive inclination towards IT use. A group's orientation towards collaborative technology is influenced by individual users' IT drive, the network effect and organizational IT maturity.

Individual users' IT drive results from perceived ease of use of IT in general, perceived relative advantage from use of the technology, users' demographic characteristics such as education, prior IT experience, age, etc. (Gallivan, 2001; Venkatesh, et. al., 2003).

In the context of technology drive, network effect refers to the impact of subjective norms (Taylor and Todd, 1995; Gallivan, 2001) on a users' use behavior and his or her interest to initiate other colleagues into using the system. An individual users' IT orientation is also a result of other group members' interest in initiating colleagues into IT. This is especially true in the case of end-user computing (EUC) environments, for two reasons. EUC environments are characterised by applications, the features of which are fairly user-friendly and the use of such technologies enables group members to execute their individual tasks in a smoother manner. Secondly, end-users have been found to often learn faster to use the technology if 'taught' by peers and colleagues. This is more applicable in group-oriented technology environments, where the group's overall use of these technologies, depends on what can be termed 'network externality'.

Organizational IT maturity refers to the level of sophistication of use of IT, the evolutionary stage of IS in the organisation and the extent of use of IT applications for strategic decision making. In other words, IT maturity is a result of IT professionalism which refers to the level of professionalism in terms of technical competence and business understanding of IT exhibited by the organisation. While it is quite common to find organisations and individuals who have a high level of technical competence and the inclination to use IT, it is rather uncommon to find organisations/individuals who understand and appreciate the business value of IT and have the technical and managerial competence to put such knowledge into action. A IT-mature organization provides the facilitating conditions (Venkatesh et. al, 2003) which encourage use of IT by individuals and groups.

A group's technology drive is influenced by individual users' IT drive, the network effect and the organizational IT maturity thus positively impacting the behavioral intention of the group members to use collaborative technology. Hence,

> *Proposition 3: Greater the group's technology drive, greater is the use of collaborative technology.*

3.4 Performance Pressures

A group may experience pressure to use collaborative technology if there is an inherent performance pressure to execute the task well or if there is a pressure to support a collaborative task using technology.

A group which performs a task which is more significant in the organization scheme of tasks (Campion, Medsker and Higgs, 1993) is likely to experience greater pressures to perform and hence to use IT support for task execution. Task significance is manifested in the authority provided to the group, priority given for allocation of resources, access to information and ease with which the group can export or import information related to the group task . Alternatively, if the group members perceive that the task under consideration is a very important task in comparison to its other tasks, the members are likely to perceive greater performance pressures, either (or both) in terms of efficiency of the task performed or the effectiveness of its outcomes. This is akin to the performance expectancy construct in UTAUT (Venkatesh et. al. 2003). A highly motivated group with an innate drive for excellence and keenness to produce an efficient and effective output of the group task may also experience inherent pressures to perform.

When the spatial differentiation of the organisation is high and as a result, internal processes of the organisation are spread geographically, then there is a great need for members of the organisation to use technology to collaborate and communicate laterally. It is also common to find members of a group being temporally dispersed either due to locational (time-zones) difference or due to differences in working hours. Both geographic and temporal dispersion necessitate use of collaborative technology support (Massey, Montoya-Weiss and Hung, 2003).

> *Proposition 4: Greater the performance pressure experienced by the group, greater is the use of collaborative technology.*

3.5 Use

In the context of collaborative technology, use can be defined as employment of one or more features of a system by the members of the group to perform the group task. Collaborative technology includes the hardware, software, applications and network infrastructure which support a variety of group tasks in the organisation. It thus covers the entire spectrum of electronic mailing systems, bulletin boards, intranets and extranets, messaging systems, group support systems, decision rooms, computer conferencing tools, computer-based video-conferencing systems, etc.

Level of use of collaborative technology can be measured using two parameters -scale of use (reflecting quantity) and sophistication (reflecting quality and functionality) of use. These parameters can be measured both objectively and subjectively depending on the specific task, the collaborative technology application and the group under study. The issue of using objective versus subjective measures has been a contentious one in literature. Although objective measures of use reduce the possibility of researcher and participant bias, it may not always be feasible to measure use of technology in an objective manner, nor would it be essential to make such an attempt. There may be situations where subjective measures of use are more applicable and sensible, than the use of strictly objective measures. Many authors (see Vaidya and Seetharaman, 2005 for a comparison) have attempted combining subjective and objective measures, especially in situations where using one of these may give an incomplete picture.

3.5.1 Scale

Scale of use represents the magnitude and spread of collaborative technology use. It is hardly possible to capture the magnitude of use of intellectual technologies without considering either time or task as a basis. An intellectual technology can be described as a technology, the use of which is limited only by

the imagination of the user. We therefore suggest a combination of the following two measures of use (Vaidya and Seetharaman, 2005)

- Frequency of Use of collaborative technology for the task
- Proportion of task performed using collaborative technology

Frequency of use refers to the regularity of utilization of collaborative technology by the group for performing the group task. In other words, it attempts to capture the answer to the question— 'how often does the group use the collaborative technology to perform the task or parts of the task'. While there is no consensus in the literature as regards the measure of the scale of use of a particular IT application or infrastructure, it is possible to describe possible task environments when a particular measure would be more suitable.

Measure of Frequency of Use	**Suitable Group Task Environment**
Duration of Use (minutes/hours)	The task cannot be segregated into smaller components and requires a specific kind of use of the technology, such as instant messaging or video conferencing. Such a measure also tries to imply the level of dependency of the group on the technology to perform the task.
Number of Times Used	The task can be subdivided into numerous smaller components
Number of Messages Sent/Received	The task is mainly focused on information sharing between members of the group and the information shared can be identified as individual elements or cues related to the overall group task
Number of Transaction Sets	The task is composed of different types of activities and each can be individually considered a unique transaction
Proportion of Total Time Spent	The task cannot be divided into smaller tasks but can be done through a varying time duration depending on the group or environment
Perceived Frequency of Use	Absolute or objective measures cannot be used and hence it is only possible to use perceived measures or when available objective measures are not appropriate

Table 1. Frequency of Use and Suitable Task Environments.

'Proportion of task performed using collaborative technology' refers to that portion or share of the task performed on the technology. An organisational group task often consists of multiple smaller tasks or activities. While a group may choose to perform some constituents of the task through collaborative technology, it may also perform some others through other media such as face-to-face or telephone. It is possible hence, to list the lowest level constituents of the group task and analyze the use of collaborative technology with respect to each of these group task constituents.

3.5.2 Sophistication

The term sophistication refers to 'refinement' or exhibition of higher level of knowledge. In the context of collaborative technology use, it refers to the use of the general collaborative technology infrastructure and specific collaborative technology applications, at various levels of refinement, as reflected in the information activities performed using the technology. It is possible to define use of collaborative technology in the context of following types of group information activities - Information sharing, Information Management, Group Information Management and Synchronous Group Activities. A detailed description of these information activities with increasing level of task complexities has appeared in Vaidya and Seetharaman (2005). It is possible to create a typology of groups based on their collaborative technology use such as Amateurs (low scale/low sophistication), Satisficers (high scale, low sophistication), Passive Experts (low scale/high sophistication) and Active Experts (high scale/high sophistication).

The choice of these measures is based on two factors. First, the measure 'proportion of task' is incorporated mainly to neutralize the perceived quantum of use captured in the frequency variable. It also reflects the importance given to the collaborative technology in the context of the group task.

Second, multi-level research theory (Burton-Jones and Gallivan, 2007) has emphasized the need for a measure for each possible interaction between the elements in the theoretical framework (in our case — user, task, group and organisation) and the phenomenon (use of collaborative technology). In this dissertation we have used frequency (to represent the technology element), proportion of task (task) and sophistication (interaction between technology, task and user). As regards the interaction between the group element and technology, this study assumes that all members of the group are in an equivalent state (network externality). Similarly, with respect to the interaction between the organisation and the technology aspect of the framework, it is assumed that collaborative technology is available in the organisation and is accessible to the group under study.

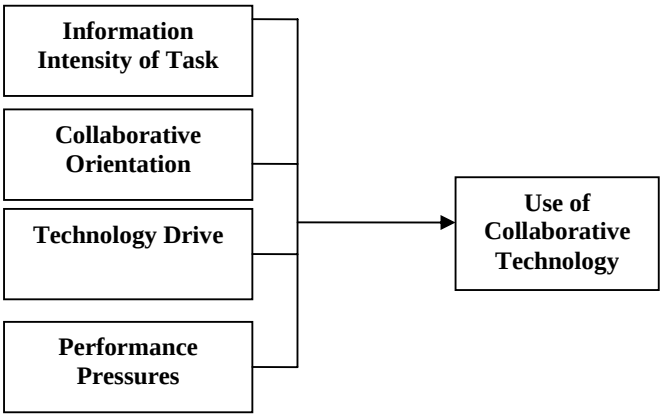

Figure 2. The Framework.

3.6 Exploratory Survey

An exploratory qualitative survey was conducted to demonstrate the framework. The primary aim of this study is to understand various factors that influence collaborative technology use. It has been often shown that for such studies qualitative research methodologies are more appropriate (Eisenhardt, 1989; Yin, 1994). The choice of research sites covered firms in both manufacturing and services sector keeping in mind the need to vary the basic task performed (Table 2).

Type of Industry	Orgs.	Groups	Pseudonyms
Financial Institutions (Banking/Insurance)	3	3	FIN, INS1, INS2
Educational Institution	1	2	EDU1, EDU2
Manufacturing (Towers/ Elevators/ Petroleum)	3	4	COT,ELE,PET1,PET2
Media (Newspaper)	1	2	MED1,MED2
Software	2	3	SOF1,SOF2,SOF3
FMCG (Detergents/Cassettes)	2	2	DET,CAS
Total	**12**	**16**	

Table 3. Exploratory Study Sites

Middle/senior management level groups who performed at least one decision task were chosen. Due to paucity of space, detailed descriptions of the organizations and groups are not being provided here. A summary of the findings is presented in tabular form in Table 2. In order to maintain simplicity, two values of low/high have been used. Moreover, the high/low values have been used to relatively describe the level of the respective constructs. Further analysis of the data is required before any precise conclusions can be drawn. But the initial findings are interesting and hence we felt it important to present them here.

No.	Group	Task	Coll. Orientation	Tech Drive	Performance Pressures	Frequency	Prop. Task	Sophistication
1	**FIN**	High	High	High	High	High	High	High
2	**INS1**	Low	Low	Low	High	High	Low	Low
3	**INS2**	High	Low	Low	Low	Low	Low	Low
4	**EDU1**	High	High	High	Low	Low	High	High
5	**EDU2**	Low	Low	Low	Low	Low	Low	Low
6	**COT**	Low	Low	Low	Low	Low	Low	Low
7	**ELE**	High	High	High	Low	High	Low	High
8	**PET1**	High	High	High	High	High	High	High
9	**PET2**	High	Low	Low	Low	Low	Low	Low
10	**MED1**	High	High	Low	High	High	High	Low
11	**MED2**	High	High	Low	Low	High	Low	Low
12	**SOF1**	High	High	High	Low	High	Low	High
13	**SOF2**	High	High	High	High	High	High	High
14	**SOF3**	High	High	High	High	High	High	High
15	**DET**	High	High	High	High	High	High	High
16	**CAS**	High	High	Low	High	High	High	Low

Table 4. Summary of Findings

4 DISCUSSION

The framework presented in this paper essentially attempts to understand and describe the possible differences in the use of collaborative technology by different organisational task groups. In the process of doing so, it identifies the factors that influence collaborative technology use by groups and the nature of impact of these factors on collaborative technology use. It can be seen from the summary of the exploratory survey that a group experiencing high pressures to perform combined with an orientation towards collaboration (such as MED1 and CAS) display a high scale of use. On the other hand, groups which posses a drive to use technology and experience high performance pressures (such as FIN and DET) use collaborative technology actively and in a sophisticated manner. Comparing these with groups who posses the technology drive but do not experience pressures to perform (such as EDU1 and ELE) display a high sophistication but lower scale in their use of collaborative technology. But to draw any concrete conclusions and the precise nature and quantum of impact of various factors, further study is essential both in the form of detailed longitudinal in-depth case studies and large sample surveys. While longitudinal cases would help establish the interaction amongst various factors over time, large sample surveys would aid in greater generalization of the findings.

In summary, the features used in a collaborative technology and the information activities that are supported by such use are largely a result of the technology drive of the group members, while the dominant effect of task related factors and performance pressures are on the scale of technology use. The collaborative orientation of the group may be a catalytic construct the presence of which may enhance both extent and intensity of technology use.

The prescriptive value of the framework lies in aiding a group move to that level of use which may best suit the environment it functions in, using certain specific management mechanisms (Vaidya and Seetharaman, 2007). For instance organizations can use technology champions, who, using informal one-to-one modes to 'teach' *Amateurs*, thus creating **awareness**. Information centers and help desks which provide online **support** to end-users are essential for *Satisficers*. **Incentives** for regular use and/or support for identifying opportunities are two possible mechanisms for *Passive Experts*. *Active Experts* often tend to be dependent on collaborative technology infrastructure to meet their everyday task needs. The key aspect of technology management for active experts is therefore **maintain and enhance**.

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