EVALUATING EMS VALUE - THE CASE OF A SMALL ACCOUNTANCY FIRM

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Abstract: This paper discusses the evaluation of Electronic Meeting Systems (EMS). More specifically, it tackles the problem of evaluating the perceived organizational value of these systems. EMS lay down one sub area of research crossing Computer Supported Cooperative Work (CSCW) and Group Support Systems (GSS) in particular and information systems in general. Based on these multiple perspectives, we developed an evaluation grid for EMS. The evaluation grid identifies several EMS components as well as different levels of organizational impact. Our hypothesis is that with this grid it is possible to analyse and evaluate the organisational, group and individual impact of EMS. The paper also presents an application of the grid to a real organization: an accountancy firm.

1. INTRODUCTION

Meetings are probably the most used, regulated and documented group process. The informal pub meeting (e.g. Dialogues of Plato), Senate's sessions (in Rome), Round Table, Councils of the Bishops, Parliaments' Assemblies, the corporate General Assemblies, the institutes' and schools' management board meetings are just some of many examples showing that meetings play an important role in society.

A meeting is usually a face to face interactive process accomplished by a group of people in a certain place and time, in which the group tries to accomplish some collective goals. A more thorough definition would also take into account that the meeting process begins before the session and has repercussions later on. Many authors studying meeting processes posit that this process is composed by activities preceding the meeting session, by activities accomplished during the session and by activities which happen after the meeting session. Before the session, one should include meeting proposal, approval, planning (including definition of topics, goals and selection of participants) and invitation. During the session, we primarily find content interventions and process interventions, although some other tasks may be found as well, such as group development or strategy formation.

After the session, one should consider meeting assessment, report production and distribution, and progress review.

The literature reports several EMS aiming at supporting the above tasks. Unfortunately, using EMS brings many gains to meetings but some losses as well (Romano & Nunamaker, 2001). Furthermore, extensive use of EMS in organizations highlighted the tendency of EMS to be self-extinguishing in the long run (Briggs et al., 2001).

One factor that contributes to this situation concerns the reduced levels of integration and assimilation that EMS achieved in organizations. So, in order to analyse to what extent organizations value EMS, an evaluation action must be performed.

As pointed out by Ramage (1996), five different types of CSCW evaluation can be identified: (1) evaluate the effects of CSCW in organisations; (2) evaluate CSCW systems per se in order to produce better systems; (3) evaluate the concepts that underline the system and whether those concepts are applicable; (4) evaluate CSCW in context, not just the technology but the whole socio-technical system; (5) evaluate what CSCW to acquire.

This paper proposes an evaluation scheme that falls in type five.

From now on, this paper is organised in five sections. In section 2 we review the literature on different approaches to evaluating information systems in organisations. In section 3 we identify and characterise meeting components. The section 4 appeals to the importance of evaluating EMS impacts at various levels. The section 5 proposes an evaluation grid and a formula to measure EMS impact. Finally, in section 6, we report an application of the proposed approach.

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2. LITERATURE REVIEW

One of the most straightforward EMS evaluation techniques consists in analysing the quality of results produced by the meeting, relying either on experts' opinions or the participants themselves

More sophisticated approaches regard meetings as production systems, with inputs, processes and outputs. The output variables include different measures of quality, such as quality of decisions, quality of the process, number of ideas generated, originality of the decision, time to make a decision, or level of detail. Beyond quality, this type of evaluation includes variables such as satisfaction (with the process, with the results), confidence and consensus (Pinsonneault & Kraemer, 1989).

This approach was proposed by Pinsonneault and Kraemer (1989) and later adapted, extended and enhanced by several researchers (e.g. Nunamaker et al., 1991 Fjermestad & Hiltz, 1999).

The production system approach emphasises the direct impact of input variables, and technology is one of them, on group work. Some researchers noted however that evaluation should not be restricted to the group. Thus, one should also evaluate to what extent technology matches corporate strategies and organisational processes. One such approach is the Technology Transition Model (Briggs et al., 1999).

Another line of research departs from the observation that EMS evaluation is a specific case of CSCW evaluation, and CSCW evaluation is also a specific case of HCI (Human Computer Interaction) evaluation. The CSCW perspective emphasises the aspect of communication, coordination and cooperation: how the group organises work, builds a common perspective and achieves high performance ability (Joahanson et al., 1991). The Media Richness Theory (Daft & Lengel, 1986) is one example of this approach.

The HCI dimension introduces the perspective of the user, emphasising usability and ergonomics (e.g. Hayes, 1998).

So, as briefly discussed in the above lines, EMS systems should be evaluated using different perspectives encompassing the human, group and organizational levels.

Another important issue to ponder concerns the existence of a multiplicity of methods to evaluate systems. Heuristic Evaluation (Nielsen, 1993) relies on the evaluator's immediate reactions, intuitions and predictions, categorised under a set of Design Principles and Usability Attributes. Much advocated in the HCI field (Tognazzini, 1992), usability testing takes generally the form of studies conducted by system designers with real users in a semi-realistic use context.

Various methods involving direct user reactions can be adopted to obtain qualitative data about users' experience with systems (either immediately or a little while after use). These methods have been used particularly as a way to capture exploratory data prior to further analysis or to improve a commercial product by collecting customer feedback (Abbott & Sarin, 1994).

Laboratory experiments are quite widely used to evaluate CSCW systems (e.g. Ishii et al., 1993). However, as with user testing, there are significant problems with the de-contextualised and artificial nature of these experiments.

Another way to evaluate a system is to go into the work place and watch real users using it over time. Traditionally, ethnography requires a long period of immersion. This approach has been widely used to evaluate CSCW systems such as air traffic control rooms (Mackay, 1999). Some researchers, e.g. Hughes et al. (1994), proposed "quick and dirty ethnography" techniques to make this method less time consuming and still provide useful amounts of data. Others have proposed using contextual inquiries, a combination of observation with directed interviews (Beyer & Holtzblatt, 1998).

3. ROLES, PROCESSES AND RESOURCES

The components of meetings that may be analysed in order to evaluate EMS are: roles, processes and resources.

Roles correspond to categories of recognisable behaviours, objectives and motivations linked to the execution of an organisational, group or individual function.

When playing a role, individual, group or organizational agents are autonomous and responsible for accomplishing a task. The EMS support that is relevant in this context considers: (1) Mechanisms that support accomplishing goals; (2) Mechanisms that support identifying motivations and defining strategies (e.g., cognitive mapping tools; Eden & Ackermann, 1992); (3) Time management mechanisms; (4) Mechanisms that support the learning process; (5) Mechanisms that help or guide the agent performing the assigned role, (e.g., expert systems; Aiken et al., 1990); (6) Mechanisms that help planning goals, identifying responsibilities and allocating resources.

Another component of meetings is the process. Processes organise collections of interrelated activities executed by multiple agents to reach complex goals. In the perspective of system support, the following dimensions may be identified (Nunamaker et al., 1991):

Process structure, Process support, Process automation, Task support and Task automation.

Resources are artefacts used, shared or produced by agents while participating in processes. From an information processing perspective, the following elements have to be considered: Share data, Structure/index data, Save/retrieve data and Associate data with user(s).

At this moment we have identified the components of a meeting. Once again we should emphasise that these components should be regarded at three different levels: organizational, group and individual. These three levels are necessary to evaluate the organizational value of EMS.

4. INDIVIDUAL, GROUP AND ORGANISATIONAL LEVEL

The main purpose of EMS is to support groups accomplishing their goals with increased quality, productivity and satisfaction. We have asserted in this paper that our purpose is to go beyond the group towards the more broad organizational perspective and, at the same time, towards the more specific individual perspective. Why do we need to bring together all these perspectives? Basically, because success or failure depends on the combined impact of these three factors. We give some concrete examples: (1) CSCW success depends on who benefits and who has to do additional work. The agents that do not get benefits from the technology undermine its use to the point of failure (Grudin, 1990); (2) EMS have proved to decrease significantly organizational costs but, nevertheless, failed because this technology needs champions and this type of agent is very scarce in organizations (Briggs, et al., 2001); (3) EMS require good agendas, defined before meetings and, in fact, one of the most significant advantages of EMS has been attributed to this strong requirement. However, 1/3 of meetings do not have any kind of agenda (Romano & Nunamaker, 2001) and, thus, EMS may be perceived as awkward.

Our purpose, then, is to evaluate EMS simultaneously at the individual, group and organisational levels. At the individual level, we propose to evaluate the technology support to individual agents, executing individual tasks and managing individual resources while cooperating with other agents in the scope of processes.

The other level is the group level. In fact, EMS support agents playing group roles, executing collaborative tasks, and producing and using shared information.

Finally, at the organisational level, we address the EMS aptitude to support organisational roles, processes and resources.

5. THE EVALUATION GRID

By crossing the role-process-resource dimension with the organisation-group-individual dimension, we created the evaluation grid.

The grid consists of nine cells, each one classifying relevant EMS **features** that should be analysed and valuated:

- Organisational role - Agents may play several organisational roles, (e.g. general manager).
- Group role - In a meeting, a person may be acting as participant, facilitator, sponsor or secretary (Aiken & Vanjani, 1998).
- Individual roles – Besides organizational and group roles, persons also act upon individual aspirations.
- Organisational processes - At the organisational level, a great number of processes may be identified, but, a small number are critical (Hammer, 1990).
- Group process - Groups execute several processes in meeting environments according to the issues that need to be dealt with, e.g. relationship development or conflict management (Dubs & Hayne, 1992).
- Individual processes - Correspond to processes that have meaning at an individual level, such as prioritizing and scheduling individual tasks.
- Organisational memory - The identification of organisational databases is specially important in this dimension, as well as identifying to what extent the system being analysed may be linked with them (Concklin, 1992).
- Group memory - What is important here is analysing the information produced either during the actual meeting or in previous sessions (Nunamaker et al., 1991).
- Individual memory - The personal calendar is one example of individual memory supported by computers, but other forms of individual memory may be identified and analysed in detail.

Figure 1 presents the evaluation grid where each one of the cells was expanded with the **detailed features** that, in section 3, were considered relevant to EMS evaluation.

Based on the detailed evaluation grid, we finally defined a way to measure EMS value, using the following formula:

$$V = \sum_{i=1}^{9} \left(\left[r_i / (c_i \times f_i) \right] \times 10 \right)$$

	Role	Process	Resource
Organisation	Organisational role accomplish roles define motivations/strategies time management learning guiding planning	Organisational process process structure process support process automation task support task automation	Organisational memory share data save/retrieve data structure/index data retrieve data user identification
Group	Group Role accomplish roles define motivations/strategies time management learning guiding planning	Group process process structure process support process automation task support task automation	Group memory share data save/retrieve data structure/index data retrieve data user identification
Individual	Individual role accomplish roles define motivations/strategies time management learning guiding planning	Individual process process structure process support process automation task support task automation	Individual memory share data save/retrieve data structure/index data retrieve data user identification

Figure 1 - The detailed evaluation grid

c is the number of concrete **items** that are selected to the evaluation process. These items may be roles, processes or resources and are selected after an analysis of the organizational context and specific EMS being evaluated.

f is the number of **detailed features** relevant to EMS evaluation and considered in each cell of the evaluation grid (see Figure 1).

r corresponds to the sum of the **rates** given by the evaluators to the **items** in each cell of the evaluation grid. Currently, the ratings are 0 for "no support" and 1 for "support."

V is a total measure of the organizational value given to the items selected by the evaluation process. Since the maximum value that can be measured in each grid cell is 10, V has a maximum of 90 and a minimum of 0.

6. USING THE EVALUATION GRID

The EMS evaluation process was performed in a small accounting and business-consulting firm. This firm is mainly composed of accountants and consultants, which have a very flexible work structure, where coordination is primarily accomplished with meetings and skills standardisation.

The selected organization decided to evaluate several EMS: Group Systems (Nunamaker et al, 1991), EMS2PDA (Costa et al., 2001), Smart Meeting Pro (www.smartech.com), and Logan web (Raikundalia & Rees, 1996). In this paper we will only show the evaluation results of the EMS2PDA system.

The evaluation grid was based on the detailed evaluation grid presented in Figure 1, tailored to the specific characteristics and interests of the target organization.

The tailoring process results from the identification of the specific roles, processes and resources pertaining to the firm and relevant to the system being evaluated.

With the help of several firm members, we could identify two main organizational roles: consultant/accountant and manager. In what concerns group roles, we identified the participant, the sponsor and also the meeting facilitator. This last role is an imposition of the EMS2PDA system, since the "normal" meetings generally do not use this role. No individual roles were discriminated.

In what concerns organisational processes, the main processes that were identified are activity planning and activity control. This last one includes monitoring and information support to the accountants' and consultants' control procedures.

Among the group processes listed by researchers (e.g. Dubs & Hayne, 1992), the firm members found that the production of meeting agendas, the support to meeting decisions and the production of meeting reports were the most important in their organisational context.

Considering resources, at the organizational level, the most important were the accounting system and an organisational database supported by an Intranet, which the firm called Web-database. In what concerns group memory, the most significant resource is the actual meeting data, as well as data from the previous meeting.

Finally, in what concerns individual memory, the personal calendar is the most important resource used,.

	Items (c)	Detailed features (f)	(1)	(2)	(3)	V
Org. role	Consultant Manager c=2	supports agent accomplishing organisational role supports defining motivations/strategies of agent playing organisational role supports time management of agent playing organisational role supports learning of agent playing organisational role guides agent playing organisational role supports planning of agent playing organisational role	0 0 0 0 0 0	0 0 0 0 0 0		0
Group Role	Participant Sponsor Facilitator c=3	supports agent accomplishing group role supports defining motivations/strategies of agent playing group role supports time management of agent playing group role supports learning of agent playing group role guides agent playing group role supports planning of agent playing group role	0 0 0 0 1 0	0 0 0 0 0 0	0 0 0 0 0 0	0
Individual role	 c=1	supports agent accomplishing individual role supports defining motivations/strategies of agent playing individual role supports time management of agent playing individual role supports learning of agent playing individual role guides agent playing individual role supports planning of agent playing individual role	0 0 0 0 0 0			0
Org. process	Activity Planing Activity Control c=2	organisational process structure organisational process support organisational process automation organisational task support organisational task automation	0 0 0 0 0	0 0 0 0 0		0
Group process	Meeting agenda Meeting decision Meeting reporting c=3	group process structure group process support group process automation group task support group task automation	1 1 0 1 0	1 1 1 1 0	0 1 1 1 1	7
Individual process	Schedule process c=1	Individual process structure Individual process support Individual process automation Individual task support Individual task automation	1 1 1 1 1			10
Org. memory	Accountancy dB Web-database c=2	share data save/retrieve data structure/index data retrieve data user identification	0 0 0 0 0	1 1 1 0 1		4
Group memory	Actual meeting data Previous meeting data c=2	share data save/retrieve data structure/index data retrieve data user identification	1 1 1 1 1	0 0 0 1 0		6
Individual memory	Personal calendar c=1	share data save/retrieve data structure/index data retrieve data user identification	1 1 1 1 1			10
					Total	**37**

Figure 2 - The evaluation grid (the case of EMS2PDA)

and tools like Palm Desktop, Navigator Calendar or Microsoft Outlook generally support it

With this list of concrete items, we prepared the evaluation grid and asked four members of the firm to experiment the EMS2PDA system and evaluate it according to the grid.

The obtained results are presented in Figure 2. Note that the EMS2PDA system does not supply value to the organization in four out of nine features: organizational, group and individual roles, and organizational process. The EMS2PDA system offers maximum value in two features: individual process and individual memory.

The total measured organizational value of the EMS2PDA system was 37 in a scale 0-90.

Note that this approach shows several limitations. One is that we may need different weights to measure value according to the relative importance of each item and detailed feature. Another minor limitation is the possible confusion between organisational, group and individual levels when each item is being analysed. The way to solve this problem is to use always the same criteria for all the options in the evaluation.

Another limitation is the situated nature of the evaluation process and the impossibility of comparing

data obtained in different contexts. In fact, considering that the evaluation grid was constructed for a particular organization, we can compare different EMS evaluations from the same firm, but it is impossible to compare if a specific solution fits better this firm than another firm.

This limitation of the evaluation grid is also linked to its flexibility. Since the firm involved in the evaluation process was a small firm and time was a very precious good, we had to use a simplified version of the grid. If the organisation involved had more time to spend on the evaluation process, our approach could also be used, although using a more detailed evaluation of resources, processes and roles and a greater number of items.

7. CONCLUSION

The purpose of this paper is the evaluation of EMS value to organizations. We identified three major components of EMS: roles, processes and resources.

Three different levels of integration were also identified: organizational, group and individual. These two dimensions were then combined and produced the "evaluation grid." The evaluation grid was applied to a small consultant firm.

The approach showed that it may be adjusted to simple organisations. This work contributes to the situated evaluation of cooperative systems (Twidale et al., 1994) applied to the specific case of EMS

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REFERENCES

Abbott, K.& Sarin, S. 1994. *Experiences with Workflow Management: Issues for the Next Generation* In *Proceedings of CSCW 94*, pp.113-120

Aiken, M., Motiwalla, L., Sheng, O.& Nunamaker, J., 1990. *ESP: An Expert System for Pre-Session Group Decision Support Systems Planning* In. *Proceedings of the 23rd HICSS*, Hawai, January 2-5; pp.279-286

Aiken, M.& Vanjani, M. , 1998. *An Automated GDSS Facilitator* in *SWDSI 1998 Conference* Dallas, Texas.

Beyer, H.& Holtzblatt, K. , 1998. *Contextual Design*. Morgan Kaufmann.

Briggs, R., Adkins, M., Mittleman, D., Kruse, J., Miller, S.& Nunamaker, J. , 1999. *A technology transition model derived from field investigation of GSS use aboard the USS Coronado* In *Journal of Management Information Systems*, 15(3).

Briggs, R., Nunamaker, J.& Tobey, D. , 2001. *The Technology Transition Model: A Key to Self-Sustaining and Growing Communities of GSS Users* In *Proceedings of the 34th HICSS, Hawaii*.

Conklin, E., 1992."Capturing Organizational Memory" In *Proceeding of GroupWare 92,* CA, pp. 133-137.

Costa, C., Antunes, P.& Dias, J. , 2001. *The Meeting Report Process: Bridging EMS with PDA* In *Proceedings of the 3rd ICEIS* Setubal.

Daft, R.& Lengel, R. , 1986. *Organizational information requirements, media richness and structural design* In *Management Science*, 32(5).

Dubs, S.& Hayne, S. ,1992. *Distributed Facilitation: A Concept Whose Time Has Come?* In. *Proceedings of CSCW 92;* pp.314-321

Eden, C,& Ackermann, F.,1992. *Strategy development and implementation – the role of a group decision support system*" In *Computer Augmented Teamwork*. Van Nostrand Reinhold.

Fjermestad, J.& Hiltz, S,1999. *An assessment of group support systems experimental research: Methodology and results* In *Journal of Management Information Systems*, 15(3).

Grudin, J. 1990 *Groupware and Cooperative work: problems and prospects*. In *The Art of Human Computer Interface Design*. Apple Computer Inc.

Hayes, B. 1998 *Measuring Customer Satisfaction: Survey Design, Use, and Statistical Analysis Methods* American Society for Quality: Milwaukee, WI.

Hughes, J., King, V.& Rodden, T., Andersen, H. 1994 *Moving out from the control room: ethnography in system design*, In *Proceedings of CSCW '94*, pp. 429-439.

Ishii, H., Arita, K.& Yagi, T. 1993 *Beyond Videophones: Team Workstation-2 for Narrowband ISDN*..In *Proceedings of ECSCW '93*, pp.325-340.

Mackay, W. 1999 *Is paper safer? The role of paper flight strips in air traffic control*. In *ACM Transactions on Computer-Human Interaction*, 6(4).

Nielsen, J. 1993. *Usability Engineering*. London: Academic Press.

Nunamaker, J., Dennis, A., Valacich, J., Vogel, D.& George, J., 1991 *Electronic meeting systems to support group work: theory and practice at Arizona* In *Commmunications of the ACM*, 34 (7).

Pinsonneault, A.& Kraemer, K. 1989 *The impact of technological support on groups: An assessment of the empirical research* In. *Decision Support Systems*, 5 (3).

Raikundalia, G.& Rees, M. 1996, *Enhancing Collaboration in Formal, Synchronous Electronic Meetings with LoganWeb* In *Proceedings OzCSCW96*, Univ. Queensland, pp. 6-13.

Ramage, M. (1996) *CSCW Evaluation in Five Types*. Report CSEG/17/96, Computing Dep., Lancaster University, UK.

Romano, N.& Nunamaker, J, 2001 *Meeting Analysis: Findings from Research and practice* In . *Proceedings of the 34nd HICSS*; Hawaii.

Tognazzini, B. 1992 *Tog on Interface. Reading*, MA: Addison-Wesley.

Twidale, M., Randall D.& Bentley, R. 1994, *Situated evaluation for cooperative systems* In *Proceedings of CSCW 94* USA pp.441-452.