Decision Making Process: A Collaborative Perspective

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Abstract: The introduction of Information and Communication Technologies (ICT) in organisations implies an evolution of the decision making processes. This evolution is analysed on a cognitive and organisational point of view. These processes are analysed and described. The necessity to cooperate is then shown and we finally underline the fact that new systems must be designed in order to support the decision making process.

Keywords: Decision Making, Decision Support Systems, Cooperative Decision Support Systems.

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1. Introduction

[1] has shown that the Information and Communication Technologies (ICT) introduction in organisations obligatory leads to a time fragmentation. He also shows that the information overload is both a source and a consequence of this overload.

Nevertheless, with the great development of the ICT, the Decision Support Systems become partially usable: only when the decision makers meet each other. The collaborative work among several actors involved in a decisional process is reinforced. It becomes then essential to model the cooperation for the collaborative work.

Due to the economic evolution, the decisional processes in organisations present a great evolution. The reactivity obligation for companies and the technological evolution face the consequences that the cognitive and organisational decisional processes have been considerably modified.

2. Organisational Decision Making Process

The organisational decisional processes evolve and more actors participate to the decision: the responsibility and the initiative are more distributed.

On the other side, it is more and more necessary to have a report of activities. A great part of the managers' activity aims to imply, motivate a great number of actors concerned by the problem to solve.

Even when the decision is organisationally made by one person, it is rather always prepared by a collaborative work. The cooperative processes increase and contribute more and more to decisions to make. Two fundamental conditions of the cooperation are facilitated by this evolution:

- The interactions are intensified, then the possibilities to establish cooperative behaviours increase and these cooperative behaviours effectively increase (see [2]; [3]).
- This exchange increase leads to better know the other actors' objectives, which also are a preponderant issue to establish a cooperative behaviour (see [4]).

The organisational context is very present for decision making. It is fully part of the individual decisions through the actor involvement but also of the collective decisions. The organisational decisions by definition build up the organisation and at the same time determine its action. In other words, the decision making is often diffuse in the organisational and collaborative activity. The decision is

made step by step, circulating in several circles of exchanges among actors. When a decision is made, by a kind of way, an organisational change of state is operated.

For the collective activity, the way of decision making also is the place of negotiations among involved actors. In this exchange among actors called by [5] problem setting / problem solving, for which the problem is set until its easy solving; there is negotiation and confrontation among actors on the way how to set the problem.

This is indeed a strategic action from all points of view that gives several problem settings, especially the contextual elements having strong relationships with the problem definition and for the consequences of several choices.

All these issues allow us not only to reconsider our model of decision making, but also to design supports in another way underlining three points: information overabundance, innovation and design processes must be reinforced, and finally the choice step of the decision making cognitive process must be made relative to the introduction of negotiation processes or other collective processes.

3. Cognitive Decision Making Process

The actor in the organisation is in front of a new situation characterised by a large access to information even information overabundance; a great participation to several processes, meetings of transversal groups. He then must face the prospect of shortened deadlines of decision making and a set of situations that often conduct to the cognitive overflow syndrome (see [6]).

Among the cognitive processes, that become very important for managing the new situation, we find the efficiency selection and the vigilance that it implies. The need to see the efficiency implies a great involvement of a person in her task but also in the organisation. It is indeed obvious that for an actor, rapidly feeling what is efficient for the organisation, it implies a shrewd and pregnant consciousness of the organisation interests, needs and perspectives. The more pertinent is a fact, the lower the cognitive cost. The vigilance is a willing attitude of the actor that allows him to improve his chances to perceive pertinent elements in their environment.

In order to perceive the information pertinence and to take the opportunities that they could represent for the organisation, the actor must fulfil a vigilance function.

Based on these initial issues, we propose to revisit the decision making cognitive process proposed by Simon, having for hypothesis that the reflexion process of an actor is less than 10^{th} seconds [5]. An abstract of the previous description would be that the environment evolving very rapidly, each actor is led to sharpen its own intelligence and vigilance processes. Among the several steps distinguished by [5] (figure 1), the intelligence step becomes more active and complex, because the environment that must be taken into account in this step is more complex. The way to apprehend the environment also is modified; the actor has a pre-eminent role of efficiency research. Instead of research information, in order to not forget important pieces of information, he must now operate a very rapid outranking in a plethora of information. The design step also becomes more frequent, because each environment apprehension implies to measure the efficiency.

The choice step is fundamentally not modified because there really is not a generation of similar alternatives, a systematic comparison among them and a selection of one of them by rational evaluation process reasoning, in the very rapid outranking process described behind.

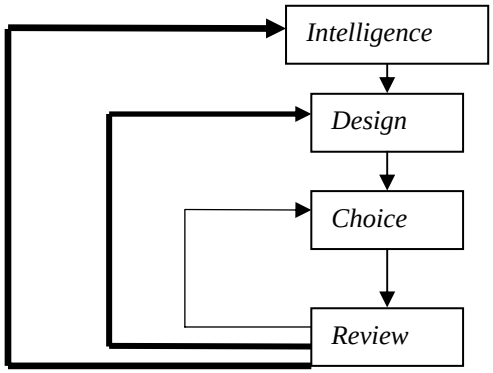

Figure 1. The revisited decision-making process of [5]

The cognitive iterative process of decision making is then modified (figure 1): the two first steps are more often visited that the third one, the return loop from the choice to the intelligence, but also from the design to the intelligence are reinforced. Several iterations are necessary before the choice step (for more details on this process see [7]).

The evolution of the organisational and cognitive processes are strongly connected and operate in a simultaneously, causal and imbricate way.

4. Cooperation Necessity

In organisations, the great majority of decisions are made after an intensive consultation of several actors but not by individual decision makers working in larger organisations (see [8]). [8] have shown that the more complex organisations are, the less decisions are made by individual actors. For [9] the decision making processes in organisations generally imply several actors interacting each others. This interaction implies the information communication and a shared understanding by decision makers involved in these processes. They analyse this interaction along three issues: the used knowledge meaning must be common to every one; an artificial or not agent must have the necessarily authority for regulating the workloads; then the users must have enough confidence in the used technologies, that eventually could be seen through several visualisations of shared knowledge.

The participants to a decision making process must join their efforts in order to have a common goal where they must integrate multiple points of view not necessarily in harmony each others. They must work together not necessarily at the same place and at the same time. They are engaged in a coordination effort in order to solve the problem for which they must divide the decision making in several sub-tasks which will be assigned to individual participants.

5. Groups' Evolution

Several authors analysed the collective decisional process along several issues without really introduce the context notion to take into account in the design of tools able to support the decision makers. We noticed that these analyses are established in several communities and more particularly those of the social psychology. In this last field, [10] has shown that the group behaviour is difficult to establish a generic analyse. The work context also must be taken into account. He also shows that it is necessarily to understand the nature of the task assigned to the group and its characteristics.

[11] analyses the collective decisional process under five dimensions: the group structure, the group roles, the group processes, the group style and the group norms. This analysis is for us interesting because it proposes a definition of the context of the group work.

The group structure is defined by several structures linked to the number of persons and the type of the group: individual, team with a hierarchy notion, and committee with a necessity of consensus among the group members, group less structured.

The group roles are assigned to one or several persons. Each member of the group can play one or several roles, which are easy to implement in a Decision Support Systems (user, analyst…).

The group processes used for the decision making could considerably influence it. If the information or decision making flows circulating are generally well-known, and could be analysed as workflows for example; the way how the process must emerge is generally not explicit et it could influence the decision in one or in another way. Must a consensus be raised? If yes, is there a deadline?

The group style is composed by the decision makers' styles that could influence the process, its behaviour under several conditions and the decision making outputs quality.

The group norms are certainly the most important dimension. The social psychology of the decision making is in that sense very important.

It is necessary to be careful to use a common sense among participants; towards the collective or individual social pressures; towards the gender (balance male, female) and to the prescriptions about the group behaviour, the personal believes, the potential sanctions that constitute the decision making environment.

Following [12] the shared knowledge building among the group members dynamically arises and is strongly connected to a context proceduralisation, which is an activation of a general context part of

the task implemented by interactions among individuals. Otherwise [13] defined a different context granularity from the decision making or task focus. He shows that the decision making context is dynamic and changes in accordance with the point of view adopted for the group observation: the group in itself or several individuals or the project context.

[13] published a case study on the publication of daily and weekly periodicals in Ireland. They have shown that the Information and Communication Technology (ICT) introduction in this enterprise has considerably modified the production process improving the enterprise effectiveness.

We analysed this case study through the five dimensions defined by [11].

The group structure is more diffuse, the group is generally constituted in an ad hoc way without a real formalisation of its structure. The group doesn't know if it is structured as a team, a committee or in a hierarchical way.

The group style includes several styles coming from several groups constituting the decision making group; the group established only for a precise need, the members have not enough time for establishing a new style to the group. The group style is generally built through a long period.

The norms and the processes of the group become from several different groups and are then mixed one to each others.

The group roles include several roles coming from different groups, a group member will then create his own role that could be a mixed of several roles played in the past in other groups.

In other words, we could assume that the context dynamic of decision making influenced by the introduction of ICT is more reactive and volatile. The cognitive load of decision makers is more important because they share more information and they must remember more information (for more details see [14]).

6. New Supports: Cooperative Decision Support Systems

In order to support in a proper way this decisional process, new tools have to be designed. These systems are generally defined by several authors as frameworks integrating several tools. The main point of these frameworks is that the system must be able to support dynamically decision-makers by proposing an "Intelligent" assignment of tasks among the involved actors: decision-makers and software seen as agents.

[15] has shown that Cooperative Decision Support Systems must be developed. She defined these tools as frameworks composed by several tools. Therefore, we propose a Cooperative Decision Support framework. This framework is composed by several packages:

1. an interpersonal communication management system,
2. a task management system,
3. a knowledge management tool,
4. a dynamical man/machine interactions management tool (for more details see [15]).

7. Conclusion

According to [16] electronic communication has some effects on the group behaviour and she concludes by:

- An electronic meeting can be used as an ante-meeting to gather information and solicit opinions before a decision to be made face-to-face;

- Face-to-face decision making probably is the best when a decision requires complex thinking and subtle multiparty negotiations, and when problems are ill-defined (p. 191).

[17] concludes his study by assuming that: the study of the effectiveness of decision making could be studied, in order to highlight that too much technologies could generate negative effects, in particular the decline of consensus and personal participants implication.

All these effects led us to think that a methodology of Collective DSS use has also to be defined. [17] concludes his study by assuming that face to face meeting must be planned during all along the group work, with a sufficient number, by using classical synchronous electronic meeting systems.

We are convinced by the fact that **meeting points** have to be introduced all along the group decision making process. This process has to be managed as a classical project and methodologies coming from project management domain could also be used. The meeting points have the same utility than the milestones in project management and offer the advantages of the face to face situation.

Our perspective of this work is to develop a methodology of Management for Collective Decision Making Processes supported by Cooperative Decision Support Systems.

REFERENCES

1. TETARD, F., **Managers, Fragmentation of Working Time, and Information Systems**, Thèse de doctorat de l'Université Abo Akademi, Turku, Finlande, 2002.

2. AXELROD, R., **Donnant, donnant**, Odile Jacob, Paris, 1992.

3. DELAHAYE, J.P., **L'altruisme récompensé?,** Pour la science, Paris, 1995.

4. ZACHARY, W. W. and ROBERSTON, S. P., **Introduction**, In Zachary W. W., Roberston S. P, Black J. B. **Cognition, Computing and Cooperation**. Ablex Publishing Corporation, Norwood, 1990.

5. SIMON, H., **The New science of management decision,** Prentice hall, Englewood-Cliffs, 1977.

6. TEULIER-BOURGINE, R. and ZARATE, P., : **Vers une problématique de l'aide à la décision utilisant les connaissances**. Actes de la Conférence en Ingénierie des Connaissances IC'01, Grenoble, France, 2001, pp. 147-166.

7. LAHLOU, S., **Les attracteurs cognitifs et le syndrome du débordement**, Intellectica 2000/1 no. 30, 2000, pp. 75-115.

8. GORRY, G. and SCOTT MORTON, M., **A framework for management information systems**, Sloan Management Review, volume 13 number 1, 1971, pp. 50-70.

9. SMOLIAR, S. and SPRAGUE, R., **Communication and Understanding for Decision Support**, Proceedings of the International Conference IFIP TC8/WG8.3, Cork, Ireland, 2002, pp. 107-119.

10. MAC GRATH, J. E., **Groups - Interaction and Performance**, (1st Edition), Prentice-Hall, Englewood Cliffs, N.J, 1984.

11. MARAKAS, G., **Decision Support Systems In the 21st Century**, Second Edition, Prentice Hall, 2003.

12. BREZILLON, P. **Context dynamic and explanation in contextual graphs**, In Blackburn P., Ghidini C., Turner R.M. and Giunchiglia F. (Eds.) Modeling and Using Context (CONTEXT-03), LNAI 2680, Springer Verlag Verlag, 2003, pp. 94-106.

13. BREZILLON, P., ADAM, F. and POMEROL, J.C., **Supporting complex decision making processes in organizations with collaborative applications - A case study**, In Favela J. and Decouchant D. (Eds.) Groupware: Design, Implementation, and Use, LNCS 2806, Springer Verlag, 2003, pp. 261-276.

14. BREZILLON, P. and ZARATE, P. **Group Decision Making: A Context oriented view**, Proceedings of teh International Conference IFIP8/WG8.3, Meredith R., Shanks G., Arnott D., Carlsson S. (Eds), Prato, Italie, ISBN 0 7326 2269, 1-3 Juillet, 2004, pp. 123-133.

15. ZARATE, P., **Cooperative Decision Support Systems**, In Encyclopedia of Decision Making and Decision Support Technologies, Adam F. and Humphreys P. (Eds) IGI Global publication, 2008 (in press).

16. KIESLER, S., **Group Decision Making and Communication Technology**, Organizational Behaviour and Human Decision Processes, 52, 1992, pp. 96-123.

17. FAVIER, M., **Performances des décisions de groupe assistées par un collecticiel : groupes en face à face versus groupes distribués**, Revue Systèmes d'Information et Management, no. 3, 1996, 1996, pp.29-55.