A COLLABORATIVE WEB SYSTEM TO IMPROVE CITIZENS-ADMINISTRATION COMMUNICATION

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Abstract: One of the public administration dreams is to improve the quality of service and the simplification of procedures and tasks. Administrative procedures in town councils, intelligent agents, workflow processes and Web-based computing are some issues which can be mixed to get a user-oriented system able to support feedback between citizens and their Town Council. Notifications by means of e-mails and messages in user's intranet facilitate user-to-civil servant and system-to-user communication and collaboration. In this paper, a Complaints and Suggestions Web-Based Collaborative Procedure (CS-WCP) is presented as an advanced e-administration solution. All the administrative procedure steps are well analyzed by workflow modelling, and then every task is coordinated. Intelligent agents allow performing some tasks, which used to be done in a manual manner, in an automatic way. This system allows people with different cultures, religions, knowledge, nature and necessities to interact with the local administration in an easy and intuitive way.

1 INTRODUCTION

A Town-Council is a sophisticated world of relationships in which citizens, politicians, civil servants and companies coexist all working together supporting the wellness of the community. Nowadays, public administration is necessarily electronic. The term e-administration belongs to the nineties, thanks to the technology age.

Technology was born to help people in their lives. Everywhere, at every place, there are computers which solve problems efficiently, effectively, and quickly in daily work. There are a lot of things that software can do to improve people's work. Two of these things are: (1) on the one hand, people can access software systems from anywhere and anytime through the Internet. And on the other hand, (2) information can be processed in an ordered way.

Nowadays, the most important richness is data. A correct processing of this information, a well structured storage, interrelations between related concepts, etc. are important issues. By means of collaborative web-based systems, information is supported in the best way.

CSCW (Greif, 88)(Grudin, 94) and Groupware (Johnson-Lenz, 81) as the technology supporting CSCW research field arise to solve the necessities of a group of very different people.

In our opinion, town councils are places where this kind of software could help to coordinate civil servants, to facilitate the communication between each other, and also to allow collaboration among them. This is not only good for an internal use, but also for coordinating, communicating, and collaborating with citizens.

Regarding the daily work in a Town Hall, citizens need to express what they think, and town councils need to know what their citizens think in order to improve their services.

Lots of administrative procedures are processed every day in administrative units of the town councils, most of them initiated by citizens. The worst thing is that many administrative procedures are nowadays still being processed in a manual manner. As procedures are initiated using non electronic request forms, information is finally not stored in databases but only on physical archives –a lot of useless papers and other material documents are generated. This way information is untidy and

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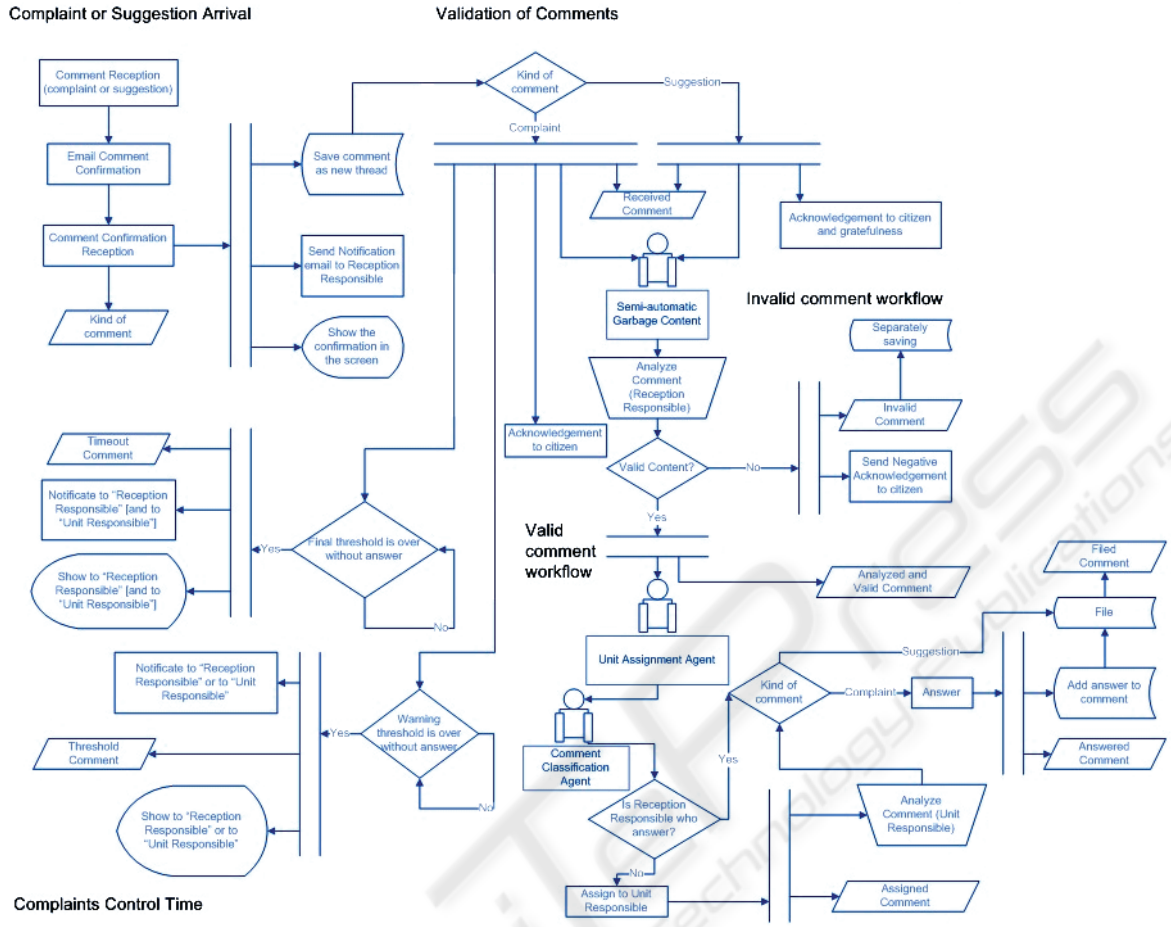

Figure 1: Chart of the main process.

unconnected. These are some problems which arise when data and procedures are not electronically handled.

In this paper we introduce an electronic administrative procedure which takes into account collaboration, communication, as well as worker-to-worker (w2w) and Administration-to-citizen (A2c) coordination. Specifically, our proposal may be called a Complaints and Suggestions Web-Based Collaborative Procedure (CS-WCP). We denominate *comment* to both complaint and suggestion. Some issues like the workflow of the system, notifications from/to different actors of the system, states of the procedure, mail messages, different roles, the validation of comments and procedure times have been specially studied in order to obtain the final collaborative system proposed.

CS-WCP includes three intelligent agents supporting tasks that are processed in a semi-automatic manner. We say semi-automatic because these agents suggest what to do, and they could do it by themselves, but the last decision depends on the final responsible of the system.

A town council is a place where people with different cultures, religions, nature, disposition and necessities arrive to solve their problems. At least in Spain, due to immigration, this is an arising reality of which civil servants are worried about.

An intuitive way to allow people to express themselves provides rich and important information to locally improve a society.

This work also shows a complete description of the workflow system, as well as some empirical results of the CS-WCP application and a report on its evaluation.

The context of the project is described in section 2, and then the main workflow is described in section 3, including a description about necessary roles and comment marks. Automatic matching for classification of comments is explained in section 4. Finally, conclusions and future work are introduced in section 5.

2 MAIN WORKFLOW AND SYSTEM DESCRIPTION

From a simple point of view, the system takes a comment (it may be a complaint or a suggestion) which is sent to the Town Council through the Web. It is processed, some times automatically, some times manually, and then, the comment is taken into account.

Due to this workflow model, the system is completely described in a comprehensible way to all the people involved in the development of the final system: civil servant, analysts and developers. Figure 1 shows the complete chart of the main process in blocks. Obviously, the process is not as simple and it will be described in the following sections, block by block.

In concrete, these blocks are: (1) *complaint or suggestion arrival*, (2) *validation of comments*, (3) *invalid comment workflow*, (4) *valid comment workflow*, and (5) *complaints control time*.

Complaint or suggestion arrival block describes the arrival of a comment to the system, just before starting the real process.

Then a validation process about the content of the comment is necessary to filter only constructive messages. This is the *validation comment* block. An intelligent agent, the *Semi-automatic Garbage Content* agent, classifies comments as valid or invalid; then, a particular user of the system decides what to do with the comments, or they even can be automatically eliminated.

Invalid comment workflow block shows the way in which an invalid comment is eliminated from the system.

Valid comment workflow block shows the logical steps followed for a valid comment. In this block there are two more intelligent agents: the first one – the *Unit Assignment* agent - recommends a re-assignment of a comment to a *Unit Responsible* (zero, one or more units, as described later on), but the main responsible of the system would have the last word; and the second one – the *Comment Classification* agent - classifies comments semantically according to a valid vocabulary for the administrative unit.

The last block, *complaints control time*, describes two threshold times in the system.

The workflow has been modelled by means of basic flow charts using MS Visio and the application is a work in progress which is being developed using PHP technology. This basic flow chart has been extended with a new figure to support intelligent agent modelling.

For a better understanding of the system, we include this subsection to briefly describe both the necessary roles and the comment marks, which will be mentioned later on.

A user in the system accessing to the Web without authentication, that is to say, with the default user, is considered to be a *Citizen*. This is a public role. Neither a user nor a password is required to access the system as a *Citizen*. Complaints and suggestions could be sent through the system, but we have considered that a valid e-mail is essential for providing responses to the citizens. Any user with another role needs to be authenticated in the system.

A *Reception Responsible* user receives all the comments (complaints and suggestions) and he may personally answer to the comments or assign them to *Unit Responsible* users, assisted by the two mentioned intelligent agents, the *Unit Assignment* agent and the *Comment Classification* agent.

The *Unit Responsible* user is usually a civil servant in an administrative unit. Such a user only receives assigned comments from the *Reception Responsible* and he must answer in time.

There is a final role in the system, the *General Administrator*. This user is in charge of creating, modifying and deleting users.

And on the other hand, a series of comment marks have been created so that users and administrators can follow the process of any comment: (1) *Kind*, an initial classification of the comments –might be a complaint or a suggestion; (2) *Received*, the comment has been received and saved in the system and may be processed; (3) *Invalid*, a rude, insulting, offensive or non constructive comment, which will not be accepted in the system; (4) *Analyzed and Valid*, if the content analyzed is accepted; (5) *Threshold*, when a timely warning threshold has been overcome; (6) *Timeout*, when a final time-based threshold has been exceeded; (7) *Assigned*, if the *Reception Responsible* has re-addressed the comment to a *Unit Responsible*; (8) *Answered*, for the case of a complaint that has been answered; and finally, (9) *Filed*, when the process is fully accomplished.

3 COMPLAINT OR SUGGESTION ARRIVAL

Complaint or suggestion arrival comprises the time range from the moment when a user enters a comment in the system up to the logical bifurcation -complaint or suggestion-.

When a citizen wants to file a complaint or a suggestion (a comment, in general) by means of our CS-WCP, he must fill in an electronic form with the following data: (1) an e-mail address where the answers will be sent back, the text of the comment, and the kind of the comment (complaint or suggestion). These are mandatory fields. Some more information is optional (2): name, surname, identity card, address, phone, mobile phone, and the name of the administrative unit involved in the comment. And, some additional information (3) is saved in an automatic manner: arrival date and hour of the incoming comment.

Users of the system are warned about acceptance conditions for theirs comments (rude, insulting, offensive, non constructive comments are not allowed) and they are also informed of the next steps which are going to follow the actual one.

It is important to have a correct e-mail for feed back. This way, citizens receive an e-mail for confirmation purpose, and then, comments must be confirmed by citizens through this e-mail. Only when a confirmation of a comment arrives to the system, the process is actually started.

There are three tasks performed in parallel at this point: (1) a notification is sent to the *Reception Responsible* (see section about roles), (2) a new comment thread is saved, and (3) a gratefulness message including some information about the next steps is shown on the user's screen.

CS-WCP is a server-side program with some Web interface clients. The notification mechanism to alert to *Reception Responsible* (and remainder notifications) is a collaborative system based on e-mail and on the Web. The *Reception Responsible* receives an e-mail with the new comment, but he has the whole information, even the notification in his intranet client too.

Both his intranet and the e-mail contain the identification and the text of the comment, the date/hour of arrival, the final date/hour threshold (there is a legal limit to answer a complaint; this is logically not the case for a suggestion), and how much time is left for administration to answer.

There are also three important links: (1) *Invalid*, to mark a comment as invalid because of its unacceptable content; (2) *Assign*, to send the comment to a *Unit Responsible* (see section about roles); and (3) *Answer*, to initiate the answer about the complaint filed.

Depending on the kind of comment, complaint or suggestion, the workflow will take one different way, deriving to one or another task.

4 VALIDATION OF COMMENTS

Once a comment is saved in the system, a set of tasks is performed depending on the kind of comment. If it is a complaint, a set of tasks will be performed, and a different set will be performed if it is a suggestion.

Anyway, an acknowledgement is always mailed to the user. Acknowledgements include the final date when the response should be answered (only for complaints). Comments in this point will be marked as *Received Comment*.

Afterwards, the *Reception Responsible* will analyze the comment in order to check if the content of the comment is appropriate. Remember that rude, insulting, offensive or non constructive comments are not allowed. But, as told before the Reception Responsible is guided in his decision through the intelligent agent called the *Semi-automatic Garbage Content* agent.

This agent behaves as a filtering agent (Sim, 04) and classifies comments as valid or invalid; then, a particular user of the system decides what to do with the comment, or it even can be automatically eliminated.

For this purpose, the agent is fed by a vocabulary containing a full set of semantic terms related to unsound words. The agent automatically mines the comments to extract the number of words present in the unsound vocabulary database.

The recommendation of the *Semi-automatic Garbage Content* agent is two-fold: valid comment, if the number of unacceptable terms in the comment is reasonably low or invalid comment, when the number of invalid terms overcomes a predefined score.

The agent also offers the number of bad sounding words detected in the comment.

5 INVALID COMMENT WORKFLOW

Notice again that the content of a comment may be non constructive. In other words, someone on the Internet could introduce nonsense in the CS-WCP system, or perhaps some impolite expressions could be added, or something like this. So, comments are analyzed in a semi-automatic way.

Firstly the intelligent agent associated to this task recommends a decision.

Then, if the decision taken by the responsible person is finally that the comment is invalid, two parallel tasks are performed.

The first one is to mark the comment as an invalid comment, and it is separately saved (for future statistic purposes).

Additionally, a negative acknowledgement is sent to the citizen who made this comment to inform him in a cordial manner about the reasons of the rejection.

6 VALID COMMENT WORKFLOW

At the moment when the *Reception Responsible* accepts the comment as a valid comment -after accepting the recommendation of the intelligent agent to mark the comment as valid, or after not accepting the recommendation of the *Semi-automatic Garbage Content* agent to mark the comment as invalid-, it is marked as an *Analyzed and Valid Comment*.

Here a new intelligent agent –a user assistant (Lieberman, 98) and recommender agent (Curran, 04)-, namely the *Unit Assignment* agent assists the *Reception Responsible* in the decision of who is the best-tailored person to handle with the complaint or suggestion. The assistant agent again mines the comment looking for semantic terms related to the administrative units of the council. This agent, as it may be appreciated, performs a semi-automatic ontology-based information extraction. A recommendation algorithm offers as output zero, one or a set of ascending ordered possible unit candidates. A value of zero means that the *Unit Assignment* agent is not able to recommend one concrete administrative unit to be the more confident to the suggestion or complaint. Obviously, in this case, a reasonable action for the *Reception Responsible* is to personally handle the comment. A sorted set of administrative units means that more than one unit may be related to the incoming message. If lastly the *Reception Responsible* decides that one *Unit Responsible* is the person who should answer, he assigns this comment to the *Unit Responsible* from a predefined list. The *Unit Responsible* selected by the *Reception Responsible* may coincide with one unit responsible recommended by the *Unit Assignment* agent. But this is always up to the *Reception Responsible*.

The *Unit Responsible* selected will receive an e-mail notification with the assignment and he is invited to analyze the comment. A third and last intelligent agent helps in classifying the comment that arrives to a unit. The idea behind the use of this *Comment Classification* agent was originally to aid the *Unit Responsible* in keeping track of the great variety of comments through appropriate clustering techniques. This classification is also being used to throw interesting statistics of the contents of the comments that are sent by the citizens. The *Comment Classification* agent is fully inspired in the so called semantic agents (Korhonen, 03), which operate on the semantic web. The semantic web is an extension of the current web in which information is given well-defined meaning. A semantic agent introduces a set of descriptors, including the vocabulary, the semantic interconnections and some simple rules of inference and logic.

Of course, this new event is also displayed in his intranet and the comment is marked as an *Assigned Comment*.

Either the *Reception Responsible* or the *Unit Responsible* has to take into account the comment if it is a suggestion. Then, it will be filed and marked as *Filed Comment*. Now, if the comment is a complaint, it has to be answered in time. The response is added to the comment, and the comment is marked as an *Answered Comment*, so it can be filed. Lastly it is marked as a *Filed Comment*.

7 COMPLAINTS CONTROL TIME

Spanish laws force public administrations to establish a limit time for any administrative procedure. That is, administrative procedures should be completed in a finite time (MAP, 92)(MAP, 00). If a person of the public administration does not answer a question in time, obviously the system can not do much. Nevertheless the system helps the public workers by providing two control times.

A person who has to answer a complaint always can see how much time is left in the intranet of the CS-WCP system. He perfectly knows that the answers must be sent out before the final time. In order to provide an efficient aid, the system incorporates two thresholds: a *warning threshold* and a *final threshold*.

The first one, the *warning threshold*, is always lower than the other one. When the procedure is near to finish without being answered a new e-mail is sent to the person who must answer (*Reception*

Responsible or *Unit Responsible*), alerting about the proximity of the final time.

This complaint comment is stuck out in the main web page of the intranet of the responsible person. This control time is only a warning about the proximity of the final time. As this is only a warning, the responsible can still answer the complaint in time. Obviously, this control tries to avoid the lack of answers because of oblivion or omission.

The e-mail contents are in form of messages. The text and the final time are displayed. Below the text of the complaint, a link called *Answer* permits to answer this complaint.

It was said before that this warning is sent to *Reception Responsible* or to *Unit Responsible*. The reason for this differentiation is the following one: if a comment is marked as an assigned comment, then the complaint should be answered by a *Unit Responsible*, but if it is not marked as an assigned comment, this is due to the fact that the *Reception Responsible* decided to respond by himself. Warnings are only for people who should answer the complaint.

Otherwise, if nobody answers a complaint after the *final threshold*, then this would be the worst situation and three parallel tasks would be performed: (1) to notify this fact to the *Reception Responsible*, (2) to mark the comment as a timeout comment, and (3) to show this information in the intranet of the *Reception Responsible*.

The first and the third tasks are very similar. The only difference is that notifications are made by e-mail. Thus, an e-mail is sent to the *Reception Responsible* as the final responsible of the electronic system to inform him about this situation. Perhaps he was the person who should have responded the complaint, but if the responsible person was a *Unit Responsible*, the *Reception Responsible* should be aware of this situation. A notification is also sent to a *Unit Responsible* if he was the one who should have answered. A notification includes as information the text of the complaint, the final date and hour, and the responsible of its response. This information is shown in the intranet of the responsible person in the same way.

8 SYSTEM EVALUATION AND EMPIRICAL RESULTS

The system has being developed in the context of a Research + Develop project in a real scenario. All the analysis, modelling and developing stages have finished and now we have finished the test process, therefore we also present such results in this work. We have worked together with the local public administration managers to define the system.

Before the CS-WCP system had been deployed, the town-council received two or three suggestions a day and it was not possible to citizens to distinguish between complaints and suggestions. Moreover, the suggestions are not processed with the desired time because there is not a system like CS-WCP running.

Due to this system, complaints and suggestions from citizens are well redistributed. CS-WCP forces the collaboration of different areas inside the town-council in order to build a suitable response to the demanding citizen. Hence, citizens' demands are oriented to people at the town council who are going to answer in the best possible way. It does not matter if citizens are from one culture or another, if they need one thing or another. The comment will arrive to the most suitable worker.

During the time we have analyzed the system, twelve months, it has received 471 suggestions and complaints. With the CS-WCP system, the Albacete Town-Council has improved the citizen participation (Masters, 04). The CS-WCP system is not only a mailbox of suggestions. The Town-Council must provide an administrative response to the citizen who has sent a complaint or a suggestion.

One of the indirect benefits of the system is the inclusion of a simple filter by means of the e-mail validation. This technique has allowed avoiding a high amount of malicious emails sent to the system.
Figure 2 shows two views of the administrative module of the CS-WCP. This module is used by civil-servant to follow the status of each complaint or suggestion. A colour bullet indicates the status: new, pending, transferred, processing, waiting, positive response, negative response, out of date. A responsible of an administrative area can check his own list of complaints and suggestions and he can manage the status of the item.

During this period of 12 months, over 75% of the suggestions and complaints arrived to the system via the Web. The civil-servant uses the CS-WCP in all cases to manage the different complaints and suggestions. The rest over 25% arrived by phone calls or by paper using the Citizen Office. It can be noted how citizens mostly prefer to use the Web to communicate their suggestions or complaints.

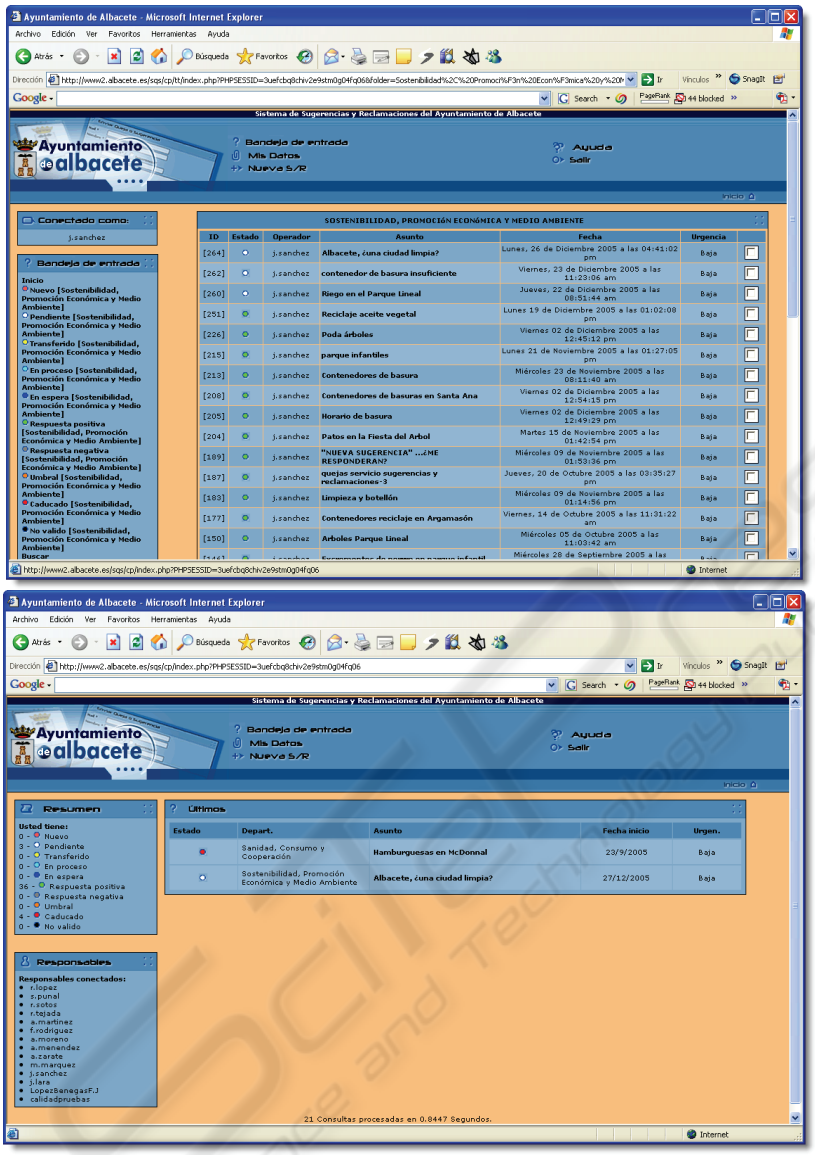

Figure 2: Managing complaints and suggestions.

Another interesting point is the channel selected by citizens to receive the administrative response:

- By letter: 33,3%
- E-mail: 63,91 %
- Fax: 0,21 %
- Phone: 2,55 %

As it can be observed, over 75% of citizens use the Web to put their complaint and suggestion but only over 63,91% of citizens prefers to receive the administrative response via e-mail.

The different complaints and suggestions can be organized in administrative areas depending on the subject. The areas involved in this first year of the system are the next ones:

- Mayor's Office: 13,16%
- Environment: 14,23%
- Quality: 10,83%
- Culture, Sports and Festivities: 12,31%
- Personal, Internal questions, Finances: 5,52%
- Woman, Equality, Participation: 1,91%
- Town Planning: 5,52%

The user satisfaction and the quality of service of the local public administration are increased thanks to the rapid processing of complaints and suggestions. Citizens feel that town-council hears what they have to say.

The system can be tested on *http:// www.albacete.es* and it is available only in Spanish.

9 CONCLUSIONS AND FINAL REMARKS

An intelligent Web-based collaborative system to support the suggestions and complaints administrative procedure called CS-WCP has been presented. The work presented is a mature project currently running in the Town Council of Albacete (Spain). This project consists of a large analysis of the needs of a town council, some models to represent such a reality, an application to solve the situation, and some empirical results after a year of success working.

Complaint is a common activity in modern societies. There is a high degree of demand and people expect that public services increase more and more their quality. A good quantity of suggestions reveals the society degree of maturity. Modern public administration need to hear the opinion of their citizens.

A town-council is a rich scenario for the deployment of CSCW systems because there are several groups and roles of people working together. It is also a special scenario where many different people (culture, religion, nature, disposition and necessities) arrive to look for a solution to their daily and particular problems.

Both complaint and suggestions are managed by different groups inside the town-council in a collaborative way. CSCW system plays an important role to help public administration reach a higher level of quality.

The main collaborative aspects managed in this system are the coordination between different civil servant to attend the complaints or suggestions and the communication between public administration and citizens.

The procedure has been modelled using a workflow system and moved from manual to semiautomatic due to the introduction of intelligent agents.

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REFERENCES

Curran, K., Murphy, C., Annesley S., *Web intelligence in information retrieval*. Information Technology Journal, (volume 3: issue 2), 2004, pp. 196-201.

Greif, I., *Computer-Supported Cooperative Work: A Book of Readings*. Morgan Kaufmann, San Mateo CA, 1988.

Grudin, J., *CSCW: History and Focus*. University of California. IEEE Computer, 27, 5, 1994, pp. 19-26.

Johnson-Lenz, P. and Johnson-Lenz, T., *Consider the Groupware: Design and Group Process Impacts on Communication in the Electronic Medium*. In Hiltz, S. and Kerr, E. (Ed.): Studies of Computer-Mediated Communications Systems: A Synthesis of the Findings, Research Report, Band 16Computerized Conferencing and Communications Center, New Jersey Institute of Technology: Newark, New Jersey, 1981.

Korhonen, J., Pajunen, L., Puustjärvi, J., *Automatic composition of web wervice workflows using a semantic agent.* IEEE/WIC International Conference on Web Intelligence (WI'03), 2003, pp. 566-569.

Lieberman, H., *Integrating user interface agents with conventional applications*. Knowledge-Based Systems (volume 11, sigue 1), 1998, pp. 15-24.

Masters, Z., Macintosh, A. and Smith, E., *Young People and E-Democracy: Creating a Culture of Participation'* Proceedings of Third International Conference in E-Government, EGOV 2004; Zaragoza, Spain; 30th August to 3rd September, 2004.

Ministerio para las Administraciones Públicas, *Ley 30/1992 de Régimen Jurídico de las Administraciones Públicas y del Procedimiento Administrativo Común*, Madrid. Ministerio de Administraciones Públicas, 1992.

Ministerio para las Administraciones Públicas, *Libro Blanco para la Mejora de los Servicios Públicos*, Madrid: MAP, 2000.

Sim, K.M., *Toward an ontology-enhanced information filtering agent*. ACM SIGMOD (Volume 33, Issue 1), March 2004, pp. 95-100.