# How to increase work autonomy in workflow management systems?

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## Abstract

**Purpose** – Current workflow management systems (WfMS's) are often too rigid and lead to "chain production" in the office. The paper proposes a number of "tuning measures" to reconfigure an implemented WfMS in such a way that it is more agreeable to the needs of its users.

**Design/methodology/approach** – The "tuning measures" are generated through a creative process that is founded on two theoretical pillars: the job characteristics model, from the domain of job design theory and work psychology, and the assignment and synchronization policies, from the area of workflow management.

**Findings** – By combining theories from both job design theory and workflow management we have developed a number of measures to "tune" WfMS's in a human oriented way. An expert panel has selected the six most promising of these measures. These six measures have been used in the evaluation of three contemporary WfMS's. From this evaluation we concluded that current workflow technology is only partly able to support our measures.

**Research limitations/implications** – Because of the limited system evaluation, it would be valuable to do a more thorough evaluation of the three systems, have a closer study of the other generated ideas, and to broaden the scope of systems we considered. Additionally, it seems worthwhile to perform an actual validation in practice, i.e. an experiment with real workflow users in a realistic setting.

**Originality/value** – New in this paper is the focus on people working with WfMS's. The paper tries to go beyond the traditional borders of finding a good support for a business process. It highlights the importance of the human factor in the success of the implementation of a workflow system in a company and gives directions for concrete improvement in order to make working with a WfMS more enjoyable to its users. The proposals stated in the paper are of value to workflow designers, managers and workflow researchers.

**Keywords** Work flow, Management techniques, Management systems, Empowerment, Job design
**Paper type** Research paper

## Introduction

Workflow management systems (WfMS's) offer a tremendous potential for organizations. Shorter lead times, fewer mistakes in work handoffs, and a better insight into process execution are some of the most notable advantages experienced in practice. At the same time, the introduction of these systems on the work floor undoubtedly results in great changes in how that business professionals coordinate their work. If a WfMS's work coordination is experienced as too rigid or mechanistic, it may negatively affect employees' motivation, performance, and satisfaction. In this paper, we propose a set of measures to "tune" functioning workflow systems to minimize such effects. The measures we propose do not require undue cost, time, or organizational changes, as they characteristically lie within the configurable options of a WfMS.

A WfMS is a software product that supports the specification, execution, and control of business processes (Ellis and Nutt, 1993; Georgakopoulos *et al.*, 1995; Jablonski and Bussler, 1996). It is a proactive system that manages the flow of work and that defines, creates, and manages the execution of workflows through the use of software that is

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able to interpret the process definition, interact with workflow participants and where required, invoke the use of IT tools and applications (Workflow Management Coalition, 1999). Commercial WfMS's have been around since the early nineties, while their conceptual predecessors can be traced back to the seventies, (see e.g. Ellis, 1979). They have become "one of the most successful genres of systems supporting cooperative working" (Dourish, 2001, p. 52). The worldwide WfMS market, estimated at $213.6 million in 2002, is expected to redouble by 2008 (Wintergreen, 2003).

A WfMS is imbedded in an organization as is illustrated in Figure 1. The workflow process is schematically defined by the workflow definition. This definition represents the steps in the process and their ordering. The process automation layer contains the WfMS (i.e. workflow engine, worklists, and administration and monitoring tools), and possibly some other applications for executing the work. The WfMS is responsible for controlling and managing the work items based on the workflow process definition. Through the work lists these work items are offered to the people performing an adequate role. These people can use other applications to execute their job, or in some cases, the work item might be performed automatically. Finally, people performing the roles have a certain place in the organizational structure. This is represented by different organizational models, such as the hierarchical structure. Based on their position people may have certain rights to execute certain work items.

The implementation of a WfMS usually creates great changes in the organization. The impact of such a system can be observed in several domains of the organization (i.e. productivity, knowledge, collaboration, coordination, and communication), and at different levels of abstraction (the organizational level and the task level) (Sarmento, 2000a; Sarmento, 2000b). For example, Reijers and van der Aalst (2005) have investigated the impact of WfMS's on organizations in terms of productivity (i.e. lead time, service time, and utilization of the process). They conclude that in general WfMS's will positively affect the identified performance indicators.

Despite their success, WfMS's have received their share of criticism as well (see e.g. Dourish, 2001; Ellis and Wainer, 1994). Skeptical arguments are mainly raised by employees (the potential users) and work psychologists, who fear that workflow

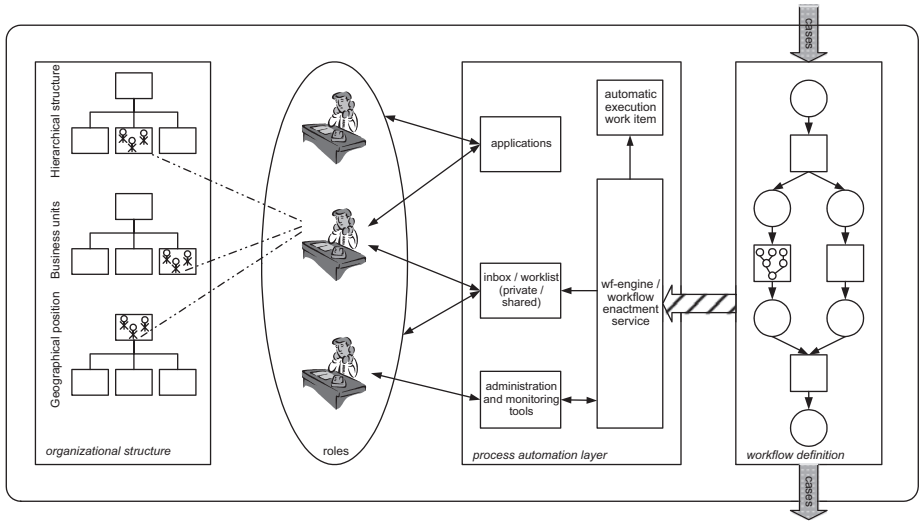



**Figure 1.**
The workflow system

systems can lead to a mechanical approach to office work where man is seen as an exchangeable resource (like a machine) and not as a human being. In a study by Kueng (2000), an interviewee described the effects of a WfMS introduction like this:

> Jobs became more monotonous. The system forces the employees to work strictly according to the process definition. Through the use of the workflow system, we now have some kind of "chain production" in the office. (p. 310)

The image of a WfMS as a rigid system is also described very glaringly in the well-known case study of a WfMS implementation in the UK print industry (Bowers *et al.*, 1995). The system was not accepted by the end users, who invented various ways to work around the intended procedures.

This paper proposes measures that can be taken to reconfigure an implemented WfMS, so that it becomes more agreeable to the performers working with such a system. An important driver in the creation and selection of these proposals was to come up with measures that have a wide applicability and are easy to implement as well. The proposals have emerged from the confrontation of two perspectives. On the one hand, we have considered the general characteristics that positively influence the motivation, performance, and job satisfaction of performers. On the other hand, we looked at the policies that WfMS's generally use for distributing and assigning work to performers. Even though such policies do not affect the work to be executed itself (as specified in an underlying process definition), they have a direct impact on the human/machine interaction.

The paper is organized as follows. In the next section, we will give the theoretical background of the perspectives we mentioned, as used for generating the proposals. Next, we will describe the various proposals, how they have been selected, and how they were validated by an expert panel. Then, we will briefly present the evaluation of three current, commercially available WfMS's to determine to what extent these systems can be reconfigured in accordance with the presented proposals. Finally, the paper ends with our conclusions, a discussion of its limitations and future work.

## Theoretical background

In this section, we will briefly discuss the theoretical background used for the development of the "tuning" measures. The background overview rests on two pillars:

(1) job design theory from the area of psychology;

(2) theory of WfMS's.

From both areas we selected an influential model on which to base our research. The first model describes job characteristics and the second model clarifies the ways in which a WfMS can be tuned. These models will be explained below.

### *Job characteristics model*

We believe that a user-friendly design of the technical system can contribute to the success of information systems, particularly by improving an employee's experience of the work (s)he performs. Therefore, we consider the important dimensions on which a job can be assessed in order to determine the degree to which a job is pleasant to the performer.

Based on the theory of human needs, Hackman and Oldham (1975, 1976) developed the job characteristics model (JCM). Today this model is known as the dominant framework for defining task characteristics and understanding their relationship to employee motivation, performance, and satisfaction. According to this theory, a job can

be characterized in terms of five core job dimensions (Hackman and Suttle, 1977; Hackman and Lee, 1979; Robbins, 2001):

(1) Skill variety – the degree to which the job requires a variety of different activities so the worker can use a number of different skills and talent.

(2) Task identity – the degree to which the job requires completion of a whole and identifiable piece of work.

(3) Task significance – the degree to which the job has a substantial impact on the lives or work of other people.

(4) Autonomy – the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out.

(5) Feedback – the degree to which carrying out the work activities required by the job results in the individual obtaining direct and clear information about the effectiveness of his or her performance.

The higher a job scores on each of these characteristics, the better the job is and the higher the motivation, performance, and satisfaction of the person executing this job will be (Robbins, 2001). Therefore, it makes sense to design and improve working environments considering the impact on these characteristics.

*Assignment and synchronization policies*

The second theory describes the policies that WfMS's generally use for distributing and assigning work to performers. It was published by Muehlen (2004). The publication describes the assignment and synchronization policies in a very detailed way. For the purpose of this paper, an extensive elaboration will not be provided for this model. We will explain some basic parts and refer the reader to the original paper for further information.

Muehlen's model consists of two parts. The first part, assignment policies, covers the distribution of work among qualified employees. The second part, synchronization policies, explains how a work item that is placed on a shared worklist can be accessed by individual workflow participants. In Figures 2 and 3, an overview of the policies is shown.

A policy can be seen as an axis on which a certain variable varies. First, consider the "planning of new work items" policy from Figure 2. This variable can be valued as a net change strategy or a re-planning strategy. In a net change strategy, the workflow system assigns available work items to certain people and places them on their worklists. The work items stay there until they are performed. However, if a re-planning strategy is implemented in the system the work items are assigned to worklists, but when they have not been picked up by the performer they can be recalled. Together with the newly available work items they are then re-distributed among the employees and their worklists. This redistribution may imply that a work item is assigned to another employee.

Another policy is the "queuing of new work items." Here, three different strategies can be chosen. We will only discuss the two most extreme, since the third is a combination of these two. When new work items are offered in a queue, it means that they have to be performed in the order they arrived (i.e. the First-Come-First-Served (FCFS) principle). When a pool strategy is used, the work items do not have to be performed in the order they arrived. Thus, this leaves more freedom in the order of work execution.

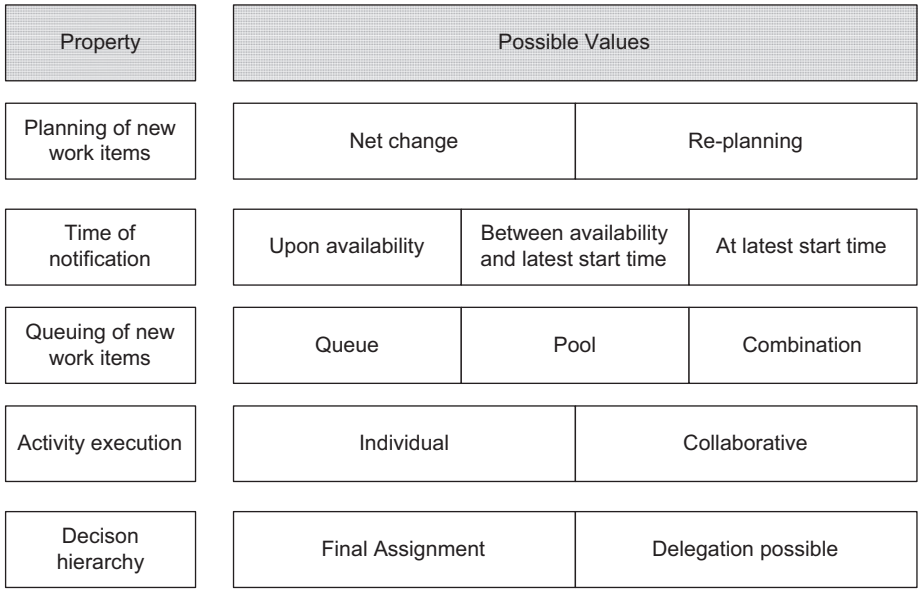



**Figure 2.**
Assignment policies

**Source:** Muehlen (2004)

The "assignment of work items" in Figure 3 is a synchronization policy and describes the way in which work items are offered to an employee. If a push-mechanism is used the system determines who is going to work on what work item at what time. If a pull-manner is used the employees can decide themselves when they are going to work on which work item.

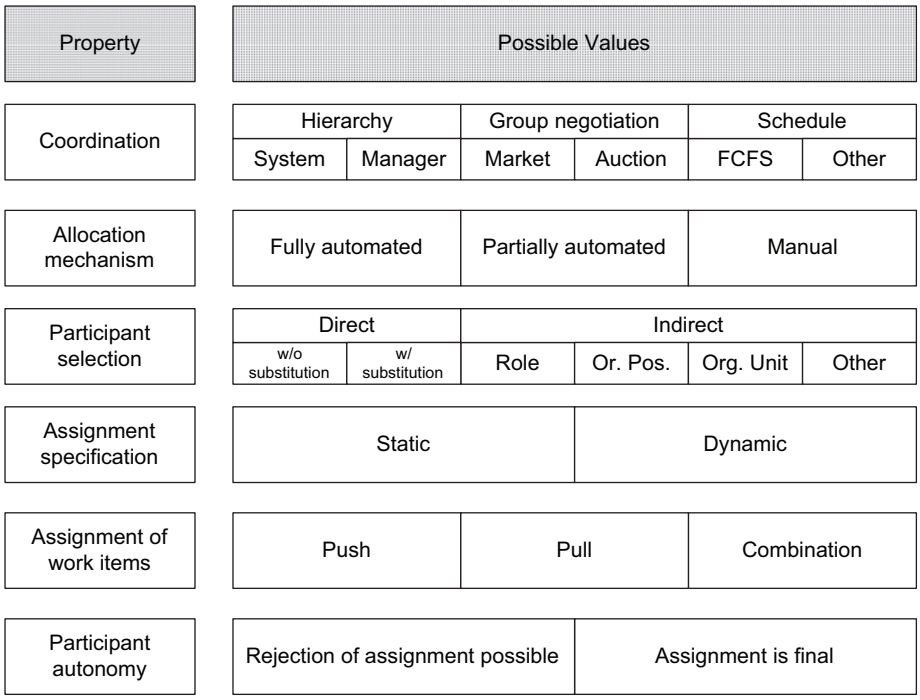
Finally, "participant autonomy" describes to what degree the assignment of a work item is final. If "rejection of assignment" is possible, an employee can reject performing a work item that is assigned to him or her. If the "assignment is final" the employee has no choice and has to execute the work item.

The assignment and synchronization policies usually belong to the configuration options of WfMS's. Therefore, they can be easily implemented and changed. Configuration options can be seen as the "properties" of the WfMS that can be set, or as the small changes that can be made to the system when already running. Thus, the configuration options do not involve the design of the user interface of the system, nor the organizational or workflow process model. Compared to Figure 1 this means that only small changes to parts of the process automation layer are made.

Using the two theories, we have outlined the framework for developing human centric "tuning" measures for WfMS's that are easy to implement. In the next section, the development of these measures is elaborated.

## Tuning measures

Based on the theoretical framework, as described in the previous section, the next logical step is to combine these two models and propose a number of measures to "tune" a workflow system in such a way that working in the system becomes more user-friendly.




**Source:** Muehlen (2004)

**Figure 3.**
Synchronization policies

In this section, the method of developing the measures will be discussed. Next, the most promising measures, according to an expert validation, are presented and the desirable effect of these measures on performers of the work will be clarified.

*Method description: idea generation, selection, and validation*

The generation of ideas to "tune" a workflow system in a user friendly way has been a creative process based on the combination of the two models from the areas of psychology and workflow management. By thinking about the impact a change in one of the policies could have on the job characteristics, the idea was developed to find a way to "tune" a WfMS in a user friendly way. To illustrate this process of generating "tuning" measures, we will give a simple example[1]. In the explanation of the re-planning strategy in planning new work items, Muehlen (2004) states:

> A re-planning strategy would re-allocate all work items that have not yet been started, possibly removing work items from some performer's worklists and placing them on other worklists. (p. 282)

We think an employee will not like the fact that work that is allocated to him/her suddenly is removed or changed, as it affects his/her work autonomy. Therefore, one of the ideas we generated is: "Do not re-plan work items by workflow enactment service."

In a similar way, 32 ideas for tuning measures have been generated. These ideas were spread over all parts of the workflow system (Figure 1). Next, these ideas have been critically assessed on their ease of implementation. We defined "ease of implementation" as an intervention that does not require significant resources (too

much time or money) to be realized. Changing an organizational structure or process model usually is costly in terms of time and money (Hammer and Champy, 1993; Nissen, 1998; Champy and Weger, 2005). Therefore, all the selected measures should lie within the configuration options of the WfMS. The assessment process narrowed down the original listing to 21 ideas, and 11 were eliminated. In particular, the ideas that caused changes in the organizational structure or in the process model of the process were eliminated. For a complete list of ideas we refer to Appendix A.

In the next step, the 21 remaining ideas have been validated by a qualitative expert validation. This validation only served as an explorative study to get a feeling for the measures that are most important. The six workflow experts (with diverse backgrounds, from both psychology and IT, and practice and research) were asked to indicate if they thought the measure would have a positive impact on the employee, if it would be easy to implement, and if they could rank a list of the top five ideas. Based on these expert rankings, we selected the six most promising measures for further research. The outcome of the experts' top five is represented in Table I. The final list of six measures is firstly determined by the total number of asterisks an idea received and secondly by the number of selections.

*Six "tuning" measures and their desirable effect on JCM characteristics*

Below, we describe the most promising measures, selected by the experts, and we will explain their desirable impact on the job characteristics from the JCM-model.

| | R1 | R2 | R3 | R4 | R5 | R6 | Total number of asterisks | Number of selections |
|---|---|---|---|---|---|---|---|---|
| 1 [CASEMAN] | **** | | | *** | | | (7) | 2 |
| 2 [REDIRECT] | | | * | **** | | | (5) | 2 |
| 3 [REJECT] | | * | * | | | | (2) | 2 |
| 4 [RELEASE] | | | | | | | (0) | 0 |
| 5 [REPLAN] | | | **** | | | | (4) | 1 |
| 6 [RESUB] | | ** | ** | | * | *** | (8) | 4 |
| 7 [PRIV PULL] | ** | | | | | | (2) | 1 |
| 8 [SH PULL] | *** | *** | ***** | | | ***** | (16) | 4 |
| 9 [#ITEMS] | | | | | | | (0) | 0 |
| 10 [RANDOM] | | | | | | | (0) | 0 |
| 11 [BATCH] | | | | | | | (0) | 0 |
| 12 [APPEAR] | | | | ***** | | ** | (7) | 2 |
| 13 [TEAM BAT] | | | | ** | **** | * | (7) | 3 |
| 14 [TEAM WI] | ***** | | | * | | | (6) | 2 |
| 15 [PREFS] | | | | | *** | | (3) | 1 |
| 16 [HISTORY] | | | | | *** | | (3) | 1 |
| 17 [STAT MOD] | | **** | | | | | (4) | 2 |
| 18 [ROUTE] | * | | | | ** | | (3) | 2 |
| 19 [RESULT] | | | | | ***** | | (5) | 1 |
| 20 [RANKING] | | | | | | | (0) | 0 |
| 21 [TARGET] | | ***** | *** | | | **** | (12) | 3 |

**Table I.**
Interview results of the top five of best ideas per respondent

**Notes:** The experts are represented by the columns R1 to R6. Every expert has chosen the five best ideas in his/her opinion. The more asterisks an idea has received the higher it was placed in the ranking by the expert

In general, the measures provide the performer of the work with more autonomy, or, in other words with more self-determination, while the WfMS is still controlling the situation.

(1) "Use a shared worklist, from which an employee can choose himself: pull-manner." [SH PULL]
The first measure gives the worker more autonomy. By using a pull mechanism (instead of a push-mechanism) the employee can decide when to start specific work items. The execution of work is not forced by the system, and thus the employee has more freedom. Through this freedom, the worker can also ensure that the work alternates, and thus can improve one's skill variety.

(2) "Show an employee if he or she works hard enough, if he or she is reaching the targets." [TARGET]
This measure improves feedback to employees. In many workflow systems, the performers have to reach targets to the amount of cases they have to process every hour or every day. It is nice for an employee to know if he or she meets the requirements that are asked. This information should, of course, be private.

(3) "When a work item has to be performed again after a (negative result of a) check, return it to the same employee to execute it again." [RESUB]
The aim of this measure is to improve feedback. Often, the execution of important steps in a process is checked by, for instance, a supervisor. In this case, the supervisor determines whether the step has been performed properly. If that is not the case, the step has to be redone. If an employee has made such a mistake or error in executing an activity for a certain case, it can be very valuable to know what went wrong and why it went wrong. Therefore, the case should be sent back to the same employee that made the mistake, so he or she can learn from it.

(4) "Create 'team batches' of work items. A team of employees (having the same competences/roles) can divide the work according to their own preferences. (Here we assume that the allocation mechanism is manual, but not necessarily controlled by a team leader or manager.)" [TEAM BAT]
By creating "team batches", employees will experience more autonomy, skill variety, and task significance. In "team batches", the work that is assigned to the team still has to be divided amongst the members of the team. By negotiating and discussing who should do what, employees can have more influence on the work they are supposed to perform, and they can experience more task significance.

(5) "Give employees the opportunity to adjust the appearance of work items in their worklists to their own preferences: FIFO, earliest due date, random, etc. (Here we assume the assignment of work items is in a pull manner and the worklist is private.)" [APPEAR]
The fifth measure provides an employee with more autonomy. When there is a possibility to adjust the appearance of work items in the worklist the employee can create a better overview of the things he or she has to do according to his or her own preferences. This makes it easier to decide for oneself which work item should be performed next.

(6) "Case management: let an employee work on the same case as much as possible." [CASEMAN]
Finally, case management improves the task identity and task significance for employees. When employees work as much as possible on the same case they

know the ins and outs of the case; they will become more involved with the customer's point of view; and they will feel more useful.

The final step we conducted in this research is an evaluation of the measures by considering current workflow technology. This evaluation is described in the next section.

## Evaluation

To test the theoretical ideas on how to tune a workflow system, we have evaluated the most promising measures, using three commercially available workflow systems, Staffware (Tibco), COSA (Transflow), and FLOWer (Pallas Athena)[2]. Based on documentation about these systems we have identified to what degree the six measures are supported by these systems. Here, we present the results of this evaluation.

### *Outcome evaluation*

Table II shows that not all the ideas can be implemented or supported (yet) by the three contemporary WfMS's we considered. Overall, we can conclude that COSA provides the best support for realizing these ideas. A remarkable result is the difference between the two production workflow systems, COSA and Staffware. Although they are based on the same concept, they do not provide the same support for the measures.

Moreover, FLOWer seems to provide less support. This is due to the different concept it implements. The case handling paradigm, on which FLOWer is based, already provides a lot of flexibility and autonomy to users, but this is done in a way (see Reijers *et al.*, 2003) that makes some of the tuning measures impossible to realize.

Finally, we notice that none of the systems is able to directly support a form of team work.

## Conclusion

Although WfMS's are successfully used in companies, critiques are raised too. Especially when it concerns workers and their experience of the workflow system, the views are not necessarily positive. The schism around WfMS's is accurately captured as follows (Dourish, 2001):

> On the one hand, they are perhaps the most successful form of groupware technology in current use; but on the other, they have been subject to sustained and cogent critiques, particularly from the perspective of the analysis of everyday working activities. (p. 52)

| | Staffware 9.0 | FLOWer 3.0 | COSA 4.2 |
|---|---|---|---|
| [SH PULL] | + | – | + |
| [TARGET] | – | – | +/– |
| [RESUB] | – | + | + |
| [TEAM BAT] | – | – | – |
| [APPEAR] | + | – | + |
| [CASEMAN] | +/– | +/– | +/– |

**Table II.**
Summary of the implementability results of the six best ideas

**Notes:** +, the idea can be directly supported by the WfMS itself; +/–, the idea can be partly supported by the WfMS, some small adaptations to the system have to be made or some add-on's have to be installed; –, the idea cannot be supported by the WfMS, or the underlying concept of the WfMS makes the facilitation of the idea not possible

In this paper, we have looked for practical ways to make these systems more agreeable to those who have to use them in their everyday work. On the basis of various case studies of workflow implementations and an extensive survey among end users, Poelmans (2002) concludes that the provision of flexible features will likely not rule out the necessity of appropriating a WfMS in more thorough ways. A tentative conclusion from his research is that not the selection of the right WfMS, but the way it is configured and implemented is crucial in the success of a workflow implementation:

> The most important factor is giving the end-users sufficient influence, after implementation, to have the system appropriated to their needs. (p. 160)

The measures we have proposed are simple ways to reconfigure existing WfMS implementations to address the needs of end users. All of them are thought to positively affect the factors that make work enjoyable and satisfactory. The measures' validation by experts from both research and practice, IT and psychology, adds credibility to their usefulness and feasibility. Taking a very general model of workflow policies as starting point, a wide applicability of the measures among WfMS's was aimed for. From the limited system evaluation we carried out, we can conclude that the specific brand of WfMS determines how easy it is to implement a measure.

Because the research is an initial starting point to think about and improve the human aspects of WfMS's, the main limitations of this work are (i) the low number of experts involved in the validation, and (ii) the system evaluation based on documentation. Thus, future work would mainly be in these areas. Firstly, more experts should be asked about their opinion to get a statistically correct view on the measures. Secondly, more systems should be included in a more detailed evaluation. The best way to do this is to actually configure these systems in a real life situation according to these measures. Finally, the ideas should be tested in practice. A recommendable design to do this is with an untreated control group with pre-test en post-test (Cook and Campbell, 1979). During pre-test the control group and the test group are measured under the same circumstances. After that, the situation is changed for the test group and during the post-test the control group works in the old unchanged situation, while the test group members do their work in the changed system.

Of course, not all presented measures can be applied at once (some measures exclude each other) and not every situation can be improved by the same measures. Moreover, the choice of the concrete configuration options also depends on the organizational and process context. However, we have achieved our aims with this paper if it manages to inspire researchers and practitioners to look for those simple reconfiguration options that make working with a WfMS more enjoyable. In doing so, the organizational benefits of WfMS's can be exploited to their full potential.

## Notes

1. A more elaborate description of the generation of ideas can be found in Vanderfeesten (2004) and Vanderfeesten and Reijers (2005).
2. An important criterion for selection of the systems has been the popularity of the systems. At the moment, Staffware and COSA both have substantial market shares in Europe. They are good in production workflow (i.e. handling a large number of cases that all have to be processed in a similar way). Furthermore, we felt that FLOWer is an interesting system because it is growing in popularity, and it is based on the case handling paradigm (Reijers *et al.*, 2003), which provides more flexibility in the system.

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## Appendix. List of tuning measures

| | |
|---|---|
| [APPEAR] | Give employees the opportunity to adjust the appearance of work items in their worklists to their own preferences: FCFS, earliest due date, random, etc. (Here we assume the assignment of work items is in a pull manner and the worklist is private). |
| [BATCH] | Offer an employee "batches" of work items. In this way the batch is pushed, but the employee can choose the order of execution of work items within this batch. (Here we assume the worklist is private). |
| [CASEMAN] | Case management: let an employee work on the same case as much as possible. |
| [HISTORY] | Offer a variety in work items to an employee. Remember the kind of work items an employee has executed and decide, based on this history, what kind of new work items will be offered to him or her. |
| [ITEMS] | If possible, show more than one work item on the worklist of an employee, even if a push mechanism is used. |
| [PREFS] | Keep up with the kind of activities an employee likes and make sure he or she will get more of this kind of activities (and less of activities (s)he does not like). |
| [PRIV PULL] | Let an employee choose work items from the private worklist himself/herself: pull-mechanism. |
| [RANDOM] | The queuing of work item sin the worklist should be random. |
| [RANKING] | Make available an employee's place within the ranking of good employees (for instance "hard working", "producing high quality work"). |
| [REDIRECT] | Give employees the possibility to send a work item to another employee, who is better in performing the job, who has more knowledge about the case who is not busy, etc. |
| [REJECT] | Give employees the possibility to reject a work item (with a valid reason) and return it to the workflow enactment service. |
| [RELEASE] | Release a new work item directly. (Time of notification is upon availability). |
| [REPLAN] | Do not "re-plan" work items by workflow enactment service. |
| [RESUBMIT] | When a work item has to be performed again after a (negative result of a) check, return it to the same employee to execute it again. |
| [RESULT] | Give each employee authorization to view the final decision or result of a case in the process. |
| [ROUTE] | Give an employee the possibility to check the progress and route of a case during the process (dynamic aspect). |
| [SH PULL] | Use a shared worklist, from which an employee can choose himself/herself: pull-manner. |
| [STAT MOD] | Design a possibility for the employee to examine the static process model in a comprehensible way (static aspect). |
| [TARGET] | Show an employee if he or she works hard enough, if he or she is satisfying the targets. |
| [TEAM BAT] | Create "team batches" of work items. A team of employees (having the same competences/role) can divide the work according to their own preferences. (Here we assume the allocation mechanism is manual, but is not necessarily controlled by a team leader or manager). This idea is quite similar to the concept of a self-managing team, which is one of the hot items in organizational psychology. |
| [TEAM WI] | Create "team work items". Employees (with different competences) have to cooperate to execute an activity. |

**Table AI.**
Proposed measures

*Eliminated measures*

- Versatile employees: one employee can operate in different roles. (Control of role distribution is at manager or system.) This idea is similar to the concept of job rotation.
- Versatile employees can choose the role they want to execute themselves.
- Automate boring tasks, do not automate challenging tasks.
- Do not "over-specify" the content of an activity. When it is possible to have an amount of freedom in executing the activity, this freedom should be used. For example: when there are several ways to produce the output of an activity, let the employee choose in which way he wants to perform the activity.
- Do not specify in what order parallel activities should be executed.
- If possible, do not specify in what order the operations of an activity (the parts of the execution of the activity) should be executed.
- Use coupling/cohesion ratio to design activities in the workflow process model.
- Make a uniform interface concerning other applications or systems that have to be used in executing an activity.
- Return feedback of a customer to the organization as detailed as possible and as far as possible to the workers on the shop floor.
- Do not only show the parts of information to be completed during the execution of an activity, but also show the information that is already filled in and the information to be filled in after the activity.
- Decisions in a process should be executed by an employee, and should not be automated.

**About the authors**

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