Paper-Based Support for Computer-Mediated Activity: a Cognitive Task Analysis

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Abstract

The incomplete or erroneous use of software can have serious economic consequences. Having learned the basics of a particular software package, users do not automatically, through practice, progress to a level of expertise where they can gainfully incorporate their use of the software into strategies for solving problems and answering questions in real life. Under-use, ineffective use and inefficient use of software commonly occur.

Insights into the mechanisms underlying suboptimal performance, and pointers to possible remedies to the situation, can be gained from a wide range of theoretical and practical frameworks from different disciplines.

Various approaches have been put forward to provide support, paper-based or otherwise, to people who use software as a tool to carry out externally-imposed tasks. This paper presents the results of a cognitive task analysis aiming to identify patterns in the use of a particular piece of software by five office workers in the course of their day-to-day work. Such patterns would provide a starting point for the design and development of support materials. Although capturing real-life performance in an analyzable manner proved difficult, under-use, ineffective use and inefficient use of the software were all observed and knowledge of different types was seen to be required for successful performance.

This thesis would not have been possible without Account Software Consultancy B.V. in Veenendaal, the Netherlands. Makers of the software package that was used in Part 2, their effort in introducing me to my respondents went far beyond the business relationship that exists between us. I am also grateful to my respondents themselves. Karlijn, Christy, Christa, Clara, and Rob; and also Gert-Jan, whose data I decided not to include: Thank you! Not only did you allow me to interfere with your work, you also made me feel welcome as I did so. I really enjoyed the experience. Last but not least, I wish to express my gratitude to Michaël Steehouder and Hans van der Meij. Both contributed considerably to the good bits that I hope the reader will find in this work; its weaknesses, however, are all mine.

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Introduction

People experience considerable difficulties when working with computers. Very little human activity in the industrialized world is not nowadays in one way or the other shaped by the use of computers. Computer software offers a powerful environment for performing routine tasks and knowledge work alike. All this software must be interacted with, by people who frequently depend on little more than written materials to support them. A whole new generation of documentation designers has emerged to produce those.

Documentation design is a multi-disciplinary activity. A software manual is a form of non-fictional, instructional writing: therefore the field of communication science is heavily involved, as are those of instructional design and cognitive psychology. Finally, the writing of software manuals requires technical and business knowledge of computer use and information processing. With so many godfathers, one might expect the profession to be able to draw on a wealth of research studies and theory providing guidelines for carrying out the task. The reality is different. Manuals for writing software manuals abound, but on closer inspection the vast majority of guidelines provided is based on heuristics and "best practices". Research studies underpinning those heuristics are few and far between. The one area in which practical advice is backed up with theory and experimental research is that of writing procedures—usually aimed at novice users (see, for example, Duggan & Payne, 2001; Farkas, 1999; Karreman & Steehouder, 2004; van der Meij, Blijleven, & Jansen, 2003; van der Meij & Gellevij, 2004). This is perhaps not by coincidence: written procedures are, after all, not something that other design disciplines are overly interested in. Documentation design is not the only design activity aiming to support software users, and it is by no means the one with the most standing. Other, more high-profile, design disciplines demand a slice of the cake. In this manner, for example, theory and experimental scientific results from cognitive science have been appropriated by the applied field of interaction design, while theories of learning are generally seen as finding their most obvious application as a starting point for instructional design. Once assigned to a particular area of practical interest, it is difficult for findings from scientific endeavour to subsequently cross the boundaries between the various disciplines.

Such parochialism may, in the end, cost us dear. Erroneous, inefficient or incomplete use of software systems in organizations is the norm rather than the exception and has serious economic consequences: in terms of man-hours wasted, of incorrect or invalid results which may have serious repercussions, of reduced acceptance of the system after implementation, and of the simple fact that what has been paid for is only partially utilized[1]. It does not take much imagination to work out the return-on-investment that would result from pooling all the available knowledge when dealing with this situation. Theoretical and experimental science has much to offer all practitioners whose ultimate goal is to help people use computers more efficiently and more pleasurably; regardless of the job titles printed on their business cards.

This paper presents research that draws on established theory, and borrows from proven principles, originating outside the traditional field of software documentation; with the eventual aim of designing software documentation that works, built on sound theoretical and research-

[1] Hard proof of this claim is difficult to find. The following quotation (Strassman, 1990, p. 314) is no more than anecdotal evidence: "I once commissioned a study tracing all efforts to correct a faulty invoice sent to the customer. The cost of correcting a mailed invoice was 20 to 30 times the cost of an error-free invoice. We could not find any computer errors … All errors were human errors, which in each instance originated from inadequate training or poor management practices." More anecdotal evidence is provided in the trade press (e.g. Gartenberg, 2005).

based principles. It presents the results of a cognitive task analysis aiming to identify patterns in the use of a particular piece of software by five office workers in the course of their day-to-day work. Such patterns would provide a starting point for the design and development of support materials. Although capturing real-life performance in an analyzable manner proved difficult, under-use, ineffective use and inefficient use of the software were all observed and knowledge of different types was seen to be required for successful performance. In particular, the results suggested that conceptual knowledge underlies almost all successful performance; and that the lack thereof often leads to serious difficulties that become evident only much later.

Part 1:
Theoretical Framework

1. Exploring the Problem Space

Over and over again in the course of my career as a developer of software documentation, I have observed that most of the time software is used only partially, inefficiently, or ineffectively. I find it useful to think of an "intention horizon" which encompasses exactly that which the user is trying to achieve and beyond which he or she does not perceive any information or situation as relevant to the work at hand. Frequently the intention horizon is seen to lie well within the total functionality of the software.

People start out with the intention to get something done. They turn to a piece of software to help them achieve their objective; but if this tool does not immediately seem to meet requirements, then rather than find out how to apply it to the problem at hand, they lower their aims to match what they think the software can do. Sometimes the bar is lowered considerably, to such a degree even that I have seen quite a few instances of expensive software not being used at all. Staying within their comfort zone, people thus experience a narrowing rather than a widening of their intention horizon. The answer that is given when people are asked why they are satisfied with unsatisfactory results of their often considerable efforts, seems to be a variation on either of two themes: "I have a job to do now, but one day I will find the time to look into this" is one; and "I don't need all those advanced features, I only use the software to do simple things" is the other. To me, this has always sounded like the new car owner who does not know about the concept of gears and regards anything higher than first gear as an advanced feature that it is not necessary to explore, because the car is used only for simple tasks such as doing the weekly shopping. Personally, I have never met anyone who told me, *First gear gets me there, doesn't it? When I have to travel out of town I take the train, so I've no problem with driving along at ten miles per hour. All those old biddies behind me can honk their horns as much as they want! And when I get to the parking space, I just drive around the block if I have to, so why should I take the trouble to learn about difficult things such as reverse gear?* Yet I must have met literally hundreds of people who told me something along the lines of, *I'm sure that styles and templates are very useful if you do clever things with a word processor; but I don't need them for my three-page articles. It's good fun playing with all those fonts on my computer, and if my table of contents comes out funny then so be it — I'm an author, not a computer scientist! Sure, my editor grumbles about the files I deliver; and re-using bits of an article I wrote last year in something I'm writing today is a real pain. But that's life, isn't it?*

One of the respondents in the research described in this paper estimated that carrying out a particular task using a particular piece of software took her on average 12 hours, that is one-and-a-half working days, spread out over one working week. Using the software as it was intended to be used, the same task would have taken her between ten and twenty minutes. In order to achieve such a dramatic reduction of time spent on an unpleasant job, she would have had to set up the system exactly once. (I did this for her: it took me about half an hour.) The task was one that she carries out five times per year. Yet it had never even occurred to her to sit down and look beyond her current intention horizon, to see if any "advanced features" might be available that would help her do what she was trying to do.

The results of numerous studies have suggested that neither good design of the software nor experience of its users can ensure its efficient usage (see Bhavnani & John, 1997). Even the most experienced users of the best possible designs make incomplete or inefficient use of software. That leaves third-party intervention in the form of training or documentation. If documentation design wishes to take up the challenge of slaying the dragon, then the first step should be to form a clear image of the nature of the beast. Below, I will first explore practical and theoretical insights, and applied research as described in the literature. Next, a descriptive research study is described in which observation and analysis are used to identify patterns in the cognitive

processes that take place when a person attempts to make use of a software tool in order to solve a real-life problem.

The Paradox of the Active User

Ben-Ari and Yeshno (accepted for publication) make the following comment about a group of science teachers who use a particular word processor extensively in the course of their everyday work:

> … almost all of them claimed that they were not fit subjects for the experiment because they were not expert users … Considering the high levels of education and experience of the subjects, the most surprising result was the simplistic level of their interaction with this sophisticated but very familiar software tool … (Ben-Ari & Yeshno, accepted for publication, p. 3)

and Fu and Gray note, in more formal terms but no less bemused:

> From our analyses, people chose to use suboptimal procedures even when they apparently had knowledge of the optimal procedures, and thus have violated the normative principle of rationality. (Fu & Gray, 2004, p. 928)

It seems that the users who prompted these researchers to make their unambiguous remarks were not making the best possible use of the undoubtedly sophisticated and powerful tools at their disposal. The phenomenon that people have considerable trouble learning to use software, and that their skills tend to converge at relative mediocrity even after extensive practice, is so widespread that a phrase has been coined for it, "the paradox of the active user" (Carroll & Rosson, 1987). Originally referring to the paradoxical situation that although software users are primarily interested in getting things done, all their practice fails to make perfect, the phrase has stuck. Giving a slight twist to it, its meaning has since been neatly summarized as "the persistent use of inefficient procedures by experienced or even expert users when demonstrably more efficient procedures exist" (Fu & Gray, 2004).

the production bias

Whether such persistent use of suboptimal procedures is indeed a paradox as defined by the dictionary or not, it is certainly a highly undesirable state of affairs. The dragon seems to be two-headed: Carroll and Rosson (1987) distinguish two "biases" leading to the situation in which people's skills in using computers tend to converge to relative mediocrity. The first is motivational, and this head of the dragon is labelled the "production bias". People generally do not use computers just for fun. They have an ulterior motive, in that there is something that they want done. Their paramount goal is throughput and they have no patience with instruction for instruction's sake, nor with exercises that, once carried out, do not bring the desired goal noticeably closer. Faced with an instruction manual, very few software users would read, mark, learn, and inwardly digest the text in its entirety and fewer still would patiently work through any exercises provided. From where these users stand they have better things to do. They may well leave the instructions for what they are; causing documentation developers all over the world to complain that "they simply won't read" and to secretly hope for permission from management to have printed on every first page the catch-phrase, "Read The F… Manual!" or RTFM for short. Whilst there is nothing wrong with wanting to get things done—indeed, without such a wish there would be no motivation to attempt to use any software tool in the first place—many uses of software call for a learning phase during which no productivity takes place and

which cannot be skipped. Driven by the wish to get things done, people apply any knowledge they have acquired (through the manual or otherwise) as immediately as possible, whether it is appropriate to the current situation or not. They cling to actions that worked before in situations that seem similar to the current one and disregard dissimilarities or even plain undesired results.

the assimilation bias

This is the point at which the second bias kicks in and this second head of the dragon, the "assimilation bias", is of a more cognitive nature. In learning, people assimilate new knowledge into existing structures which have proven to be quite persistent: they have been acquired at a sometimes considerable cost and are not easily replaced. People will go to great lengths to not give up on something that they think they know. Seen in this light this second aspect of the paradox of the active user is no different from the situation in which students of science, or indeed practicing natural scientists, are reluctant to change the theories by which they explain the natural world. Indeed, so closely related are the two situations that well-respected studies have been carried out aiming to develop a model of the scientific reasoning process, in which the behaviour was studied of subjects trying to figure out the workings of a programmable device (Klahr & Dunbar, 1988). These researchers mention what they refer to as "a pervasive confirmation bias" (p. 3): when evaluating hypotheses (of how a system works), subjects focus on attempts at confirmation and over and over again fail to test potentially disconfirming instances. Neither do they change their hypothesis in the face of disconfirming outcomes (p. 41). Similarly, Chinn and Brewer (1993) distinguish seven different ways of dealing with data that is incompatible with the established conceptions that constitute a currently held view. Only one of those is that of actually changing the incorrect theory of how the world works and this strategy seems to be not at all popular. The literatures (of history of science, education, and psychology) studied by Chinn and Brewer present a rather discouraging multitude of students and learners on the one hand and practicing scientists on the other, opting time and again for one of the other six ways of coming to terms with what is perceived as anomalous data: ignoring it, rejecting it, excluding it, holding it in abeyance, reinterpreting it or, if there is really no other way out, yielding to it marginally by making only peripheral changes to non-core aspects of the current theory. These findings, and many others, from the study of scientific reasoning and discovery show up in computerised homes and workplaces as the assimilation bias.

the expertise reversal effect

To sum up the paradox of the active user: the production bias and the assimilation bias together result in a situation where software users cannot be persuaded to accept instruction beyond that which is perceived as required. The situation is aggravated by what is known as the expertise reversal effect, which is the phenomenon of instructional formats that are effective with novice learners losing their effectiveness, and even hindering further learning, in more experienced learners (Kalyuga, Ayres, Chandler, & Sweller, 2003; van Gog, Ericsson, Rikers, & Paas, 2005). In very plain English this means that even when non-novices are willing to set out the sprat of time and effort invested in learning, in order to catch the mackerel of expert skill acquisition, the standard instructional materials that are designed for novice learners may well be unhelpful at best and harmful at worst.

Paper-Based Support: User Manuals

Let us now turn to the materials that software makers provide to support those who use their software. These come in many different shapes and forms; yet the bulk of them are instantly recognizable as belonging to the same genre: that of the *user manual*[1].

the traditional user manual

A typical user manual is hierarchically structured with the chapter as its main unit. Sometimes the chapters are grouped into sections, or groups of chapters are split off into separate booklets. In this manner, the "installation manual" and the "advanced user's guide" may come about (where the word "advanced" refers to the nature of the program concepts, rather than the program's context of use). Each chapter contains an operational description of and (usually stepwise) instructions for working with a particular program concept or program task. Conceptual descriptions are added, usually at the beginning of the chapter, to place that which follows in context; in addition, a number of introductory chapters or appendixes provide program-wide meta-information, listing hardware requirements, providing installation and troubleshooting instructions, and informing the reader of terminology used in the manual. Usually, the aim is to be complete: a chapter titled "Working with Widgets" will attempt to explain everything that can possibly be done with the program concept labelled (by its designers) "widget".

As an example, Appendix I reproduces the table of contents of the user manual that comes with version 9 of the EndNote program (from now on: *ENUM9*), a piece of PC-based software that is used for maintaining bibliographical databases and inserting formatted citations and references from those databases into academic manuscripts[2]. Program concepts to which chapters are devoted include *libraries* (chapter 4), *references* (chapter 8) and *term lists* (chapter 9). Program tasks that are described include importing references from external databases (chapter 6) and using the EndNote program in conjunction with the user's word processor of choice (chapter 10). These operational chapters constitute the bulk of a typical user manual (in *ENUM9* they account for 434 pages out of 582, liberally illuminated with screen captures). They contain no more conceptual description than is required to place the operations in context. For example, chapter 9 of *ENUM9* defines "term lists" by stating that these are "used to store terms" and then moves on, in the same paragraph, to listing the actions that a user can perform on a term list.

In addition to the separate chapters covering the program's operations, a user manual almost always contains instructions for installation, backup and troubleshooting; either within the one manual, or as a separate installation manual. In *ENUM9* this type of "technical" information takes up 60 pages. The introduction is often used for meta-information on hardware requirements, references to other products, contact details, typographical conventions and a glossary of program-related terminology, whereas appendixes tend to be used for reference information such as lists of functions, keystrokes, or field values. This meta-information takes 32 pages in *ENUM9*. Finally, a "guided tour" in chapter 3 takes the reader through the main program concepts and program tasks. This chapter is written around a sample file provided with the installation and takes 56 pages of, again, procedural instructions padded out with description insofar as required.

It is the detail required to ensure completeness that makes many user manuals so voluminous. *ENUM9* consists of 582 pages of body matter, with an additional 14 pages for the table of contents and another 23 for the index, even though this particular program supports only a small part of the user's main task which is producing scientific papers to a professional standard.

a typology of knowledge

In order to discuss knowledge and information, we need a vocabulary. Many classification schemes with their associated terminology have been proposed (see Alexander, Schallert, & Hare, 1991). In discussions about and research into technical documentation, the notion of procedural ("knowing how") versus declarative ("knowing that") knowledge plays an important role[3]. One problem with this simple distinction is its lack of specificity. Both terms cover a multitude of sins. In fact, they are collective terms for a number of subtypes of information and knowledge (Ummelen, 1994). Various authors have attempted to establish more fine-grained classification

schemes. One such specific instrument, developed explicitly for classifying knowledge, is proposed by Ton de Jong and Monica Ferguson-Hessler. These authors identify a matrix in which four types of knowledge are set off against a number of qualities. Whereas the qualities (deep versus surface; structure; automated versus nonautomatic; modality; general versus domain-specific) only take a value for knowledge-in-use, the knowledge types are a straightforward classification that can equally well be applied to information. These are as follows (de Jong & Ferguson-Hessler, 1996, pp. 106-107):

- *Situational knowledge* is knowledge about situations as they typically appear in a particular domain. An example of situational information in the context of *ENUM9* would be the inclusion of different sets of requirements posed by editors of academic journals and other publications.
- *Conceptual knowledge* is static knowledge about facts, concepts, and principles that apply within a particular domain. If *ENUM9* would contain an explanation of its underlying model, in which libraries, references and term lists are interrelated, then this would be a prime example of conceptual information.
- *Procedural knowledge* contains actions or manipulations that are valid within a particular domain. Stepwise instructions are the best-known example of procedural information.
- *Strategic knowledge* helps organise the problem-solving process by directing which stages should be gone through to reach a solution. In the context of *ENUM9*, strategic information could be a decision chart showing what to do when and under which conditions to achieve certain objectives.

Applying this classification to the information that a typical user manual presents to its readers, it becomes clear that the genre is decidedly biased towards one or two types. The table below roughly expresses the four types as a percentage of the total number of pages in the body matter of *ENUM9* (that is, excluding table of contents and index). Although chapters are classified as a whole, the resulting figures can still be expected to show a trend, which is all that the table purports to do.

	chapter(s)	# of pages	% of body matter (total: 582 pages)	knowledge type
operational information	Ch. 4-19	434	74.6	procedural
technical information	Ch. 2; Ch. 19-20; App. A-B	60	10.3	procedural
meta-information	Ch. 1; App. C; glossary	32	5.5	conceptual
guided tour	Ch. 3	56	9.6	all

Procedural information accounts for some 85% of the total number of pages, which seems a rather high percentage. Not all software manuals score this high on "procedural". Many provide more reference information, upping the percentage of conceptual information at the expense of procedural information. This said, *ENUM9* is by no means atypical. Indeed, it is very much like that which the author of this paper, a professional technical writer, is regularly asked to write. Nor is it a piece of work that any technical writer would be ashamed to claim as his or her own. *ENUM9* is well written, in plain English, and it covers all of the software's functionality. In

addition it is not unattractively laid out, contains many screen captures, and comes with a comprehensive table of contents as well as an index. In short, there is nothing wrong with it. The relative absence of conceptual, situational and strategic information is not a characteristic of this particular example: it is a very common feature.

2. Elements of a Solution Space

"Kunnen zonder kennen kan niet" says Tamara van Gog (van Gog, 2006), a highly alliterative Dutch phrase which my best attempt at a translation, "Doing without knowing cannot be done", does not do justice. And she is absolutely right. Take, for example, the setting up that many programs require in order to function well: the template building and the definition of styles in a word processing environment, the painstaking entering of object properties in a database-based system. These activities do not map directly onto a pre-existing user goal, and no instruction on how to perform them will be sought. Still, one way or the other they must be learned, as without them all subsequent use of the software will be suboptimal. At the same time the paradox of the active user is a fact of life. Most users are not prepared to learn how their software tool works before applying it to real-world tasks; not in the same way that they learn to drive a car before using it to do the weekly shopping. The net result is that whatever the software tool under consideration, real expertise is extremely few and far between. Driving instruction is in most countries enforced by law; but very few companies send their staff on training courses before planting a powerful computer on every desktop. We cannot force-feed instruction to computer users; can we perhaps drip-feed them, by scaffolding the actual performance that they will undertake anyhow, whether they are ready to do so or not?

Learning can take place through not only explicit but also implicit instruction. For the purpose of this discussion, I will call instruction *explicit* when a learner's learning is the stated objective of the activity in which he or she is engaged; whereas instruction is *implicit* when a learner's learning is a side-effect of achieving a different stated objective. In this manner, a worked example for learners to study is an explicit instructional format, as the only reason why anyone would engage in studying the worked example, is in order to learn. On the other hand, a "cook book[4]" case study for programmers to copy code from and paste it into their own projects embodies implicit learning. In order to embed somebody else's code into one's own project, some modifications will be required; and through making modifications to code, no matter how trivial, underlying patterns and constructs are inevitably learned. Learning through explicit instruction comes *before* performance, which is the application of knowledge to a particular situation with the intention to change that situation. Implicit instruction however can be delivered *during* performance.

It is known that the acquisition of expertise requires many hours of deliberate practice (Charness, Tuffiash, Krampe, Reingold, & Vasyukova, 2005; Ericsson, 2005). Practice makes perfect; yet it is that which we practise that we become perfect at. The more we use inappropriate strategies during performance of a task, the more — as long as at least *some* short-term result is achieved - our intention horizon narrows. Conversely, the more we use appropriate strategies, utilizing a full range of functionality, the more our intention horizon opens up. Designing software documentation that does not explicitly instruct but rather scaffolds performance[5] could thus indeed enhance not only current but also future performance — in effect, drip-feeding instruction. Nothing succeeds like success, as the saying goes; although the positive impact of self-efficacy on the effectiveness of ongoing computer use may be mediated by a number of factors (Deng, Doll, & Truong, 2004). Still, it is worth trying to enhance motivation and the suspense of disbelief as to the necessity of learning. It is a great boost to confidence and self-efficacy to find that some software feature that does not map one-on-one onto a user goal is not necessarily an "advanced" feature to be applied under arcane conditions, but that it is really a time and effort-saving device which can be used over and over again. The ultimate goal of software documentation therefore should not be to overtly instruct prior to performance, but to scaffold during performance; eventually leading to true expertise in users for whom the documentation is no longer required.

New Approaches to Documentation

Over the years many enhancements to the traditional user manual—not without reason, it seems, frequently referred to as an "instruction manual"—have been proposed and implemented; triggered by theoretical and applied research as well as by shop-floor dissatisfaction with the current state-of-the-art.

minimal manuals

A relatively well-known innovation is the minimal manual (Carroll, 1990). The main minimalist design principles for computer documentation are as follows (van der Meij, 2003; van der Meij & Carroll, 1998):

- Choose an action-oriented approach.
- Anchor the tool in the task domain.
- Support error recognition and recovery.
- Support reading to do, study and locate.

Implemented judiciously, these design principles have been reported to lead to more efficient and effective computer manuals (van der Meij & Carroll, 1998, p. 19). They also lead to an unsatisfactory ratio between number of pages and depth of coverage. The examples presented in the literature (see van der Meij, 2003, pp. 218, 220) show how much space is needed to explain "how to type something" in a text editor. Closer inspection reveals that it is the principle of action-orientation that is largely responsible for this effect: in a minimal manual the reasons "why" and "when", as well as error recovery instructions, will have to be included time and again in every single task description whenever they apply. A more fundamental problem with the minimal manual is that, despite academic assertions that the approach is of value when supporting novices and experienced users alike (Carroll & van der Meij, 1998; Hackos, 1998; Mirel, 1998b), it has not been made clear how a minimal manual for intermediate or advanced use of software could be designed or how it could work in practice.

cognitive enhancements to the traditional user manual

The above-mentioned minimalist design principles focus first and foremost on chopping off the dragon's first head, the production bias. Another such strategy focuses on the deliberate insertion of motivational elements into the manual (Loorbach, 2006; Steehouder, 1997). Insights from cognitive science have led to attempts to disarm the assimilation bias, by improving the effectiveness and efficiency of the information that is presented. For example, the inclusion of extensive case work (Mirel, 1998a; Renkl, 2002) has been put forward as a way of involving readers. Further examples include techniques to promote frequent switching between text and working environment (Duggan & Payne, 2001); studies into the optimum use of screen captures (Gellevij & van der Meij, 2004; Gellevij, van der Meij, de Jong, & Pieters, 1999); and the application of dual coding theory to allow for more information to enter working memory at any given time (Ganier, 2000; Mayer, 1999; Mayer & Anderson, 1991).

Cognitive Load Theory

Cognitive Load Theory (CLT) is a theory of cognition, applied to explicit instruction. CLT argues that in order to be the most effective, instruction must take into account the limitations of working memory. According to CLT, human cognitive architecture consists of an extremely limited working memory that can hold no more than a handful of disparate chunks of information, and a virtually unlimited long-term memory that holds information stored in schemas. Interactions between working memory and long-term memory help or hinder learning. Schemas are loaded from long-term memory into working memory when required, with each

schema being handled as a single chunk. Learning takes place through processing in working memory. As this has a very limited capacity, cognitive memory load quickly becomes a problem. With a view to managing working memory load in order to facilitate the changes in long-term memory associated with schema construction and automation, CLT-based instruction is designed so as to minimize extraneous cognitive load and increase effective ("germane") cognitive load (van Gog, 2006). A number of "effects" have been identified which must be taken into account when designing such instruction. For example, the imagination effect describes the phenomenon of learners who are asked to imagine a procedure or concept outperforming those who are asked to study the same procedure or concept (Leahy & Sweller, 2005). Other effects are, in addition to the expertise reversal effect mentioned earlier, the "goal-free effect", the "worked example effect", the "split-attention effect", the "redundancy effect", the "modality effect", the "completion effect" and the "variability effect" (van Gog, Ericsson, Rikers, & Paas, 2005, p. 74). CLT-based instruction takes all these effects into account to arrive at design guidelines and explicit instructional formats (Clarke, Ayres, & Sweller, 2005; van Gog, Paas, & van Merriënboer, 2004; van Merriënboer, Kester, & Paas, 2006).

mental models theory

What the above-mentioned proposed enhancements to the traditional user manual have in common is their practical orientation. They concentrate on improving learning through improved (explicit) instruction. There exists, however, a family of theoretical descriptions of knowledge construction and acquisition that has led to a completely different angle of attack insofar as the paradox of the active user is concerned: that of mental models.

There is little consensus on what the term "mental models" means exactly (see also O'Malley & Draper, 1992, p.73; and Payne, 1992, p.109-111). We can, however, distil a common narrative. According to theory[6] a *mental model* is continuously being constructed in the mind during interaction with a complex system, during all stages of learning from the very beginning all the way to the highest proficiency. Just like any model, it is a simplified abstraction that is used to predict behaviours of the referent (the *target system*). In order to predict what the target system will do under certain conditions, the learner will mentally apply those conditions to the model, "run" it, and (still mentally) observe the outcome. The model is seen as "viable" if running it results in reliable predictions about the behaviour of the target system. This is distinguished from a *conceptual model*, which is any model that is explicitly worked out by an *instructor* to stimulate meaningful learning in those being instructed. In situations where the target system is man-made (as is the case when the target system is a software system) we can finally identify the *internal model*, which is the design created by the system's maker.

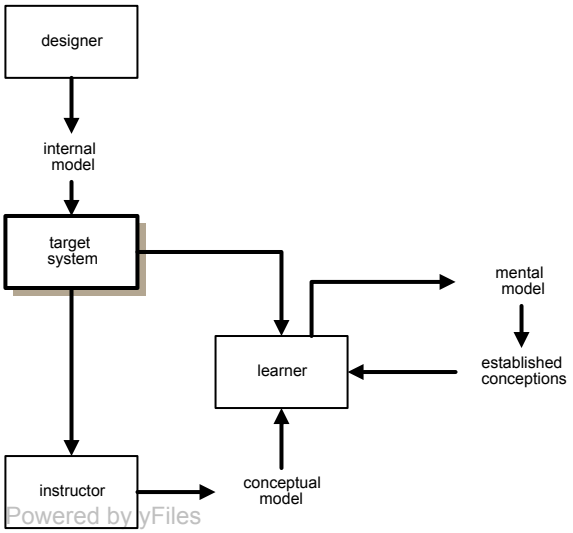

Figure 1: Overview of the relationships between the three roles (designer, instructor and learner) involved in the deployment of a complex artefact, and the models that are created by them.

Established conceptions originate from sources as diverse as past experience, external information sources, interaction with the target system, the current state of the mental model, and original thinking. They strongly influence the continuous development of the mental model. In the absence of instruction, the complete mental model will even be founded on them (Payne, 1991). Established conceptions can thus make or break the successful construction of a mental model that is workable and viable, in that it can be "run" to infer valid conclusions from it.

As we have seen, the assimilation bias is by no means exclusive to people learning how to use computers. On the contrary, it relates to a very human tendency of sticking with that which we know. Some mental models research focuses on making explicit and subsequently eradicating established *mis*conceptions (Uzuntiryaki & Geban, 2005), whereas other researchers have studied the effect of presenting an explicit conceptual model on effectiveness and efficiency of instruction (Allbritton, McKoon, & Gerrig, 1995; Mayer & Gallini, 1990). Both strategies can be seen as tackling the paradox of the active user mainly by eradicating or bypassing the assimilation bias rather than the production bias[7]. This is done through providing, or enabling the acquisition of, correct conceptual information.

Computer-Mediated Activity: User Motives and Goals

To complete this exploration of the problem space, it is now time to investigate what exactly it is that we are hoping to provide support for. A manual is a document with a job. Its job is to provide the knowledge that is required to make use of a particular system—in the case of a software manual, this is a software package—to perform a particular task. So, the knowledge that a software manual must provide to do its job well is tightly related to the activity that the software helps carry out.

man-machine systems

Readers of software manuals may be addressed in their role of operator or that of user (Steehouder, 1997). An *operator* simply operates the controls of a device and is by doing so done with his task, while for a *user* operating the controls is no more than a means to an end. This is a useful distinction, which looks at the man-machine system as a unit and determines the relative roles of the two partners, the human and the machine, within the system (Mirel, 1998a).

Some software is designed to carry out one particular task in the external world. In such a situation all that the user has to do is press the right buttons at the right time, as defined by the designers of the system. The software is leading, while the human is purely its operator. All that is required to carry out the work is procedural knowledge. Software of this "one-trick-pony" type is often encountered in direct control situations, for example where calibration of a laser beam is software-driven or where a domestic telephone exchange is programmed from a PC. Ticket-vending machines and ATMs also fall in this category. Much software, however, is more flexible, in that it is not limited to one particular task: once started, it needs a human to define the task to be carried out. The system may prescribe which keys to press and what menu options to select in order to carry out a particular action but it does not prescribe any particular sequence to the separate actions. The human no longer functions as a rather subordinate component in the system but becomes its true user; selecting exactly that functionality that is required, very much in the same manner that diners in a restaurant select the dishes that they wish to eat from a pre-defined offering. People working with such systems need sufficient information for making informed decisions as to not just how to interact with the software, but first of all which bits of the software to interact with. In order to make an informed choice, the user needs more than procedural knowledge: there is an additional requirement for other types of knowledge and the manual has to cover program functionality as well as straightforward operation. Possibly the bulk of current-day software falls within this category. Commercial institutions such as banks run front-office as well as back-office applications; retail chains have implemented company-wide stock control systems; and the typographer operating his Linotype was replaced almost overnight by a computerized publishing system. The advent of the personal computer has brought to the general public spreadsheet programs for manipulating calculations, word processors for producing text of any length and databases for keeping track of collections of data.

The shift from "operator" to "user" does not stop here. Some software supports human activities that its designers cannot possibly predict or pre-define. The current generation of word processors allows for laying out a complete publication, be it a shopping list or an academic journal, incorporating data from other software sources external to the word processing application. The current generation of accountancy software goes way beyond simple book-keeping and will let a person do a plethora of things, ranging from forecasting next year's profits and this year's budget overruns to determining which of the customers to send a mail shot to and when. Whereas previously people used computers mostly for reproducing their work, for automating tasks that they could at least theoretically have done without a computer, nowadays more and more software is used to enhance people's work, enabling them to do non-routine things that were unthinkable before (Mirel, 1998a). What we see here is a continuum of usage context: from a situation in which the human is subordinate to the computer system, through one in which both "parties" are more or less equal, to one in which the computer is no more than a tool, and ideally transparent to the user. People are beginning to use software to an end that lies outside the program's horizon, in the real world. The user is no longer interacting with the system but looking further ahead, "through the interface" (Bødker, 1991), with his or her attention on the ultimate purpose of the work. The word "task", as in "user task", with all its connotations of obligation may be no longer appropriate. What we see is a gradual shift from externally-imposed tasks to internally-generated aims and intentions. The documentation that comes with such software, however, has not moved on with this shift in focus. People using a

computer system to carry out their self-defined intentions no longer have a need for support materials that teach: they have a tool and they know how to use it. The need now is for support materials that scaffold the use of that tool in real-life situations. As we have seen, such situational and strategic information is usually not offered.

software artefacts

A software package is an artefact, a man-made tool. In order to apply any tool to a task, we need to know how to operate its controls: in other words, we need procedural knowledge. However, where other tools such as a hammer or a washing machine operate directly on the material world, software tools do not. Operating a hammer causes (hopefully) a nail to be driven into a piece of wood just like operating a washing machine causes water, detergent and linen to be pushed around. This differs fundamentally from a computer program, where user actions have a result only within the software environment itself. In other words: a piece of software is a self-contained universe, alien and not necessarily interesting *per se* to the user. To achieve a meaningful purpose and perform real-life work, program-defined actions must be selected and combined and their combined results must then be given meaning in the outside world. Only users who can do so are capable of performing the activities that provided the motivation for using the software in the first place (Mirel, 1998a). In order to bridge the gap between the software world and the real world, the user will be continually trying to reconcile program-defined tasks with his or her own objectives, re-defining the former in terms of the latter and vice versa. Payne (Payne, 1992; Payne, Squibb, & Howes, 1990) refers in this context to a "yoked state space" and sees the user as "yoking" (that is, reconciling and mapping) the device space (the software world) and the problem space (the real-life situation).

activity theory and the action identification model

A coherent framework for studying the interaction with tools in the context of real-life human endeavour is found in the relatively recent dusting-off of activity theory, first developed in the Soviet Union in the early decades of the previous century but now sparking widespread interest in the field of human-computer interaction (see Bødker, 1991; Nardi, 1996). Human activity in this framework is regarded as a form of doing that is directed towards a material or immaterial object satisfying a need. The object provides the motive and is what distinguishes one activity from another. Activities are carried out through chains or networks of actions which find their minimal meaningful context in the activity and which each have an objective result. Before they are actually carried out, actions are consciously planned and thus have a well-defined goal. Actions in their turn are realised through a sequence of operations, which are habitual routines used as responses to conditions faced during the unfolding of the action. It is in this manner that actions are mediated by the tools that are used. When a "breakdown" occurs an operation that is no longer habitual, by that token becomes an action and likewise, an action that is practised many times is likely to become an operation. Similarly, an activity that loses its motive can become an action and the goal of an action can be raised to a higher level so that the action becomes an activity.

What constitutes an action is highly dependent on the particular situation. In order to discuss "actions", we need to identify them at a particular level of abstraction. When asked "what they are doing", people may respond on different levels. A particular action may be identified as "seeing if someone is at home", or as "pushing a doorbell", or as "moving a finger". There is a hierarchical structure here, expressed in everyday language by the fact that people will think of "seeing if someone is at home" *by* "pushing a doorbell" which is done *by* "moving a finger". The action identification model (Vallacher & Wegner, 1987) aims to integrate on the one hand the representations that people develop after the fact and on the other the planning and direction of their actions in accord with their cognitive representations. The model states that the relationship between the two is cyclical. The three principles on which it rests are:

1. action is maintained with respect to its prepotent identity, i.e. the identification level that is uttermost in a person's mind;
2. there is a tendency for the higher level identity to become prepotent, until
3. a reality check is provided by the fact that the action cannot be maintained in terms of its prepotent identity, when there is a tendency for a lower level identity to become prepotent.

The three principles work together so that over time and repeated action, a person converges on an identity at a particular level; mediated by the context, the difficulty, and the familiarity of the action.

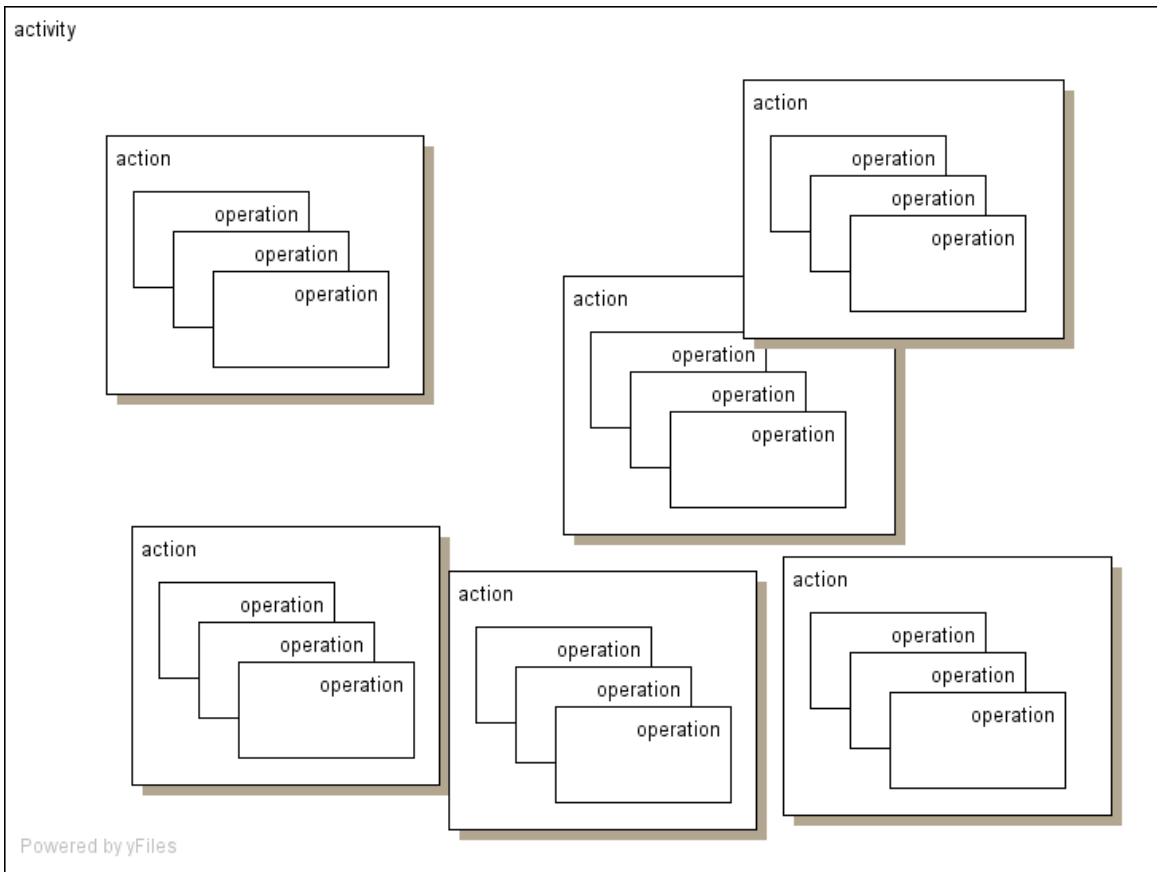

Figure 2: The hierarchical relationships between an activity, its constituent actions and their constituent operations

3. *Mapping the Lie of the Land*

Before we can ever hope to defeat the paradox of the active user, we should first take a step back and analyze the activities and actions that take place when a person applies knowledge in making the best possible use of a software tool—or attempts to do so. On what level are actions identified? What triggers them and how does one action lead to the next? What types of information are accessed and how is the information applied? Where does lack of information lead to confusion, error, impasse or even a simple dead end and what sorts of information lead to success? These are the kinds of question that need to be answered before we can, at a later stage, start thinking about designing materials to scaffold performance. The aim of the present research therefore was to study people during the performance of an activity that is part of their day-to-day work, using a complex software tool that is part of their day-to-day toolbox.

Although audience analysis and task analysis are mentioned in almost every textbook on "how to write computer manuals", in practice they are seldom carried out beyond a quick scan of computer literacy, age, level of education, affinity with modern technology, and familiarity with the task domain of the intended audience. User tasks are seen as program concepts, rather than things that a user wants to achieve. Such an audience and task analysis fails to yield information that can be used to design an effective document; not because the answers derived from the analyses are incorrect, but because the wrong things were analyzed (Albers, 1996). To design documentation that supports user activity, we must look at what that activity is from the user's—not the programmer's—point of view. Returning to our earlier example, according to its own manual EndNote is "an online search tool … a reference and image database… [and] … a bibliography and manuscript maker" (p. 6). Yet it is unlikely that the program's users think of it in those or even similar terms. They are more likely to describe it as a tool for keeping track of bibliographic references, which allows for appropriately formatted citations and bibliographies to be inserted into a document that is written using a word processor. These are the activities and actions that its documentation should support and it is on this level that audience and task analysis should be performed.

In order to carry out any such analysis, what is needed is a method that does not interfere with spontaneous behaviour yet allows for a certain degree of structuring and thus between-subject comparison. The aim must be to observe people using software to carry out activities that stem from existing requirements, rather than requirements imposed by a third party (i.e., the researcher). Also, during the observation any interference from the researcher must be kept to a minimum. It is clear that any design built on these starting points is bound to yield disparate and unstructured data. For a sound analysis, the required structure will have to be imposed afterwards. Ways of looking at humans doing things are found not only in the literature of the social sciences, but also in pragmatic disciplines such as interface and interaction design, management consultancy, and project planning. None of the existing approaches I found could completely meet all requirements.

cognitive task analysis (CTA)

The study described in this paper is in many respects a cognitive task analysis; which can be defined (Chipman, Schraagen, & Shalin, 2000, p. 3) as

> "the extension of traditional task analysis techniques to yield information about the knowledge, thought processes, and goal structures that underlie observable task performance."

"Cognitive task analysis" is not really a method but rather a declaration of intent. Once it has been decided to carry out a cognitive task analysis, the question still remains how to go about it. It has been shown that techniques relying on introspection in order to unearth motivation for actual behaviour are doomed to failure, as respondents simply have no access to knowledge about their own cognitive processes (Nisbett & Wilson, 1977). Fortunately, people *do* have access to knowledge about the *content* of such processes. Their focus of attention at any given point in time, their current sensations, and up to a point also their emotions, evaluations and plans are known to them and can be reported upon (p. 255). These are exactly the aspects of interest in the framework of a cognitive task analysis studying design activities, decision-making or problem-solving through the use of a computer program. We cannot observe them directly but perhaps we can infer them, indirectly, from observable behaviour; and we can certainly listen to respondents telling us about them as they are taking place.

contextual inquiry

The technique known as *contextual inquiry* was developed by Karen Holtzblatt in 1986 for use during requirements analysis in an early stage of user interface design. In her own words (Holtzblatt, 2005, p. 229), it looks like this:

> "Go to the customer's workplace or living situation, observe them doing the activity to be supported, and discuss what they are doing while they do it."

Contextual inquiry offers a good starting point for analyzing user activity; but it is aimed at analyzing one particular case in order to design one particular solution and does not allow for generalization.

verbal analysis

Contextual inquiry yields data that is unstructured and at times unclear. Michelene Chi developed a technique for quantifying qualitative analyses of verbal data, which she refers to as *verbal analysis* (Chi, 1997). The method is intended to

> "collect and analyze "messy" data. Messy data refers to such things as verbal explanations, observations, and videotapings, as well as gestures."

Chi then goes on to say:

> "One reason for the need to collect this kind of data is the trend toward studying complex activities in practice or in the context in which they occur. […] The goal of this article is to attempt to provide guidance for how one can approach an analysis of verbal data more generally, involving a method that integrates elements of qualitative and quantitative analyses so that the interpretation of the results is less subjective." (Chi, 1997, p. 272)

Verbal analysis offers guidance on *how* to code messy data; it does not offer guidance on *what* to code. Thus, a handle is still needed on what to look for in the raw data that is collected.

PARI method

The PARI method is a cognitive task analysis method developed to identify training needs in the US Air Force (Hall, Gott, & Pokorny, 1995). The method is characterized by one expert working through a task set up by another expert. As the activity unfolds, for every *action* its *precursor* is identified as well as its *results* and the *interpretation* given to them. Putting the elements of every step or node in chronological order, we get: **P**recursor—**A**ction—**R**esults—**I**nterpretation; hence PARI.

critical path method

Opinions as to the origin of the Critical Path Method (CPM) for project management differ. It was certainly used as early as 1957 by the chemical giant DuPont, to manage time-dependencies in the extremely complex process of shutting down plants for maintenance and restarting them, and it is often thought that the method indeed originated with DuPont. Certain, however, is that CPM was developed in an industrial, not an academic environment. Thus not documented at the time of its inception, it has become a standard project management tool and descriptions abound, although not in scientific literature.

CPM starts by mapping out the complete project to be managed in the form of a Gantt chart or a network diagram. A network diagram contains the various sub-processes in separate nodes, with the actions to be carried out either written next to the connecting lines (Activity-On-Line or AOL) or in the nodes themselves (Activity-On-Node or AON). Lines connecting the nodes indicate dependency: if X must be completed before Y can be started, a line or arrow will point from X to Y. Next, duration is added to each of the actions so that the minimal throughput time of the project as a whole can be calculated.

critical incidents techniques

Over half a century ago, John Flanagan pointed out that much can be learned about real-life situations by focusing predominantly on *critical incidents*: actions of situations that have special significance, in that they are either particularly helpful or particularly unhelpful in the context of a particular setting (Flanagan, 1954). This article, itself an overview of earlier work, has inspired many techniques for the analysis of critical incidents which are still widely applied in fields as diverse as education, traffic control, computer programming, disaster containment and medical practice (see Angelides, 2001; Klein, Calderwood, & MacGregor, 1989).

4. Notes

[1] Other forms of software documentation, such as tutorials and reference manuals, are sometimes supplied. They are however always supplemental to the user manual, and few suppliers set aside a budget for producing them.

[2] The EndNote User Manual was selected not as a *sample* of one but rather as an *example*, an illustration of the type of manual that frequently comes with a software package.

[3] A fundamentally different view from attempts to classify knowledge by contents is found in the paradigm of *distributed cognition* which looks at where knowledge resides. Knowledge that is applied during performance can be in the head but it can also reside in the world, for example laid down in checklists or instruction guides or embodied in the spatial arrangement of objects, dials or gauges. Finally, there is knowledge emerging during interaction either with others or with a (software) tool: in other words, from the reactions to our actions (Bibby, 1992; Greenberg & Dickelman, 2000; Hollan, Hutchins, & Kirsh, 2000; Hutchins, 1995).

[4] A cook book is a collection of worked examples, designed so that they can be copied and pasted into the reader's own working environment. This format is frequently used for documentation where the primary audience consists of programmers, or end-users attempting to modify the workings of their chosen software tool.

[5] *Scaffolding* is a concept borrowed from the constructivist take on learning. Constructivism holds that knowledge cannot be transmitted and that instruction should consist of experiences that facilitate knowledge construction. Such experiences can be provided deliberately through "constructivist learning environments" or CLEs. A CLE has a problem, question or project as the focus of the environment. The goal of the learner is to interpret and solve the problem or complete the project. The project is surrounded with various interpretative and intellectual support systems, in the shape of *modelling* (showing how the task could or should be performed), *coaching* (helping the learner to perform the task) or *scaffolding* (providing just-in-time materials that are helpful in performing the task) (Jonassen, 1999). The scaffolding will become redundant, so that it can be *faded* out of existence, as the learner's expertise progresses over time.

[6] For a wide-ranging and multi-disciplinary overview of mental model theories and their various applications, see (Rogers, Rutherford, & Bibby, 1992). An older seminal work is (Gentner & Stevens, 1983). Finally, (Schwamb, 1990), although unpublished, provides a thorough overview of mental models theories.

[7] Mental models theory has a tremendous intuitive appeal. It "sounds right". Yet the proof of this particular pudding remains in the eating. Are mental models really "runnable" or does the intuitive correctness refer to a more holistic idea of "some sort of internal representation of an external system"? Fundamental as this question is, from a pragmatic point of view it does not really matter whether the mental model that takes shape in the learner's mind is runnable or no more than representational. In both cases, if the learner ends up with as appropriate a mental model of the system as possible, then the assimilation bias will have been cut to size.

Part 2:
Research Study

5. Research Questions

The research described in this paper was originally inspired by my desire to understand the mechanisms involved in the under-use, inefficient use and ineffective use of complex software in real-life settings; with an ultimate view—itself beyond the scope of the research—to understanding how to design documentation that addresses these issues.

Under-use is when only part of the software's functionality is applied to the task at hand, and this is not the result of a conscious decision. If my word processor is capable of automatically laying out a complete publication and I decide not to use that functionality because I don't like the layouts that are provided, that is not under-use. Yet if I enter my text without any formatting, save the result as plain text, and send it off to a print shop who I then pay to set the text in Times New Roman with all the headings in bold, that is indeed under-use of my word processor. The intention horizon in this situation lies well within the total of the software's functionality.

It seems that the intention horizon is at least partially determined by the degree to which users are able to not just utilize but in the first place *consider* the full functionality that is available. So, when conceptual knowledge combined with strategic knowledge triggers an upgrade of the action level, this could be an indication that the intention horizon has widened. Conversely, the intention horizon can be expected to narrow when these same knowledge types trigger a downgrade of the action level. My first research question focuses on upgrades and downgrades of the action level:

RQ1: What types of knowledge precurse a shift in action identification level?

To understand ineffective or inefficient use, some sort of base line is needed to measure actual performance against. Drawing on the perspectives provided by activity theory, the action identification model and the typology of knowledge, the optimum performance of an activity in terms of both effectiveness and efficiency can be hypothesised to consist of the shortest possible sequence of actions for which the goal is expressed in terms of system concepts, capabilities and functionality. This is what I will refer to as the *minimal path*: the ultimate expert's approach, minimal as to duration and effort. There can always be only one minimal path.

I would expect strategic knowledge to be used to determine the minimal path, combined with conceptual knowledge to predict the outcome of the planned actions. During the performance, situational knowledge is used to monitor progress based on the actual outcome of actions. In this manner, the device space and the problem space are continually yoked. Knowledge resulting from results and interpretations may provide the precursor for actions that were not previously planned and that are inserted in the path, thereby lengthening it. When the goal of an action is expressed in terms of program controls, this marks a breakdown where what should be an operation is upgraded to an action. Procedural knowledge is then accessed to get back on track. My next research question thus looks at what keeps users on the straight and narrow:

RQ2: What types of knowledge precurse actions that are in the minimal path?

Inefficient use is when the end result is what was wanted and needed, but it took longer than necessary; without this being the result of fulfilling a particular desire. When I try all the fonts on my system on a particular section of a text I am producing in my word processor to see which one I like best, that is not inefficient use. However, when I do so because I don't know how to get out of the dialog box presenting font formatting options so keep clicking around, it is. My use of

the software is also inefficient when I painstakingly define professional-looking layout templates for my document, which in the end I do not use.

Inefficient use becomes visible when actions are present in the actual performance that are not part of the minimal path. The additional actions could be instances of operations being upgraded to the level of an action (as in the example of not knowing how to leave a dialog box), or of redundant actions on the same level of action identification (as in the example of building templates that are not subsequently used). Additional actions also occur during problem recovery, to get back on track. A fourth condition under which additional actions are carried out is when a wrong turn was taken unknowingly, resulting in a complete branch being added to the minimal path sequence.

This brings me to a further research question, focusing on inefficient use and the addition of actions as compared to the minimal path:

RQ3: What types of knowledge precurse actions that are not in the minimal path?

Ineffective use, finally, is when the end result is unsatisfactory while the software is perfectly capable of delivering perfection. When I attempt to lay out a table inserting spaces between text elements and I just cannot get my columns to line up, that is ineffective use of my word processor—unless the program simply cannot handle tabular text. Ineffective use becomes visible when actions that are part of the minimal path are absent from the actual performance. My fourth research question focuses on ineffective use and the absence of actions as compared to the minimal path. Actions that are not there, cannot have a precursor. The research question must be formulated a little differently from the others:

RQ4: What causes users not to carry out actions that are in the minimal path?

To round off and to make the best possible use of the data, I am looking to see to what degree people are capable of self-monitoring their choice of actions when working with software:

RQ5: Do users interpret system feedback as information, on which to base decisions affecting the further sequence of actions?

6. Research Design

This chapter describes in separate paragraphs the various aspects of the way in which the study was set up.

Method

The method of cognitive task analysis applied in this study consists of an amalgam of approaches found in the literature.

1. *Contextual inquiry* was carried out to obtain the raw data.
2. From the *PARI method*, the idea was taken of decomposing an activity into a sequence of PARI nodes, each of which contains the PARI elements *Precursor*, *Action*, *Results* and *Interpretation*. The PARI method was adapted to the current research objective in a number of ways:
   - The PARI method is based on dyads of experts, one setting up a trouble-shooting problem for the other to solve. As trouble-shooting problems can be set up in the real system only at great cost or not at all, system responses are simulated by the expert who devises the problem. In the current research, interaction with the real system was studied as in contextual inquiry.
   - In the PARI method, the problem-setting expert has full control over the flow of events. Therefore there is no need for the facilitator, who provides probing, to have complete understanding of the nature of the expertise being displayed by the problem-solving expert. In the current research, the roles of problem-setting expert and facilitator were carried out by the same person, whose expertise is in using the software tool rather than in applying it to real-world situations.
   - The PARI method aims to uncover specific training needs for specific tasks whereas the current research is descriptive. In the current research it is not so much the specific content, in a specific context, of precursors, actions, results and interpretations that are the focus of interest, but rather their classification. Precursors were traced back to information of a certain type; actions were ranked by their identification level.
   - Finally, many stages in the PARI method are carried out in order to determine exactly which activities need to be trained and thus warrant study. Again due to the different objective of the current research study, such stages were skipped.
3. The raw, "messy" data was segmented and coded in accordance with the ideas formalized in the *verbal analysis* method.
4. *Critical path analysis* suggested a way of formalizing the minimal path against which actual performance as formalized in the coded PARI sequences could be measured. The idealized unfolding of the activity was schematically drawn as an Activity-On-Node (AON) network diagram, with arrows indicating dependency as in CPM.
5. *Critical incident techniques*, finally, contributed by offering a way of identifying moments of interest. For an incident to be "critical" in the sense of critical incident analysis, it need not be detrimental to the desired outcome, or even in any way extraordinary. Critical incidents were identified where actual performance deviates from, sticks to or returns to the shortest most appropriate chain of actions (the minimal path).

Thus, the method that I arrived at allowed for studying computer-mediated activity "in the wild", as in contextual inquiry. Structuring the data that was collected as in the PARI method through verbal analysis allowed for between-subjects comparison. The AON network diagrams taken from the critical path method let me compare actual against idealized performance, and critical incident techniques helped highlight salient events.

Note: Actions that have been identified as part of the minimal path are labelled in the network diagrams by a sequence number preceded with the character sequence MPA, for "minimal path action", and referenced by this label. Actions are labelled in the coded PARI sequences by a sequence number preceded with the character A and referenced by this label. For the full activity descriptions, minimal path network diagrams, coded PARI sequences and transcribed audio traces, see Appendix II. Respondents are referred to by first names only and all references to their working environment have been removed, to protect their privacy.

Procedure

Respondents

Users of one particular software package were observed carrying out an activity of their own choosing which was part of their day-to-day work. The research was conducted within a comprehensive software environment, a Contact Management System (name: *VIS*, for *Verkoop Informatie Systeem*) embedded in a larger accountancy package. Having produced the user documentation for the software, the researcher held a high level of theoretical expertise. The researcher acted as facilitator/expert (F/E) and observed task experts (TEs) using the software in the course of their day-to-day work. The different TEs were situated in different working environments and were selected at random, so that they could be expected to vary widely in their approach to the system.

The software's manufacturer made an initial selection from their customer base, based on geographical location and customer satisfaction. No customers were approached that had in the past expressed dissatisfaction with the product. Eight of those that indicated interest, were then approached by the researcher. In return for co-operation from their local VIS expert, they were told that after the research session, as much time would be available as they wished to ask the researcher any questions they might have about the system and its use. Two organizations turned out to not yet have started using the software; the remaining six were all willing, even eager, to participate. One respondent, however, turned out to not use any but the most straightforward features of the system, and the data collected during this one session was not taken up in the study. Altogether, this study is based on the data gathered from five respondents, all of whom were judged by their own office colleagues as expert users of the VIS package.

Activities

Although it was left to the respondents to select an activity to be observed, all five chose more or less the same one: to produce boilerplate correspondence addressed to one or more contacts held in VIS. When asked, they all indicated that this was what they most used VIS for, although in subtly different contexts. Producing boilerplate correspondence is one of the things that VIS shines at. The variable data is taken from VIS and written to a separate file, which is then used as data source for the standard Microsoft Word™ mail merge facility. In different situations a different mail merge template ("hoofddocument") is called which contains merge fields taking values from a particular subset of the available VIS data. Such a "hoofddocument" is created by

the user to match requirements. The link between VIS and Microsoft Word™ is made within VIS in what is known as a "standaardbrief". Thus, regardless of further requirements, the validity of the end result will always depend on 1) the validity of the data held in VIS that is included in the result; 2) the way VIS is linked to Word in the "standaardbrief"; and 3) the effectiveness of the Word "hoofddocument". Insight in these three aspects and how they work together is a prerequisite for successful completion of the overall activity.

Observation sessions

During the observation sessions, an audio trace was produced. Recording all software interaction would have been equally desirable but in order to do so, special software would have had to be installed on the TE's computers. Such an action would constitute quite an intrusion and might often—due to system management restrictions—be downright impossible. In order to capture PARI elements that would not be pertinent from the audio trace, the F/E therefore took extensive notes which were subsequently used to enhance the information captured in the audio trace. Thus, two separate sources of raw data were obtained.

Observation sessions were conducted in Dutch and took place in two stages. First, a lightly structured observation was conducted as follows.

- The TE presented the activity to the F/E, who then observed the activity being carried out as a sequence of actions.
- In order not to disturb the natural unfolding of the activity, the F/E interfered as little as possible by asking questions. The TE was asked to elaborate only under the following conditions:
  - When required for understanding, the F/E asked the TE to identify the current action.
  - When required for understanding, the F/E asked the TE to identify the reason why the current action was undertaken.
  - If the results and interpretation of the action did not become immediately obvious during the natural flow of the conversation between F/E and TE, the F/E ensured that they were vocalized.

It is important to stress that all respondents knew that the activity to be studied was one they could select themselves. Also, they knew that the researcher was an expert on the system's functionality and operations and that she was prepared to answer any number of questions after the session. It is reasonable to expect them to make the most of this opportunity for free consultancy and indeed, with one exception all admitted to have picked an activity they found problematic. One respondent even picked an activity that she had never dared undertake before. If the researcher had not offered any advice during the interview sessions, four out of five respondents would just have sat there looking expectantly and no progress would have been made; or—in some situations—serious errors which went unnoticed by the respondent would have had repercussions weeks or even months later. Therefore, whenever a respondent asked outright how to proceed or how to solve a problem, the researcher invited him or her to refer to the user manual. There is no saying how they would have proceeded without such prompting. When absolutely unavoidable, the researcher fixed problems that proved insurmountable or that went unnoticed yet would have caused further problems during later use of the system.

Once the task was completed to the TE's satisfaction, after a short break the TE was invited to ask any questions that he or she might have about the system's functionality. No audio trace was produced of this part of the session and no reference was made to it during further analysis of the

data. It was however inevitable that I developed further impressions as to the respondent's ability and insights and these are likely to have found their way into the analyses.

Verbal analysis

Immediately following each session, the F/E's notes were worked out and a full transcription of the audio trace was made. During the subsequent analysis stage, the transcriptions were used together with the F/E's notes to work out a coded PARI sequence.

Step 1: Summarizing the activity

The activity that was selected by the TE was written out in one or two paragraphs. In all five cases, the description given by the respondent at the very beginning of the session turned out to be very concise and thus incomplete. As the activity unfolded, respondents would add to their initial description. All this information was summarized, staying as close to the respondent's own words as possible but re-organizing and re-phrasing when necessary to distil a coherent description from disparate remarks.

For example, Karlijn starts by explaining: *Nou versturen wij vijf keer per jaar een relatiemagazine daar staat allemaal informatie voor klanten en voor prospects in; en dat is eigenlijk het moment dat ik naast mijn gewone dingen echt met AV werk en dat is om de adresbestanden aan te maken voor het versturen van het relatiemagazine*[2]. All that she says, is that the activity consists of producing a file containing address data. Later it becomes clear that the file must be in Microsoft Excel™'s own file format, and that it is sent off to a print shop who requires for the fields to be present in a particular order. This information, and more that transpires as the activity unfolds, is included in the description of the activity.

Step 2: Segmentation into actions

The actual work sequence was segmented into actions. A new action was taken to begin whenever the respondent gives clear indication of doing something else from what he or she was doing before. The beginning of a new action was usually verbalized: *Kijk, en dan…*; *Daarna ga ik…*; *En nu…*[3]. In one case (Rob's) many such markers were manifest but I did not take all as indicating the beginning of a new action. Rob simply wanted to explain the details of how he had done what he had done, and it was obvious from his demeanour that he did not regard the various sub-actions that he highlighted for my benefit as something he had specifically focused on at the time. The sub-actions A5.1 to A5.4 were separately included in the PARI sequence for completeness' sake, but treated together as one level 2 action (A5) in the analysis.

Sometimes, respondents explained about actions that they had carried out at an earlier stage, before the observation session took place. Such actions were given a sequence number in accordance with the time at which they had been carried out, as in the case of Rob, who had spent considerable time filling the system with prerequisite data long before I came to see him at work. These actions are part of the minimal path and need to be carried out at an early stage, as indeed

[2] *Five times per year we send out a magazine with all sorts of information for customers and prospects; that's really when I do something with AV, in addition to my normal work, to produce the files containing the address data for sending out the magazine.*

[3] *Look here… Next, I…; And now,…*

Rob had done; yet they were mentioned only near the end of the observation session. Still, I numbered those actions A1, A2 and A3, and later ensured that they corresponded with the minimal path actions MPA1, MPA2 and MPA3. In one case (Christa) it was clear from the systems's functioning that a particular action had been carried out prior to the observation session. The mail merge carried out in A15 could not have proceeded unless a "hoofddocument" was in place. As no reference at all was made to this action, it was included in the PARI sequence as A0 but not used in the analysis.

Step 3: Formulating actions as PARI sequences

For every action (A), the precursors (P) and the results and interpretations (R&I) were written out, based on what the respondents did or said and on what the researcher observed them to be doing. In this manner, a logical reconstruction was made of the separate actions.

The notes taken during the interviews were heavily relied on. Re-phrasing turned out to be always necessary, not just (as was the case with the description of the overall activity) to distil a coherent description from disparate remarks, but also to remove context-specific terminology, and to use similar words for similar ideas. For example, Clara says (A5): *en dan doe ik dit weg en dan is hij goed. Dat heb ik vorige maand met allemaal andere brieven ook gehad […] dat klik ik maar weg, want de goede brief zit daar gewoon achter. En ik kan daar niets mee en met de factuurronde moeten er zeshonderd facturen uit met die brieven erbij en daar ben je dan razend druk mee en dan heb je helemaal geen zin om daar naar te kijken. Dat is wel leuk om dat uit te zoeken maar het werkt toch wel, dus dan klik ik dat weg want ik heb wat ik hebben wil. Als er fouten zijn zie je dat gauw genoeg. Wat je wil zien, staat er goed in, dat zie je meteen*[4]. This was logically reconstructed as: "To click away the error message" [A]; "This message cannot possibly be important; I get it often, yet the results are always fine. I'm too busy to find out what it's about." [P]; "The resulting merged document looks fine." [R&I].

Relevant precursors that I identified as missing were inserted into the sequence in italics.

Results and interpretation were reconstructed almost exclusively from the respondent's actions. Results that the respondent clearly had not expected (e.g., *Dus dit is wel goed? Hier moet ik het inderdaad mee doen?*[5]—Christy, A1), were also italicized.

Step 4: Defining the minimal path

A network diagram was produced representing the activity's minimal path, as determined by the researcher in her role of F/E. In order to determine the minimal path, I combined my thorough knowledge of the system with all knowledge of the respondent's actual situation and the requirements posed by it, gained during the observation and my carrying out the structuring thus far. This step was carried out as late as possible. Had I defined the minimal path sooner, I would not yet have studied the raw data thoroughly and might have missed many aspects of the task, related to the actual context in which it was performed. The minimal path could not be determined at an even later stage, though, as it was needed in order to identify and code the critical incidents in the next step.

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[4] *so I get rid of this and it's OK. The same thing happened last month with different letters […] so I just click that off the screen, because the letter is fine just behind it. And I've no idea what to do with it and at invoicing time say six hundred invoices must go out with all the letters; we're terribly busy with it and I've got better things to do than look into that. It might be great fun sorting it out but things work out fine so I just click through 'cause I got what I need. If there were errors, I'd spot them straightaway. I see straightaway that what I need is there.*

[5] *So this is OK? This is really how I should do this?*

Note: VIS calls and controls Microsoft Word™. User interaction with Word insofar as required for the stated activity was therefore treated as interaction with the software system under consideration. Interaction with other software packages was treated as interaction with "the system", and included in the minimal path, only when such interaction is explicitly stated as part of the overall activity. This was the case with one of my respondents (Karlijn), who carried out the activity with the explicit purpose of constructing a Microsoft Excel™ worksheet containing VIS data.

Step 5: Coding the PARI elements

The PARI sequences were written out and coded as soon as possible after the interviews had taken place, yet many "grey areas" had to be resolved. Coding proved not straightforward. Every coding involved conscious choices and decisions. Is what I observe a level 2 or a level 3 action? Is a particular precursor strategic or conceptual?

Actions

Actions in the PARI sequence were coded for level of identification, as follows:

- A *level 1* action is one that was expressed in terms of the overall activity. When Clara states: *Kijk, dit is de eerste opzet voor de beheervrienden*[6], she is referring to the need to supply written instructions to a group of colleagues; a need which relates not to the system as such but to the total scope of the activity. Thus, the action (A8) is coded as level 1.
- A *level 2* action is one that was expressed in terms of software concepts, capabilities and functionality. Christa describes A3 as: *Ik zal dat even aanpassen*[7]. She straightforwardly knows that the software will let her do what she wants and does not feel the need to think in terms of how exactly to carry out the action. This action is coded as level 2.
- A *level 3* action is one that was expressed in terms of software operation. In A6, Christa is busy working out which field to fill in, and she cannot find it: *Hij staat er niet tussen, hij moet er wel tussen staan…*[8]. This is a level 3 action.

Below follow a number of sample codings, illustrating some of the choices I made.

level		examples
level 1	straightforward	• Clara A4: *Dat wou ik graag samen met jou oplossen!*[9] • Clara A8 (see above)
	not straightforward	n/a: there were only two instances of a level 1 action, both straightforward.

[6] *Look here: this is the first draft I made for our friends at the systems management department.*

[7] *I'll just go and fix that*

[8] *It's not there, it should be here somewhere…*

[9] *That's what I'd like to tackle together with you!*

level 2	straightforward	• Clara A2: *en dan doen we daar een brief bij*[10] • Clara A3: *ik heb dat document aangepast en teruggezet*[11] • Christa A3 (see above) • Christy A9: *nou, gaan we even kijken*[12] • Rob A2: *dan moeten we die maar eens gaan aanpassen*[13] • Rob A6: *ga ik meteen naar de Weburen*[14]
	not straightforward	• Clara A6 was not coded as level 3 because of the underlying focus, which was on software operation yet by others rather than herself. • Christa A3 was not coded as level 3 because of her focus on the reason for the action.
level 3	straightforward	• Clara A5: *dan doe ik dit weg*[15] (a dialog box) • Christa A6 (see above) • Christy A2: *Dus dit is wel goed?*[16]
	not straightforward	• Christa A13 and Rob A4 were not coded as level 2 (unlike Clara's very similar A10), because of their operational focus. • Christy A10 and A11 were not coded as level 2 because she had no idea why she performed the operations.

Precursors

Precursors in the PARI sequence were coded for information type, as follows:

- *Situational* knowledge is knowledge about situations as they typically appear in the context of the activity. Christy, for example, shows situational knowledge when she says (A1): *daar staat dus zo'n icoontje*[17].
- *Conceptual* knowledge is knowledge about facts, concepts, and principles that apply when carrying out the activity. When Christa (A13) says: *omdat ik met die zoekcode natuurlijk heb zitten pielen*[18], she uses conceptual knowledge to explain her action.

[10] *so now we add the letter*

[11] *I modified the document and placed it back*

[12] *OK, let's have a look*

[13] *let's change that one, then*

[14] *I go straight to "Weburen"*

[15] *I remove this*

[16] *So this is OK?*

[17] *there's one of those little icons there*

[18] *of course, I've been playing with the search codes*

- *Procedural* knowledge is knowledge about actions or manipulations that are valid when carrying out the activity. Step-by-step instructions on how to do something in a manual provide procedural knowledge, accessed for example by Christy when in A6 she follows printed instructions.
- *Strategic* knowledge helps organise the process by directing which actions should be carried out in which order. In A8, Clara bases her actions on strategic knowledge: *dit is de eerste opzet*[19], implying a pre- planned sequence.

Below follow a number of sample codings, illustrating some of the choices I made.

type		examples
situational	straightforward	• Christy A1 (see above) • Rob A4: *ik heb wel alle A-tjes bij elkaar en alle B-tjes dus*[20] • Christa A8: *hij staat er niet tussen*[21]
	not straightforward	• The precursor to Clara A5 (unlike that to Christa's very similar A16) was not coded as strategic because of her focus on immediate response to the error message. • The precursor to Christa A8 was not coded as conceptual because she was driven by what she saw rather than what she already knew.
conceptual	straightforward	• Christa A13 (see above) • Clara A2: *die is dus net ook vernieuwd, en dat werkt niet*[22]
	not straightforward	• The precursor to Christy A5 was not coded as situational because of her confidence as to what to do.
procedural	straightforward	• Christy A6 (see above)
	not straightforward	• The precursor to Christy A2 was not coded as situational because of her focus *how* rather than *when*.
strategic	straightforward	• Rob A6: *doorbelasten aan de cliënt en daarom ga ik meteen naar*[23] • Karlijn A1: *moet ik een scherm met kolommen maken*[24] • Clara A4: *die heb ik er gewoon naast gezet*[25] • Clara A8 (see above)

[19] *this is the first draft*

[20] *I've grouped all the A's and all the B's, therefore*

[21] *it's not there*

[22] *that one is new too, and that doesn't work*

[23] *charge to the client and therefore I go straight to*

[24] *I must start by making a view showing columns*

[25] *I just put that one next to it*

type		examples
	not straightforward	• The precursor to Christy A15 (unlike that to Clara's very similar A5) was not coded as situational because of her focus on moving on. • The precursor to Christa A3 was not coded as conceptual because the conceptual knowledge seems to emerge only in the precursor to the next action. • The precursor to Christa A10 was not coded as situational because of her longer-term considerations. • The precursor to Christy A10 was not coded as procedural because whereas the *method* of obtaining the information is procedural (following instructions in the user manual), the information itself is not.

Critical incidents

Critical incidents were identified and coded for type, as follows:

- An *S* type critical incident is an action that Stays on or returns to the minimal path. Clara's A1, the action of ensuring that certain fields contain the appropriate value, maps directly onto MPA2 and yields a critical incident of type S.
- An *A* type critical incident is an Additional action as compared to the minimal path. When Christy closes and re-opens a document in Word (A5), she carries out an action that was not in the minimal path identified by the F/E. This yields a critical incident of type A.
- An *N* type critical incident is an action that is in the minimal path yet Non-existent in the actual performance. None of the actions in Karlijn's minimal path were observed in actual performance; as many type N critical incidents were marked as there are actions in the minimal path.

Step 6: Analysis

The coded PARI sequences resulting from the verbal analysis were then examined for the presence of correlational patterns that might begin answering my research questions. The results of the analyses are presented in the next chapter.

7. Results

For each of the five research questions, this chapter presents the analyses of the coded PARI sequences for each of the respondents, after which the findings are summarized.

RQ1: What types of knowledge precurse a shift in action identification level?

This research question was prompted by the desire to investigate under-use. Under-use can be spotted immediately by someone who is aware of the full extent of a particular piece of software's functionality: when the functionality is present by which a particular desire can be fulfilled, yet the user does not consider using it, the intention horizon lies within the boundaries of what the software is capable of and the software is under-used.

Awareness of functionality is a form of conceptual knowledge. To determine the optimum course of action, strategic knowledge is necessary. I therefore hypothesized that widening and narrowing of the intention horizon could be related to the presence or absence of a combination of appropriate conceptual and strategic knowledge. Further, I hypothesized that an "up" shift in action identification level from 3 to 2 or from 2 to 1 would be at least one indication of the intention horizon's widening and conversely, that a "down" shift from level 1 to level 2 or from level 2 to level 3 would indicate the intention horizon's narrowing. The data tables below show for each of the respondents the shifts in action identification level that were observed, as well as the types of knowledge that precursed the second of the two actions.

Individual respondents

Karlijn

Out of the 16 transitions from one action to the next, 12 constituted a shift in action level. There were 6 upgrades and 6 downgrades, as follows:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A2-A3	down	strat+*conc*
A3-A4	up	strat
A4-A5	down	strat
A6-A7	up	strat
A7-A8	down	strat
A8-A9	up	strat+*conc*
A9-A10	down	strat
A11-A12	up	strat+*conc*
A12-A13	down	strat
A14-A15	up	strat+*conc*
A15-A16	down	strat

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A16-A17	up	strat

At a first glance, it is as if a pattern is clearly visible: all precursors are strategic. Yet all the actions that do *not* constitute a shift in action level, are also precursed by strategic knowledge.

The combination of strategic and (missing) conceptual knowledge is found as the precursor to four actions:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A2-A3	down	strat+*conc*
A8-A9	up	strat+*conc*
A11-A12	up	strat+*conc*
A14-A15	up	strat+*conc*

In all four cases is it missing conceptual knowledge that together with strategic knowledge precurses a shift in action level. Three out of four are upgrades, the fourth is the only downgrade. It looks as if this particular combination of knowledge types tends to precurse a shift in action level; and more often an upgrade than a downgrade—a counterintuitive finding that is hard to explain.

Christa

Out of the 18 transitions from one action to the next, 10 constituted a shift in action level. There were 5 upgrades and 5 downgrades, as follows:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A3-A4	down	sit
A4-A5	up	strat+conc
A5-A6	down	sit+*conc*
A6-A7	up	strat
A8-A9	down	sit
A9-A10	up	strat
A12-A13	down	conc
A14-A15	up	strat+*conc*+*conc*
A15-A16	down	strat+*conc*
A16-A17	up	sit+strat

Upgrading and downgrading actions alternate at almost every step. However, closer inspection shows that this upgrading and downgrading of the action level is no indication of a widening or narrowing intention horizon. A7, for example, constitutes an upgrade, yet it is simply one action early in a problem recovery chain. The shift in level is coincidental: problem recovery can hardly correspond to a widening of the intention horizon. Similarly, A10 constitutes an upgrade which is

equally coincidental. The respondent saw that the system was slow and decided to cancel the action—again, hardly a widening of the intention horizon.

The combination of strategic and (missing) conceptual knowledge is found as the precursor to three actions:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A4-A5	up	strat+conc
A15-A16	up	strat+*conc*+*conc*
A16-A17	down	strat+*conc*

Only once does strategic plus conceptual knowledge trigger an upgrade of the action level. No conclusions can be drawn as to the effect of this particular combination of knowledge types on shifts in action identification level or the scope of the intention horizon, other than that whenever it occurs, a shift follows.

Christy

Out of the 11 transitions from one action to the next, 4 constituted a shift in action level. There were 2 upgrades and 2 downgrades, as follows:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A3-A4	up	sit+conc
A5-A6	down	*proc*
A7-A8	up	sit+conc
A9-A10	down	strat

A pattern does not readily present itself. The precursors to the two upgrading actions are both situational plus conceptual. The precursor to one downgrading action consists of missing procedural knowledge, yet to the other one the precursor is strategic. And again, nowhere in the trace or in de coded PARI sequence do we find any indication that the respondent raises or lowers the "bar" of what she feels she could fruitfully attempt to do with the system.

The combination of strategic and (missing) conceptual knowledge is seen to precurse only one action:

transition	direction of shift	precursor type (missing is indicated with italics)
A8-A9	no change of level	strat+*conc*

No conclusions can be drawn as to the effect of this particular combination of knowledge types from this one occurrence, which furthermore does not change the action level.

Clara

Out of the 8 transitions from one action to the next, 4 constituted a shift in action level. There were 2 upgrades and 2 downgrades, as follows:

transition	direction of shift	precursor type (second action— missing is indicated with italics)
A3-A4	up	strat

A4-A5 is not a transition: in between, the F/E carried out an action.		
A5-A6	up	strat
A7-A8	up	strat
A8-A9	down	*conc*+strat

Clara completed most of her actions, then moved onto the next as indicated by the strategic precursors. There are not really many "shifts" at all, just actions following one after the other, some of which are identified on a different level.

The combination of strategic and (missing) conceptual knowledge is seen to precurse only one action:

transition	direction of shift	precursor type (missing is indicated with italics)
A8-A9	down	strat+*conc*

No conclusions can be drawn as to the effect of this particular combination of knowledge types from this one occurrence.

Rob

Rob identified all his actions on level 2. Thus, there were no shifts in action level. The combination of strategic and (missing) conceptual knowledge is seen to precurse only one action, the very first in the sequence:

action	direction of shift	precursor type (missing is indicated with italics)
A1	n/a	strat+conc

General findings

The only pattern that showed up for the combination of strategic and (missing) conceptual knowledge, is that in 8 out of 10 cases a shift in action level follows. No pattern showed up however in the precursors to downgrades and upgrades of the action level, and these themselves seemed to have little effect on the intention horizon. At no time during any of the observation sessions was any actual narrowing or widening of the intention horizon felt to be present. Christa's intention horizon, for example, is seen to be quite narrow in A15, where rather than producing the complete e-mail shot in VIS she produces no more than a list of e-mail addresses to be copied by hand, one by one, into her e-mail client. However, I did not feel that the intention horizon had been any wider before Christa started out on the activity. The same holds for Karlijn's extremely narrow intention horizon.

RQ2: What types of knowledge precurse actions that are in the minimal path?

Actions that have been identified as part of the minimal path, yield critical incidents of type S. The minimal path is the expert's approach to solving a particular problem, minimal as to duration and effort. I hypothesized that strategic knowledge, based on conceptual knowledge, allows for finding the minimal path. During the actual performance of the activity, situational knowledge is used to monitor progress and procedural knowledge is used to get back on track

after what should have been an operation is upgraded to an action, marked by the presence of a level 3 action.

Individual respondents

Karlijn

This respondent is the odd one out. None (0%) of her 17 actions are in the minimal path, although it could be argued that A1 is a first attempt at carrying out MPA4. All 17 precursors are strategic. Strategic knowledge alone certainly seems not sufficient to guide this user along the minimal path.

Christy

Out of the 12 actions that were carried out, 4 constituted an attempt to carry out an action that is in the minimal path (33%):

action	precursor type (missing is indicated with italics)	minimal path reference
A1	sit	MPA3
A4	sit+conc	MPA2
A9	strat+*conc*	MPA2 (conclusion, after a series of A's)
A10	strat	MPA3

This respondent set out with little strategic knowledge. She worked through the activity on the basis of what she saw happening on the screen, backed up by the user manual when prompted by the researcher to refer to it. In the absence of a plan, she is driven by situational knowledge. One of the two instances where a return to the minimal path is prompted by strategic knowledge takes place in a familiar situation. This is the case when (in A9) the respondent knew from previous experience that a mail merge in Word cannot take place unless a "hoofddocument" is made. (The missing conceptual knowledge has no repercussions at this point.) The other instance is when the strategic knowledge comes straight from the user manual.

Every one of the type S critical incidents in this respondent's chain of actions is the result of an action that is precursed by situational or strategic knowledge. Correct conceptual knowledge helps Christy only once and procedural knowledge does not show up at all for these critical incidents.

Christa

Out of the 20 actions that were carried out, 9 constitute an attempt to carry out an action that is in the minimal path (49%):

action	precursor type (missing is indicated with italics)	minimal path reference
A0	strat	MPA7
A1	strat	MPA1
A3	strat	MPA3
A5	strat+conc	MPA2
A11	strat	MPA2 (conclusion, after a series of A's)
A12	strat	MPA4

action	precursor type (missing is indicated with italics)	minimal path reference
A15	strat+*conc*+*conc*	MPA9
A18	conc+sit	MPA5
A19	strat	MPA6

Only one of these has a precursor other than strategic: in A18, the system's response is interpreted and combined with conceptual knowledge to return to the minimal path.

(From the way the session unfolded, it can be deducted that at some point MPA8 had been carried out, whether by the respondent herself or by somebody else. No reference was made to this action and therefore it has not been included in the analysis.)

Clara

Out of the 9 actions that were carried out, 5 constitute an attempt to carry out an action that is in the minimal path (56%):

action	precursor type (missing is indicated with italics)	minimal path reference
A1	strat	MPA2
A2	conc	MPA4
A7	strat	MPA3
A8	strat	MPA5
A9	conc+strat	MPA1, MPA2

Again only one of these type S critical incidents has a precursor other than strategic: in A2, conceptual knowledge is applied to changed requirements. The one strategic precursor (to A9) where conceptual knowledge is applied as well, is one that leads to a considered change in the order of actions. Possible repercussions from this deviation from the minimal path are acknowledged and accepted.

Rob

All of the 6 actions that were carried out, are actually included in the minimal path (100%). (A5 is split up into sub-actions which came about not because the respondent seriously focused on the separate steps within action 5, but because he took great pains to show and point out what he was doing.)

All precursors consist of strategic knowledge. Some procedural knowledge was observed to be missing in A2 and indeed, the respondent turned out to be not completely happy with the way he had performed this step (compare the result of A5.3: *ik zou daar liever mijn voornaam in hebben maar dat heb ik nog niet voor elkaar gekregen*[26]).

General findings

The analysis suggests that it is strategic knowledge that keeps users on the straight and narrow. Out of a total of 24 observed critical incidents of type S, 20 (83%) are precursed by strategic

[26] *I'd prefer to see my first name there but I haven't figured out how to do that*

knowledge. The remaining occurrences of a type S critical incident are almost all precursed by situational knowledge (3 times, or 12.5%). Knowledge that is strategic or situational accounts for almost 96% of the critical path actions that were carried out. The one remaining type S critical incident was precursed by conceptual knowledge.

RQ3: What types of knowledge precurse actions that are not in the minimal path?

Actions that have not been identified as part of the minimal path, yield critical incidents of type A. In principle, they are detrimental to overall efficiency. In the more restricted context of the previous and next actions in the total sequence, however, a given additional action can still be seen as having a positive effect. This is the case when the additional action is carried out in the context of problem recovery. Once a problem has occurred, one or more additional actions may be needed to get back on track. In the data tables below, every additional action is labelled "positive", "negative" or "neutral": indicating whether the action brings the user to the minimal path, moves the user (further) away from the minimal path, or cannot be seen to do either. To be able to probe beyond the immediate precursor of a type A critical incident, root causes are included in the data tables.

Individual respondents

Karlijn

All of this respondent's 17 actions are additional to the minimal path (100%), with as the root cause missing conceptual knowledge leading to a wrong turn early on in the sequence. Every one of the additional actions was precursed by strategic knowledge and had a negative effect, removing her further from the minimal path.

Christy

Out of the 12 actions that were carried out, 8 are additional as compared to the minimal path (66%):

action	precursor type (missing is indicated with italics)	root cause	effect
A2	proc	lack of other ideas	neutral
A3	proc+conc+*conc*	lack of other ideas	neutral
A5	conc	problem recovery	positive
A6	*proc*	operation upgraded to action	negative
A7	conc+*sit*+*proc*+*conc*	operation upgraded to action	negative
A8	sit+conc	problem recovery	positive
A11	sit+*conc*	redundant	negative
A12	*proc*	operation upgraded to action	negative

At first sight it is difficult to see any particular pattern. Lack of procedural knowledge yields a critical incident of type A three times, but twice it is correct procedural knowledge that does the same. Three out of four knowledge types are present as precursors to the additional actions (only strategic knowledge is not present), as are all four root causes. However, if we dig a little deeper

we realize that A2-A3 one after the other follow from not really knowing what to do and falling back on procedural knowledge as to how to do things. This root cause disappears as soon as the respondent begins to trust the user manual and also moves onto more familiar ground. A5-A8 also form one uninterrupted series of additional actions, all having to do with not being quite sure how to create a "hoofddocument". A11-A12 on the other hand have nothing to do with each other. Half the time, additional actions can be seen as having a negative effect on the overall performance.

In one additional action (A7) the precursing knowledge resided not so much in the respondent herself but rather in the software environment. In this action, Christy was tempted away from the user manual by a so-called wizard which prompted for input. As the wizard bore no relationship to VIS, Christy would have done better not to use it.

Christa

Out of the 20 actions that were carried out, 11 are additional as compared to the minimal path (51%):

action	precursor type (missing is indicated with italics)	root cause	effect
A2	sit	operation upgraded to action	negative
A4 (multiple)	sit	wrong turn taken	negative
A6	sit+*conc*	operation upgraded to action	negative
A7	strat	problem recovery	positive
A8	sit	problem recovery	positive
A9	sit	operation upgraded to action	negative
A10	strat	redundant	negative
A13	conc	operation upgraded to action	negative
A14	strat+*conc*	redundant	negative
A16	strat+*conc*	wrong turn taken	negative
A17	sit+strat+*conc*	problem recovery	positive

Again a first inspection does not reveal any particular pattern. This time procedural knowledge is never seen to precurse an additional action but the other three knowledge types all are, as are all four root causes. What we can see is that A6-A10 together form one uninterrupted series of additional actions, starting with the problem encountered in A5. A dialog box did not offer the expected field, so that filling in the dialog box became an action in its own right. Following on from that, the next three additional actions were undertaken to remedy the situation and the respondent got back on track only after A9. A10 is not really part of this series, as it was triggered by a different problem (the unsatisfactory response time of the system). A16-A17 on the other hand do follow on from one another: if A16 had been avoided, A17 would not have been necessary. More often than not, additional actions can be seen as having a negative effect on the overall performance.

Clara

Out of the 9 actions that were carried out, 4 are additional as compared to the minimal path (44%):

action	precursor type (missing is indicated with italics)	root cause	effect
A3	conc+*conc*+*proc*	wrong turn taken	negative
A4	strat	wrong turn taken	negative
A5	sit+*conc*	wrong turn taken	negative
A6	strat		neutral

This respondent made a serious error twice, without knowing what went wrong or how to correct the error. Both resulted in additional actions stemming from incorrectly applied or missing conceptual knowledge which both have a negative effect on overall performance. That there are only two of this type, was because after A3 the respondent simply gave up and asked for assistance and after A6, she convinced herself that the system was just "acting funny" but nothing was really the matter. In both cases, the researcher carried out a series of actions to remedy the situation. Had these been included in the analysis, they would have been additional to the minimal path with as their root cause, "problem recovery". Similar sequences would have shown up as those which we saw with Christa in A6-A9 and A16-A17.

The third additional action is difficult to classify. It can be argued that the precursor to A6 should have been coded so as to include a certain amount of missing knowledge, as the respondent did not feel confident enough to set up the system for her colleagues without a certain amount of trial-and-error beforehand. However, looking before you leap is not a bad idea. Indeed, it can equally well be argued that this action should have been included in the minimal path and therefore is not additional at all.

Rob

No actions were added to those identified for the minimal path. One action was split up into sub actions, as these were pointed out separately by the respondent as the activity unfolded. It was, however, clear that he did this not because the separate steps felt like actions to him but because he wanted to show what he had done step by step, in order to highlight actions (A1-A3, corresponding to MPA1-MPA3) that had been carried out before.

General findings

Although an action that is not identified for the minimal path is by definition detrimental to the efficiency of performance of the overall activity, such a type A critical incident can in the immediate context of the sequence of actions still be beneficial. This is the case when the minimal path has already been deviated from, and the additional action helps getting back to it. Not considering the extreme cases of Karlijn (all actions type A critical incidents, all negative) and Rob (no actions yielding type A critical incidents), the majority of the total number of additional actions for each of the three remaining respondents has a negative effect. Out of a total of 23 such actions, 15 (65%) had a negative effect, 5 had a positive effect and 3 had neither. On the whole, more often than not a type A critical incident is not helpful.

Common root causes for additional actions do not show up but almost half of the additional actions (19 out of a total of 40, or 48%) were precursed by strategic knowledge, with another 10 (25%) where the precursor was situational. Knowledge that is strategic or situational accounts for 73% of the additional actions.

Another pattern to show up is that an additional action engenders further additional actions. An additional action comes seldom alone: see, for example Christy's series of A5-A8 and Christa's A6-A9 (A10 did not form part of the series). Likewise, there is Christa's series of additional actions in A4, caused by her initially skipping MPA2.

RQ4: What causes users not to carry out actions that are in the minimal path?

Actions that have been identified as part of the minimal path yet are not observed, yield critical incidents of type N. These can be thought of as marking ineffective use. For the purposes of this analysis I did not look at precursors, since an action that is not there cannot itself have a precursor. Instead, I traced back to the underlying root cause.

Individual respondents

Karlijn

None of the 7 actions identified for the minimal path were carried out (100% skipped), with as the root cause a wrong turn at the beginning of the sequence. A lack of conceptual knowledge led to an inefficient strategy being picked and rigorously carried through, mostly by-passing what the system has to offer.

Christy

Out of the 3 actions that were identified for the minimal path, 1 was not carried out (33%):

minimal path reference	root cause
MPA1	The respondent was not and never became aware of the necessity of the action.

At some point (A8) it should have become clear to Christy that the validity of the "hoofddocument" she was creating depends heavily on that of the underlying field values. She actually notes a problem: *Oh die moet ik dan pakken... waarom pakt hij hem nou niet?... Dan hebben we die dear dus niet nodig. Dan moet ik gewoon toch hier Geachte typen*[27]. Yet due to her lack of knowledge of what was really going on, she was focusing on immediate results and failed to recognize the omission. This may lead to some very strangely addressed letters going out at Christmas unless the issue is resolved.

Christa

Out of the 9 actions that were identified for the minimal path, 1 was not carried out and another one was carried out only as a test (22%):

minimal path reference	root cause
MPA3	Abandoned for lack of time after MPA2 proved more problematic than expected.
MPA9	The stage in which this action could be carried out "for real" was not reached during the interview.

[27] *So that's the one I'm after... why won't it take it?... So we don't need the "dear". Seems I type "Dear" here after all*

(MPA8 is not mentioned but must have been carried out, or MPA9 would have been impossible.) Effectively, carrying out all the actions took considerably more time than the respondent had expected. She kept encountering problems and retracing her steps. Christa had originally omitted to fix the invalid data first because she did not realize that records containing invalid data cannot be saved: the dependency of MPA3 on MPA2 became clear only later. Consequently, so many problems had been encountered that she ran out of time.

Clara

Out of the 5 actions that were identified for the minimal path, 1 was not carried out (20%):

minimal path reference	root cause
MPA4	Abandoned because the system refused to continue and a solution to the problem could not be found.

This respondent encountered a serious problem, tried to fix it, was not successful and gave up until such time as when assistance could be sought. The root cause here was a lack of conceptual and procedural knowledge: had the respondent understood the intricacies of Microsoft Word™'s mail merge better, she would have been able to recover from the problem and proceed.

Rob

None of the 6 actions identified for the minimal path were skipped (0%).

General findings

It is not really possible to determine a particular cause for *not* doing something. For one thing, it is hard to pinpoint *when* exactly an action is not carried out. The network diagrams show dependencies and thus the latest possible moment for an MPA to be carried out, if at all; but sometimes there are no dependencies, or a dependent MPA is skipped as well. Christy's skipping MPA1 illustrates the problem. Did she skip this action at the very beginning, or at the point where she could first have realized that something was missing? If we cannot see when something happens, we cannot find precursors to the non-event either. Letting go of the data, however, the general impression is that users skip minimal path actions because they do not feel the need to do them. In all cases, the PARI sequence shows that conceptual knowledge had been missing.

RQ5: Do users interpret system feedback as information, on which to base decisions affecting the further sequence of actions?

In the data tables below, every transition from one action to the next which starts from system feedback requiring interpretation is labelled "positive", "negative" or "neutral": indicating whether the action brings the user to the minimal path, moves the user (further) away from the minimal path, or cannot be seen to do either.

Individual respondents

Karlijn

In a sequence of 17 actions, there were 16 transitions from one action to the next. None of these started from a result that was unexpected and/or an explicit system message; so none started from a result that needed to be interpreted in order to determine the optimum next actions.

Christy

In a sequence of 12 actions, there were 11 transitions from one action to the next. Four of these started from a result that was unexpected; one started from an explicit system message. Altogether, five transitions started from a result that needed to be interpreted in order to determine the optimum next actions:

transition	summary	precursor type (second action—missing is indicated with italics)	effect
A1-A2	A dialog box which seems inappropriate frightens the respondent, who needs reassurance to proceed.	proc	neutral
A3-A4	An error message which was announced in the user manual, still comes as a nasty surprise. Again the respondent needs reassurance to proceed.	sit+conc	neutral
A4-A5	The respondent had made a simple error and correctly applies a simple fix.	conc	positive
A5-A6	Due to missing procedural knowledge, an operation is upgraded to an action which results in success.	*proc*	positive
A8-A9	Unexpected results do not trigger a much-needed re-think of the overall strategy.	strat+*conc*	negative

Christy's first two transitions that are started from a result needing interpretation are labelled as "neutral", as the problems here are really with the user interface of the system. The system puts up an inappropriate dialog box and an error message, respectively, which the user manual is expected to take the sting out of. Ideally, the system should not have put up a result which the user needs to interpret at all. The next two interpretations made by Christy both have a positive effect. In one case conceptual knowledge was applied to fix a simple user error, in the other the realization of missing procedural knowledge led to a successful fix. Finally however, once Christy moves out of VIS and into the familiar territory of Word, she no longer notices when things go awry (A8-A9).

Christy is the only of the five respondents whose very first action is in response to how the system presents itself: she sees a particular icon and guesses (correctly) that it will have something to do with the mail merge facility. The first action not being a transition, this is not included in the data table.

Christa

In a sequence of 19 actions, there were 18 transitions from one action to the next. Six of these started from a result that was unexpected; three started from an explicit system message. Altogether, nine transitions started from a result that needed to be interpreted in order to determine the optimum next actions:

transition	summary	precursor type (second action—missing is indicated with italics)	effect
A3-A4	Time and again the same error message is thrown. Before triggering a re-think, the instructions in the message are simply followed.	sit	negative
A5-A6	A field name that is expected to be present in a dialog box, simply cannot be found. Finding the field is no longer an operation but becomes an action in its own right.	sit+*conc*	negative
A6-A7	On closer inspection the field still does not seem to be there. This triggers a new angle of attack: to look in a filled-in record for clues as to the field name.	strat	positive
A8-A9	A third attempt is undertaken. The field picked this time is taken to be the correct one, as it takes the required value.	sit	positive
A9-A10	As processing is very slow, the operation is cancelled. The system asks for confirmation of cancellation.	strat	neutral
A10-A11	The message has triggered a re-think and the cancellation is cancelled, so that processing continues.	strat	neutral
A12-A13	An overview on the screen looks not quite right. It is realized that a view has carried over from the previous time, and the current action is repeated after making some changes.	conc	positive
A15-A16	A rather alarming error message is ignored, because it seems to make no sense and to offer no solution.	strat+*conc*	negative
A16-A17	Despite the error message, the result that is obtained seems to be valid. No more reassurance is required to proceed.	sit+strat+*conc*	negative

Missing conceptual knowledge in the second (A5-A6) and last two (A15-A16 and A16-A17) responses has a negative effect. The responses A9-A10 and A10-A11 were based purely on strategic knowledge, and do not contribute either way. In A3-A4, in A7-A8 and in A8-A9 the response is based on situational knowledge unmodified by conceptual knowledge, which can work out either way.

Clara

In a sequence of 9 actions, there were 8 transitions from one action to the next. Three of these started from a result that was unexpected, two of which started from an explicit system message. Altogether, three transitions started from a result that needed to be interpreted in order to determine the optimum next actions:

transition	summary	precursor type (second action—missing is indicated with italics)	effect
A2-A3	A system message saying that a link cannot be made, is incorrectly interpreted as indicating that something is set wrongly in the linking definition. The possibility that the problem lies elsewhere is not considered.	conc+*conc*+*proc*	negative
A3-A4	After exploration offers no insight into how to fix the problem, the action is postponed until such a time as when assistance can be sought.	strat	positive
A4-A5	A severe warning as to the invalidity of the results, is ignored for lack of knowledge as to what the message refers to while the results seem fine and thus far there has been no evidence as to the contrary.	sit+*conc*	negative

Again, missing conceptual knowledge in response A2-A3 has a disastrous effect: this is where the respondent actually gave up completely. In A4-A5, the missing conceptual knowledge leads to an underestimate of the severity of the situation. Further, there is one unmodified strategic response with a positive effect on the final outcome.

Rob

In a sequence of 6 actions, there were 5 transitions from one action to the next. None of these started from a result that was unexpected and/or an explicit system message; so none started from a result that needed to be interpreted in order to determine the optimum next actions.

General findings

Do users act on system feedback? They do; they act or try to act. 17 cases were observed of users basing their actions on the interpretation of unexpected results and/or explicit system messages. Yet only 6 of these, about one third, contributed towards finding the way back to the minimal path; while 7 even led the respondent further astray. There is a suggestion that in more familiar situations, the responses become less adequate, perhaps contrary to what might be expected.

8. Discussion

Five respondents were involved in this study, selected only on the basis of geographical location and lack of manifest dissatisfaction with the software. Ideally all would have had the same level of expertise with the activity that they selected, but they did not. On the contrary: my five respondents varied widely in expertise as became apparent both subjectively and objectively, through analysis of the coded PARI sequences.

Subjectively, I could not help but notice how my respondents seemed to vary in the degree to which they gainfully employed the system. Where some achieved excellent results in relatively little time, others took more time to arrive at a less ambitious or less successful outcome. This "gut feeling" corresponded to the satisfaction with which the respondents spoke about their own performance. Karlijn was unhappy about the amount of work involved and talked repeatedly about her strive for improvement: *toen heb ik het overgenomen van een collega van mij die dat altijd deed en ik heb haar manier naar mijn idee nog meer verfijnd want ik werk alweer sneller dan toen ik begon; maar het is nog steeds niet ideaal want het kost met name als we het eenmaal naar Excel hebben geëxporteerd nog heel veel tijd. Dat is eigenlijk wat het meeste tijd kost. En volgens mij moet dat beter kunnen maar daar zijn we dus nog niet achter [...] Maar nu begint eigenlijk pas de ellende*.[28] Christy knows she's not very proficient: *Maar als ik iets niet herken dan word ik altijd een beetje huiverig want ik ben niet zo'n computerfan. Om te voorkomen dat ik het hele systeem weer in het bedrijf in de war schop dan heb ik iets van, ik geloof dat ik het maar even anders doe! Maar het moet er toch een keer van komen*.[29] Christa has fewer doubts but keeps jumping from one action to another, whereas Clara quite confidently sets up the system for others to use so as to minimize the damage they can do to her setup: *Dus dat is van belang dat dat blijft staan. Op die persoon. Niet dat iemand denkt van hee, dat is mijn hoofdcontact, laat ik daar eens iets anders neer gaan zetten want dat vind ik. Blijf er af, blijf er af! Dat is ook de boodschap die ik daar ga doorgeven! [...]Voorkauwen, hoe je dat doen moet, ik heb echt een paranoïde reactie op het feit dat mensen in "mijn" systeem zouden zitten werken! […] En nu wil ik voor die collega's de kolommen instellen voor hun werk als afdeling Helpdesk zodat zij er prettig mee kunnen werken en alle informatie hebben die ze volgens mij nodig gaan hebben*[30]. Rob, finally, breezes through the chosen activity and takes pride in pointing out some of the things that he's done.

This subjective distinction in relative expertise was corroborated by the PARI sequences. Expertise is associated with solving problems without having to worry about details, and thus the predominant action level is a good indication of the level of expertise displayed by any particular respondent. A driver who is consciously engaged in determining the correct order in which to operate the foot pedals of a car will not be seen as an expert chauffeur. Similarly, a software user who describes the activity of producing print-ready copy in terms of keystrokes, is

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[28] *and I took over from a colleague who used to do it and I've improved further on her working method and it's taking less time already than when I first did it; but it's still not ideal because especially once it's been imported into Excel it takes a lot of time. That's really what takes the most time. And I'm sure there must be better ways but we haven't figured out how. […] Here's where the horror begins.*

[29] *But if it's something and I don't recognize it that always makes me feel a bit reluctant, I'm not a great fan of computers. So to make sure that I don't mess it up for the whole company I feel like, I think I'll find some other way! But sooner of later I'll have to take the plunge.*

[30] *So it is important that this stays there. For that contact. Not for anyone to think Hey, that's my contact, why not go and place a different name there because that's how I like it better. Keep your hands off it, keep off! That's my main message! [...] Take them by the hand, how to do it, I really react quite paranoid to the idea of people working in "my" system! […] And now I want, for those colleagues, to set up a column view for the Help Desk department, so that they can work with it easily and get all the information I think they will need.*

not likely to be entrusted with the expert task of preparing the annual report for the shareholders. Looking at the five PARI sequences, we see that Karlijn, Christy and Christa all carry out a considerable number of level 3 actions (50%, 66% and 35%, respectively). Clara and Rob on the other hand carry out almost no level 3 actions. The same pattern is seen in the percentage of actions that should have been carried out but weren't (type N critical incidents; see the data tables starting on page 44 for details). Karlijn skipped 100% of MPA's, Christy 33%, Christa 22%, Clara 20% and Rob 0%. Looking at the critical incidents of types S and A, which are complementary and together make up all actions that were observed, the same patterns shows up once again. 0% of Karlijn's actions correspond to an MPA's and thus 100% of her actions are additional to the minimal path. Christy carries out 33% of her MPA's (66% additional actions), Christa 49% (51%), Clara 56% (44%) and Rob 100% (0%).

Had I set up a 5-value scale rating expertise ranging from *hardly any* via *some* to *sufficient* and on via *good* to *excellent*, every value on the scale would have been assigned exactly once. Karlijn would have been rated *hardly any*, Christy *some*, Christa *sufficient*, Clara *good* and Rob, finally, *excellent*.

Under-use, ineffective use and inefficient use

This research was originally driven by a desire to learn about suboptimal use of complex software environments. Five research questions were formulated so as to provide insight into the underlying mechanisms of under-use, ineffective use and inefficient use of such environments. Those five questions focused on detail: it seems productive also to take a step back and look at the three shapes that suboptimal use can take from a distance, against the backdrop of all the data that was collected.

Under-use

Two respondents displayed under-use of the aspect of VIS under consideration: Karlijn and Christa. In Karlijn's company, VIS was installed to replace the existing contact management system. The old system contained no sophisticated mail merge functionality: most of the work involved in preparing a particular data file took place in Excel and Word. Once VIS had taken its place all the work could be done in VIS, in only a fraction of the time. Karlijn however carried on exactly as before. VIS was, like the old system, used only to export a selection. Just like before, the real work took place in Excel and Word. Interestingly, where Christa displays under-use (A15), the external package that is called upon to take over is also a very familiar one. Christa's whole e-mail shot could have been produced in and sent from VIS. Not realizing this, she plans to use the functionality in a roundabout manner to create a partial result, then carry out additional work in her company's e-mail client of choice to finish the job. Christa says, explaining why some other VIS functionality is not used within her company: *we doen nu alles via email*[31]. Indeed, as the observation session was taking place, many non-related activities were handled by e-mail not just by the respondent but by all her office colleagues. It may be that the assimilation bias, on the level of choice of actions by which to carry out an activity, plays a significant role in the under-use of software. This certainly warrants further research.

[31] *currently we use e-mail for everything*

Both cases of under-use that were encountered, stemmed from missing conceptual knowledge. When after the interviews it was explained to Karlijn and Christa how VIS could be more gainfully employed, they jumped at the opportunity to learn about hitherto unknown functionality that could save them much work.

No actual widening or narrowing of the intention horizon was seen to be happening during the performance of the one activity that was observed per respondent. Mental models theory suggests that software users predict behaviour of the system by "running" a simplified abstraction called a mental model. The mental model is continuously being constructed in the mind during interaction with the system, and adjusted over time as established conceptions change. It is thus well possible that unguided changes in the intention horizon only occur with repeated practice, after many activities have been carried out many times.

Ineffective use

Ineffective use, as shown by the number of type N critical incidents or minimal path actions that were skipped, is very difficult to trace back to what caused these actions to be skipped. If something is not done, it is anyone's guess as to why or even when it was not done. This said, the search for root causes does indicate that ineffective use is at least sometimes marked by type N critical incidents.

Skipping a minimal path action by definition results in problems. Karlijn skips 100% of MPA's, and a job that could have been done in twenty minutes takes her twelve hours. Christy skips 1 MPA (33%), and indeed this skipped action will lead to suboptimal results. If the problem is not addressed, the address labels that are produced come Christmas will at least partially undo the goodwill created by the package to which they are stuck. Similarly, if Christa (2 MPA's skipped, 22%) does not get round to making the contact type obvious in the contact code (MPA3), companies for which more than one record is present will show up in undesired places. Clara (1 MPA skipped, 20%) is aware of the fact that not carrying out the action will compromise the quality of the letters that go out. All these are indeed examples of ineffective use.

As we will see later, the overall approach tends to be driven by strategic knowledge, adjusted as situational knowledge is accessed. When this is backed up by sufficient conceptual knowledge, users will identify the minimal path but when not, they may miss parts or all of it. All type N critical incidents that were seen, could be traced back to missing or incorrect conceptual knowledge.

Inefficient use

The majority of the total number of type A critical incidents had a negative effect. This may at first sound like a truism, as the minimal path is defined as the most efficient chain of actions (hence "minimal"). Yet once it has been abandoned, additional actions may be required to get back to it and such critical incidents of type A can be regarded as having a (relatively) positive effect. Only 5 out of a total of 23 did; 3 were neutral, and 15 had a negative effect.

Additional actions tend to cluster together. When lack of procedural knowledge leads to upgrading what should be an operation to a full-fledged action (of level 3), that action is additional to the minimal path and reduces efficiency; but one such action can be expected to be all. The occurrence of series of additional actions corroborated my finding that contrary to what I had expected, inefficiency was not shown to be caused primarily by a lack of procedural knowledge. All types of precursor and all sorts of root causes showed up for inefficient use, as

indicated by actions being carried out that are not in the minimal path (critical incidents of type A; see the data tables starting on page 41).

Christa's A15 constitutes under-use of the system as discussed above, but there is plain inefficiency there as well. The planned under-use aside, Christa could have foregone the mail merge functionality altogether. Her list of data values to copy and paste into the e-mail client could more easily have been produced using a simple technique which in A18 she routinely carries out in a different context. In A18 she shows she possesses the procedural knowledge necessary for exporting the field values that are shown on the screen to Excel, but the conceptual knowledge required for using the same technique in a novel context, is missing.

Of a different nature is the same respondent's series of additional actions in A4. This was caused by the fact that she had not ensured that changes she was making, could indeed be saved (MPA2). Additional actions showing up after skipping an MPA is a pattern I had expected to observe much more frequently, as I felt that the problems caused by skipping a minimal path activity would result in "problem recovery" actions. That this pattern did not show up more than once may be because such problems tend to be of an intangible nature, where no ready problem fixing options present themselves; or because they show up only much later; but this is no more than conjecture.

The role of the various knowledge types

In the analyses all knowledge types showed up as relevant, yet 81% of all actions were precursed by strategic or situational knowledge, where conceptual or procedural knowledge precursed only 44% of the actions (note that the percentages do not add up to 100, as an action may have more than one precursor). Knowledge that is conceptual or procedural shows up in the PARI sequences often when incorrect or missing. Strategic knowledge was never identified as incorrect or missing, while situational knowledge was identified as incorrect once.

Procedural knowledge

When procedural knowledge is missing, people do things wrong. They will soon notice the error and carry out actions that are not in the minimal path because the action should be an operation; resulting in inefficiency. A clear example is Christy, who in A6 has to pay conscious attention to entering a filename in a dialog box.

Still, this example is one of few that can be found in the PARI sequences. All the respondents in this study knew how to make selections, choose options from menus and work through the various tabs of dialog boxes. Their focus was, as were their problems and frustrations, on getting things done the way they wanted them done; not on how to carry out operations. Procedural knowledge did not precurse many of the actions: only 4 out of the total 64 was precursed by missing procedural knowledge and 2 more by correct procedural knowledge. Being a prerequisite for any degree of expertise this knowledge type seemed mostly transparent, too trivial to drive actions.

At the same time, consider Christy and Christa, who both would score rather low on the "expertise" scale (*some* and *sufficient*, respectively). Their primary desire is to get things done, even though they realize their limited expertise and do not expect to get it right in one go. Thus, both display the production bias. The information they look for in the user manual is by preference procedural. Two other respondents (Karlijn and Clara) who themselves did not

display the production bias, had written instructions for others. Both sets of instructions were highly procedural. (Incidentally, both could be said to follow the guidelines for minimal manuals, albeit presumably without the authors' being aware of any such guidelines.) Whether justified or not by its relative importance, procedural knowledge is what people are seen to look for and what they attempt to provide to others.

Procedural knowledge can certainly be a confidence-builder. Christy does not feel confident enough to actually embark on the task without assistance. Although there is no indication of a lack of procedural knowledge, she still wants to follow instructions. Preferably these should come from another person but when the F/E proves not forthcoming, she turns to the manual. This respondent is convinced that things can go very wrong; so much so that she'd rather not try anything she's not familiar with: *Maar als ik iets niet herken dan word ik altijd een beetje huiverig want ik ben niet zo'n computerfan. Om te voorkomen dat ik het hele systeem weer in het bedrijf in de war schop dan heb ik iets van, ik geloof dat ik het maar even anders doe!*[32] As the mostly procedural information in the manual leads to success, Christy gains confidence: *Okee, mooi. En zo ga ik dat dan natuurlijk hier ook doen. [...] Mooi spiekbriefje trouwens! […] Ja hè? En het lukt ook.*[33]

Conceptual knowledge

Conceptual knowledge showed up in the PARI sequences to precurse 22 of the total of 64 actions, or 34%. Exactly half the time it was missing or incorrect. On second thought, this makes sense. When I just *know* that in order to get from my home in Utrecht to a particular shop in Amsterdam I best use public transport, my first action in the activity of buying a present for my sister's birthday may be to find and board a train. This action will be seen to be driven by my desire to get to Amsterdam; not by my knowledge of the traffic situations in Utrecht and Amsterdam or of the various modes of transport at my disposal. However, this conceptual knowledge is certainly present and correct. Were it not, it would show up. My first action then would perhaps be to enlighten myself of even to rent a bike. In the first case I would have added an action to the minimal path, in the second I would encounter enough problems on the way to either start re-thinking my strategy or, more likely in this example, to give up altogether.

Whenever missing or incorrect conceptual knowledge shows up in the PARI sequences, there are problems further down the line. When Christa starts making changes to one particular field that she knows to be filled in wrong for many records, she does not take into account that other errors in the same records may make it impossible to save her changes. Repeated error messages led to annoyance and additional work (A4). Similarly, when Clara applies incorrect conceptual knowledge to a problem that has shown up (A3), she does not succeed in completing a vital action (MPA4) and in the end has to temporarily give up on it. We can say that when conceptual knowledge is missing, people do the wrong things. Unlike doing something wrong, doing the wrong thing is not always immediately obvious. By the time Christa gets round to producing the letters to accompany her company's seasonal greetings, will she be able to determine why some of the address labels come out strange, and to remedy the situation? Or will she make do with what she has and perhaps correct the labels by hand?

Conceptual knowledge is also required to respond appropriately to system feedback. A typical error message will be constructed along the following lines: "the current action cannot be

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[32] *But if it's something and I don't recognize it that always makes me feel a bit reluctant, I'm not a great fan of computers. So to make sure that I don't mess it up for the whole company I feel like, I think I'll find some other way!*

[33] *OK, good. So now I do the same thing here. […] Nice crib sheet! […] It does [go well], doesn't it? And it works.*

completed because xyz is not present/ valid/ appropriate"; where xyz is a prerequisite. Some stop here; others offer the choice between proceeding or cancelling and some even offer a choice to branch off to fix xyz there and then. What is the user to do if he or she does not clearly understand what xyz is; how to make it present, valid or appropriate; or why exactly it should be present, valid or appropriate? Usually, they ignore what they do not quite understand. The task must be done, so they opt to proceed. As Clara says when dismissing an error message in A5: *Dat klik ik maar weg, want de goede brief zit daar gewoon achter. En ik kan daar niets mee en met de factuurronde moeten er zeshonderd facturen uit met die brieven erbij en daar ben je dan razend druk mee en dan heb je helemaal geen zin om daar naar te kijken. Dat is wel leuk om dat uit te zoeken maar het werkt toch wel, dus dan klik ik dat weg want ik heb wat ik hebben wil*[34].

Unchecked by conceptual knowledge, strategic knowledge can lead a person completely astray. The one respondent (Rob) to follow the minimal path perfectly, without adding actions to it or leaving actions out, is also the one where no missing or incorrect conceptual knowledge is identified. Rob was extremely aware of the importance of setting up the system before using it: *Ik ben voortdurend bezig met hoe kan ik dat beter organiseren en indelen; het vraagt heel veel tijd maar dat betaalt zich wel terug*[35]. Prompted by this conceptual knowledge, he had set up the system not only for himself but also for all other users within his company. Once this was done, the activity itself could hardly go wrong and indeed, he encountered no problems or unexpected results. Karlijn on the other hand seemed to have no clear idea as to what the system can be used for. One of Karlijn's recurring responsibilities involved preparing a data file containing contact data. Before VIS was installed, this took her 12 hours of unpleasant work. After VIS was installed, it still took her 12 hours of unpleasant work. Using VIS, the task could (as the F/E proved afterwards) be carried out in about twenty minutes, not counting the half hour or so required to set up the system—an action which needs to be done only once. Not realizing the potential of the software, however, Karlijn incorporated the new system in the old strategy. Her intention horizon was so narrow as to include almost nothing, and all of her actions were added ones as compared to the minimal path. Effectively, she did not even start out on it.

Just like procedural knowledge, conceptual knowledge can be seen as prerequisite to the successful application of strategic and situational knowledge. In the absence of correct conceptual knowledge, inefficient and ineffective strategies are developed and situational knowledge is acted upon wrongly. In Part 1 of this paper I quoted Tamara van Gog (van Gog, 2006): "Kunnen zonder kennen kan niet", or "Doing without knowing cannot be done". Karlijn and Rob in tandem neatly illustrate her point.

Strategic knowledge

Karlijn and Rob represent the two extremes on the imaginary scale of expertise. Where Karlijn could be rated as having *hardly any* expertise in the chosen activity, Rob could be rated *excellent*. The PARI sequences for these extremes, unlike the other three, both display a sequence of actions based exclusively on strategic precursors. However, where Karlijn misses every single one of the MPAs, Rob misses none. The flip side is that where Karlijn's PARI sequence consists completely of actions that are additional to the minimal path, Rob's consists of MPAs only. The difference lies in Karlijn's missing conceptual knowledge at the very beginning. This is so severe, that her

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[34] *So I just click that off the screen, because the letter is fine just behind it. And I've no idea what to do with it and at invoicing time say six hundred invoices must go out with all the letters; we're terribly busy with it and I've got better things to do than look into that. It might be great fun sorting it out but things work out fine so I just click through 'cause I got what I need.*

[35] *I am forever busy thinking, How can I organize things even better; it takes a great deal of time but that pays for itself*

chosen strategy represents an intention horizon that dwindles to almost nothing: Karlijn hardly uses VIS at all. Rob does have the conceptual knowledge that Karlijn lacks, allowing for a strategy that represents the widest possible intention horizon, making the best possible use of VIS. Rob had taken the time to learn what VIS can and cannot do and how VIS "thinks", and to apply this knowledge in laying sound foundations for subsequent work. Karlijn had not and stuck to her experience with a previous software environment.

Strategic knowledge, provided it is backed up by correct conceptual knowledge, is what brings users to the minimal path (see the data tables beginning on page 39). On the other hand, the absence of correct conceptual knowledge coupled to strongly believed-in strategic knowledge can have disastrous consequences: Karlijn's strategic knowledge served her badly and her intention horizon never even got a chance to widen.

Like Rob, Clara has made a plan and sticks to it. A conscious decision had been made to define fields and fill them with the appropriate values as the need presents itself, rather than make this action precede the planned sequence. The fact that in the end this decision will prove (and already is) detrimental to the hoped-for results, in terms of both time and loss of quality, is accepted because the immediate need is more pressing. The planned sequence would further have closely resembled the minimal path, were it not for a conceptual misunderstanding of one particular error message, resulting in temporary abandonment (A4) of a vital action (MPA4). Another severe system message is completely ignored, as lack of conceptual knowledge makes an adequate reaction impossible (A5).

Situational knowledge

The only respondent whose very first action is driven by knowledge of a type other than strategic is Christy, whose first action is driven by situational knowledge. Having little idea what is or could be involved in carrying out the activity, the role of strategic knowledge in driving the sequence of actions is taken over mainly by situational knowledge. Christy guesses what to do next and just hopes she gets it right. This respondent is easily persuaded to follow along with events as they unfold on the screen. In A7, for example, Christy abandons the user manual in favour of a Wizard presented by Word, offering to help her set up her "hoofddocument". The Word Wizard has no "knowledge" of VIS and thus leads her astray; something that Christy does not notice for lack of conceptual knowledge. At another point (A8) she focuses on immediate results so much that she misses the fact that certain problems she encounters are serious, and should really be investigated further.

Situational knowledge is intangible of nature and difficult to provide explicitly. One attempt to do so is the development of so-called Wizards. Wizards are software constructs which elicit input from the user, usually through a fixed sequence of questions, then go off and produce a result based on the input. The attraction of working through a Wizard is clear: the user keeps typing, not stopping to think or to refer to an external source of knowledge. Such "going with the flow" caters for any production bias that is present, in that it gives one a feeling of getting things done. However, no software construct can be guaranteed to guess correctly as to what a user really needs. Wizards typically produce well-defined, short-term results. As such their attraction can be dangerous, when short-term gains come at the price of long-term problems. Christy's venture into Wizard territory (A7) does her no good and quite a bit of harm.

Christa is more confident than Christy; confident enough to work by trial-and-error. Yet she too sets out without a clear idea as to what is required. She just starts somewhere and responds to what happens. For example, MPA2 is initially skipped, then a first attempt to carry it out is made in A5 after the annoyance resulting from the omission becomes too severe. However, the

respondent gets sidetracked into a sequence of added level 3 actions and MPA2 is finally completed in A11. MPA3 is left for later and MPA9 was carried out only for diagnostic purposes. It is interesting to note that the precursors to actions that bring her back to the minimal path are almost all strategic (8 out of 9), whereas the precursors to actions that are added to the minimal path are predominantly situational (6 out of 11).

The majority of all actions was precursed by strategic knowledge, but situational knowledge came a good second as the following data table shows:

critical incidents	number	strategic precursor	situational precursor	strategic or situational precursor
type S	24	20 = 83%	3 = 12.5%	23 = 96%
type A	40	19 = 48%	10 = 25%	29 = 73%
total (covering all actions)	64	39 = 61%	13 = 20%	52 = 81%

Situational knowledge is to strategic knowledge as tactics are to strategy. What it can be expected to do is help making decisions on the fly, adjusting the chosen strategy as the activity unfolds. Without conceptual knowledge, however, situational knowledge may lead to wild guesses as to how to remedy an undesirable current situation and get back on track; without strategic knowledge to work on, its tactics may take over the overall strategy and leave the user at the mercy of circumstance.

System feedback in itself is not enough to make users respond in a positive manner. To proceed on the right track, to realize that a problem exists, or to solve a problem that is known to exist the system feedback must be interpreted correctly, then acted on adequately. Only in about one third of the situations in which users were observed to respond to unexpected results and/or explicit system messages, did the action they took prove constructive. In more than one third of these cases the response was even detrimental to the overall performance of the activity. A result that "looks right" or "looks wrong" represents situational knowledge, which is interpreted correctly only when the required conceptual knowledge is present and when the strategic knowledge is not too strong (as in more familiar situations, where the adequacy of people's responses to system feedback was tentatively seen to diminish). For example, in A17 Christa continues work on the basis of a list of the wrong e-mail addresses because it looks good enough and her plan is to proceed. Correct conceptual knowledge would have led to a more appropriate response to the situation and more effective use of the system.

Methodological issues

The method that I applied to the challenge of finding answers to my original research questions, proved a little unsatisfactory at first. For one thing, the minimal path that actual performance was measured against, was stated once and for all. Once a respondent had deviated from it, any subsequent actions that were carried out were still measured against the original minimal path. Thus the positive value of making the best of a suboptimal situation once such a situation had arisen, could not be captured. More generally speaking, it turned out that some questions cannot be answered by looking at an activity segmented at the level of an action, where an action is taken to be that which the respondent identifies as such, on any particular level. The PARI sequences showed actions one after the other, each with their own identification level, precursor, precursor typology, result and interpretation, and none of them looking very much as part of a

bigger whole. Yet often enough a simple application of "common sense" was enough to explain the complete chain in a few words. This is an unsatisfactory state of affairs and the method needs thorough re-thinking if ever it can be used to provide answers to questions of the type stated.

Probably easier to remedy is the fact that the method did not allow for a clear distinction between knowledge that is not present at all, knowledge that is not accessed at the appropriate moment, and knowledge that is applied wrongly. The distinction is important. Putting information in a documentation product is not an end in itself: the end is to provide people with knowledge. As it is documentation that I am ultimately interested in, being able to analyze situations in which knowledge was not accessed or was applied wrongly, would have been useful.

The method was designed so as to in no way interfere with spontaneous performance in a fully realistic setting. Without compromising this starting point, both of the objections mentioned above could possibly be met by implementing complementary investigations. For example, after the observation session, respondents could be tested for knowledge of all four types in the domain under consideration; in this case, using the mail merge functionality offered by VIS. Such complementary investigations would offer the added benefit of enhancing methodological rigour by allowing for triangulation and, providing they were numerous enough, crystallization (Tobin & Begley, 2004). Also, either the raw transcription of the audio trace or the coded PARI sequences could have been used for cued retrospective reporting, a method in which respondents are asked to elaborate on a record of the observation session (van Gog, Paas, van Merriënboer, & Witte, 2005). (The addition of longitudinal elements to the study might also have provided interesting additional insights. However, an attempt to follow up on the study about six months later proved abortive, as most of my respondents were no longer involved in working with VIS.)

9. Conclusions

This study was conducted using a method which is an amalgam of approaches, originating from various disciplines. My first conclusion must be as to the value of the method; and indeed, I did find it valuable.

> **The coded PARI sequences resulting from the application of verbal analysis to the raw data obtained during contextual inquiry, did capture the activities satisfactorily.**

Even though I obtained no decisive answers to the original research questions, the method proved far from useless. Other patterns than those originally looked for did show up, sometimes in unexpected corners. Perhaps the most unexpected pattern that I found was one that did not even remotely relate to the research questions:

> **All analyses ranked the respondents' expertise in exactly the same way, which furthermore corresponded to my feelings about their performance as well as their own.**

Without much alteration, the method can possibly be used to rate people's expertise in a given computer-mediated activity. Another application to which the method may be well suited as it stands, is that of defining what are known as personas for the user-centred design of not only documentation, but also user interfaces and classroom training. Personas are fictitious "users" representing the intended audience, and are normally created on the basis of the designers' intuitive understanding of the situation. Basing them on observation and analysis rather than intuition can only be beneficial. This aspect warrants further consideration.

Moving from the method to the results, the most important pattern found was in many respects the lack of a pattern:

> **In order to apply a non-trivial, multi-purpose software tool to fulfil a real-life requirement, users do need knowledge of all four types. Procedural knowledge, conceptual knowledge, strategic knowledge and situational knowledge must all be present.**

This conclusion is perhaps not very surprising. After all, all people differ and can be expected to tackle a given problem from different angles. One publication (de Carvalho & Back, 2000) even claims to have found in the literature over 200 different methods of creative problem solving, which after categorization still constitute 12 distinct approaches. This does not imply, however, that the need is to *provide* knowledge of all four types for every software-mediated activity. The extent of the knowledge that must be provided is contingent upon the intended audience and the nature of the activity. For example, when the activity is straightforward and its motive is expressed in terms of the software (the "one-trick-pony" model described in Part 1 of this paper), all the strategic knowledge that is required may be "the actions must be carried out in the stated order" and the conceptual knowledge that is required may be no more than "measurements are taken as I go along and these are sent directly to the printer at Head Office"—or not even that. In such a situation all that the documentation need provide is procedural knowledge (how to carry out the actions) and situational knowledge (how to interpret, for example, a dotted line flashing up on the screen). Even when the software is complex and open-ended, the intended audience may possess much of the knowledge that is required and again, this then needs not be offered in the documentation. How many computer users in the 21st century need to be told how to select an option from a menu? Which computer programmer using a fifth-generation development environment would require to learn what to use dialog boxes for in a graphical user interface, or what the concept of an escape sequence means in the context of a regular expression? Regardless of their relative expertise, none of my respondents displayed a need for obtaining much procedural knowledge. The practice they had had using the system seems to have been sufficient for them not to make serious operational errors. This includes two respondents (Christy and

Christa) who only learned of the existence of the VIS user manual during the observation session. Where people did make mistakes related to the lack of procedural knowledge, the problem became immediately evident and was solved at no greater cost than some inefficiency. Effectiveness was not compromised. Yet users themselves regard procedural knowledge as important:

Procedural knowledge is what people with relatively little expertise are seen to look for, and what people attempt to teach others who have less experience.

If this can be shown by more rigorous research to be an established pattern then the abundance of user documentation of the "ENUM9" type is at least explained, even if not justified.

All this said, having the prerequisite knowledge is not always enough. People may possess knowledge but not apply it:

Sometimes knowledge that is present is not applied in time; sometimes even it is not applied at all.

Although Christa knew very well that records containing invalid data cannot be saved, this knowledge was accessed only after problems had arisen from her not applying it. Later, I saw her routinely perform an action which could equally well have been applied to a more complicated series of actions that she had carried out before; yet this never occurred to her. What causes people to not apply the knowledge that they possess, would make an interesting subject for further research.

Under-use is seen to stem from missing conceptual knowledge.

If mental models theory is correct, users whose intention horizon lies within the total functionality of the software tool are running an overly limited mental model to predict behaviour of the system. The theory proposes that it may be beneficial to present such users with a more complete conceptual model, explicitly worked out to stimulate meaningful learning. Skilfully presented, such a conceptual model could counteract the assimilation bias that the analysis showed glimpses of evidence for in both cases of under-use that were observed. "If all you have is a hammer, everything looks like a nail." People who believe their toolbox to contain only hammers will use any of the tools inside it to pound away at every challenge they come across, unless it very clearly is *not* a nail in which case they will be dissatisfied with the toolbox. Showing users of sophisticated software all the tools that are in the toolbox will help them tackle many more problems of many more varieties, and tackle old problems more successfully. This is certainly worthy of our best attempts.

When conceptual knowledge is missing, problems of different sorts arise that do not show up immediately if at all; and that may take long to fix even if they are detected.

Missing conceptual knowledge does not give rise only to under-use. It is also seen to result in ineffectiveness, which can be equally serious. The absence of conceptual knowledge causes users to skip actions that are vital to successful completion of the activity. The difficulties that are encountered at a later stage, can then not be traced back to what originally caused them. Even if they can be traced and addressed, this will still result in extra work. Conceptual knowledge is also required for deciding upon a sound strategy. It is mostly strategic knowledge that is seen to drive actions, and in the absence of a feasible strategy a user could fall back on situational knowledge and trial-and-error tactics. Finally, conceptual knowledge is required to appropriately respond to system feedback and messages. Earlier on, I pointed out that a manual is a document with a job, and its job is that of providing the knowledge required to apply a software tool gainfully to a particular task. Conceptual knowledge underlies almost all successful use of complex software. Attempting to provide people with it must surely be one of documentation's chief priorities.

In itself perhaps not as severe a problem as ineffectiveness or under-use, inefficiency is still undesirable. The extra effort adds up; people run out of time and start skipping vital actions; people lose confidence and get lost.

> **Once unnecessary extra work is undertaken, it tends to stretch out and feed on itself. Not caused simply by a lack of procedural knowledge, inefficiency must be taken on by addressing the need for all four types of knowledge.**

With which we have come full circle. In order to apply a non-trivial, multi-purpose software tool to fulfil a real-life requirement, users do need knowledge of all four types. Once procedural and conceptual knowledge are in place, strategic and situational knowledge can develop and grow over time. Then, performance has a chance to improve with practice; rather than practice making for perfection at a suboptimal level. Methods have been developed for providing the necessary procedural knowledge, including minimalism and many of the cognitive enhancements to the traditional user manual. Developing methods for drip-feeding conceptual knowledge will prove the next big challenge.

Part 3:
References and Appendixes

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Appendix I:
EndNote 9 User Manual Table of Contents

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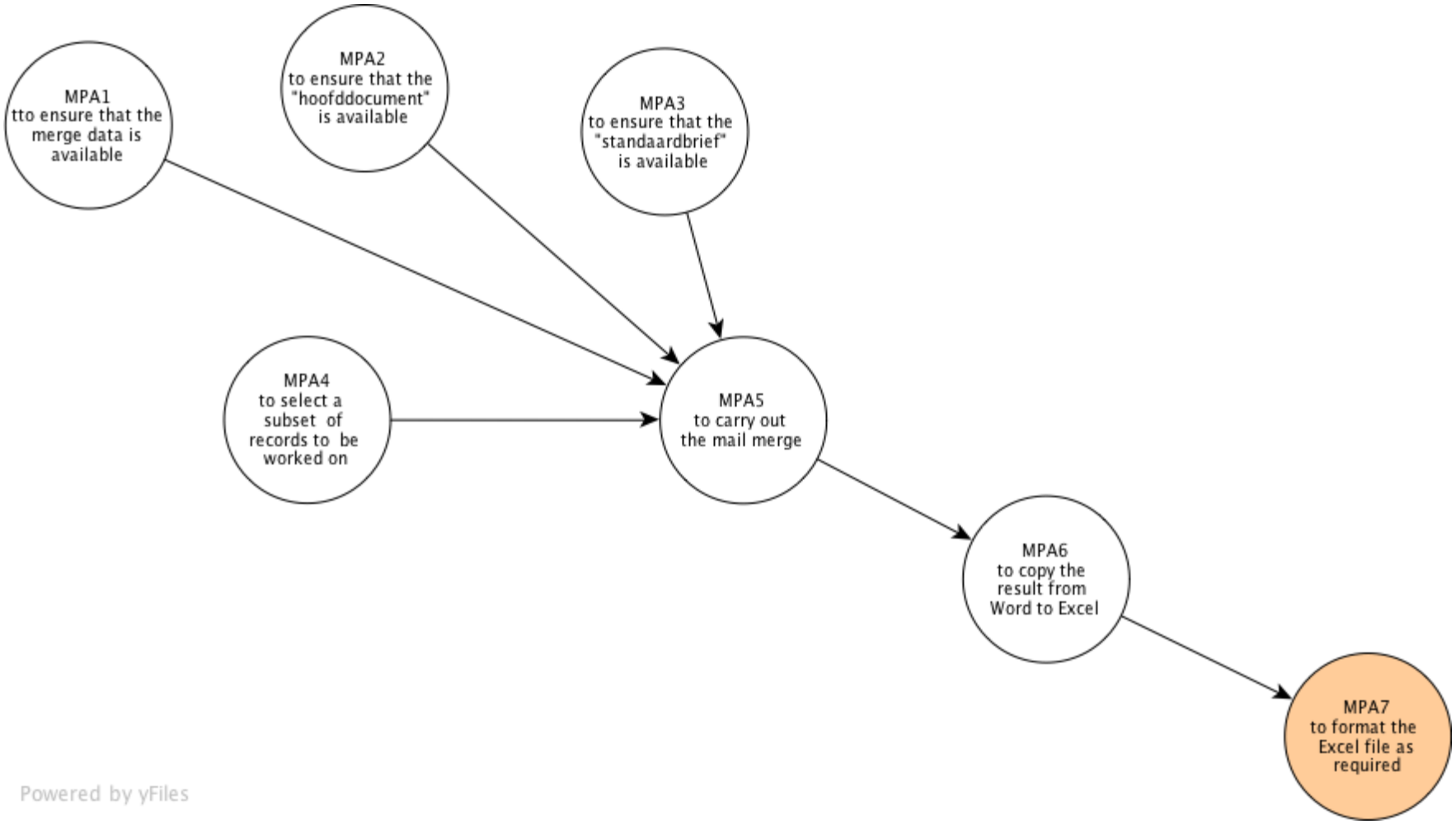
Appendix II: Source Data

Karlijn

Activity

Five times per year I have to make an Excel spreadsheet containing the addresses of all out contacts that we send a relationship magazine to. The address fields must be in separate columns, as the file is delivered to the printer and that's how he wants it. A lot of extra work is caused by the fact that sometimes there are five address fields, sometimes only four—not all the addresses have the Department field filled. I get the data out of VIS, then edit the fields and columns in Excel and sometimes in Word, whichever has the best editing facilities for what I must do. All this takes a *lot* of editing. On average, the job takes me 12 hours which I spread out over one working week as it's such unpleasant work. In the future a colleague will have to do this. I've written down all the steps to be followed in a three-page procedure, hopefully that will help a little. Because if you make a mistake you can only hope you notice straightaway.

Minimal path



Coded PARI sequence

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A1	To show all the columns that are needed (either as data, or as a basis for further processing).	2	What I have here is the starting point for all subsequent work.	strat	Proceed.	A N: MPA1
A2	To select only those contacts that are handled by certain business units.	2	The sooner I get rid of what I don't need, the better.	strat	Proceed.	A
A3	To export the selected records to Excel.	3	I cannot clean up any further, and Excel is where we are heading for.	strat	Proceed.	A
			All the work could have been carried out inVIS, with very little effort.	*conc*		
A4	To remove those records that are set to "no mailing" on either of two levels.	2	The ones we need to be removed, should be removed as soon as possible.	strat	Proceed.	A
A5	To remove data columns that are no longer needed.	3	Some columns were exported only to help make decisions, not because they contain data that we need in the end result. Those can now go.	strat	Proceed.	A
A6	To remove redundant address data when present.	3	When there is both a visiting adress and a mailing address present, we need the mailing address only.	strat	Proceed.	A
A7	To remove inappropriate (unusable) records when found.	2	There are contacts for whom no address is recorded at all. Obviously, we cannot print address labels for them.	strat	Proceed.	A

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A8	To temporarily move the data from two columns to Word for further processing.	3	Next, all sorts of edits must be made to the data. This is done more easily in Word than in Excel.	strat, proc	Proceed.	A
A9	To make the same edit repeatedly to every line pasted into Word (joining together postcode and street).	2	This is a lot of work but I do not know of a more efficient procedure.	strat	Proceed.	A
			"General search-and-replace" (GS&R) was specifically designed to do this.	*conc*		
A10	To move the modified data back to Excel.	3	The Word thing was only temporary.	strat		A
A11	To temporarily move the data from another column to Word for further processing.	3	This edit is done more easily in Word than in Excel.	strat, proc	Proceed.	A
A12	To make the same edit repeatedly to every line pasted into Word (inserting the word "Postbus " in front of the numerical value).	2	This is a lot of work but I do not know of a more efficient procedure.	strat	Proceed.	A
			"General search-and-replace" (GS&R) greatly reduces the effort.	*conc*		
A13	To move the modified data back to Excel.	3	The Word thing was only temporary.	strat	Proceed.	A
A14	To temporarily move the data from yet another column to Word for further processing.	3	This edit is done more easily in Word than in Excel.	strat, proc	Proceed.	A

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A15	To carry out three consecutive search-and-replace actions on the lines pasted into Word.	2	I do not know of a more efficient procedure.	strat	Proceed.	A
			A simple macro could do the trick.	*conc*		
A16	To move the modified data back to Excel.	3	The Word thing was only temporary.	strat	Proceed.	A
A17	To remove inappropriate records.	2	There are still more records than we need.	strat	Proceed.	A
18	To finish off the Excel sheet in accordance with the printer's wishes.	2	The printer wants the Excel file to be organised in a particular way.	strat	Done.	S: MPA7 N: MPA2 N: MPA3 N: MPA4 N: MPA5 N: MPA6

Audio trace

Dit is altijd het begin: ik heb ook altijd het offertescherm en het factureringsscherm dus waar de opdrachten in staan en daar achter staat altijd open het relatiescherm. En in principe werken we vanuit relaties dus als ik een aanvraag krijg ga ik altijd daarheen om vanuit hier of een order aan te maken of een offerte aan te maken; dat zijn eigenlijk de acties die ik in mijn werk voornamelijk gebruik.

Dus dat is eigenlijk hoe ik te werk ga, deze doe ik dan naar beneden gewoon want hier kan ik even snel zien welke opdrachten er allemaal lopen dus dit is het handigste scherm.

Is dat meeloopinformatie of zijn ze los?

Dat zijn losse dingen die ik naast elkaar open zet zodat ik kan zien wat de meest recente offertes zijn. Wat is de meeloopinformatie?

Dat je in het onderste scherm de facturen van deze offerte zou kunnen zien.

Nee dat heb ik niet, ik heb deze twee los van elkaar. In principe is kan dat niet want zodra een offerte een opdracht wordt gaat hij hier uit en komt hij hier in te staan.

Nou versturen wij vijf keer per jaar een relatiemagazine daar staat allemaal informatie voor klanten en voor prospects in; en dat is eigenlijk het moment dat ik naast mijn gewone dingen echt met AV werk en dat is om de adresbestanden aan te maken voor het versturen van het relatiemagazine. Dus ik werk hier vanaf november afgelopen jaar, toen heb ik het overgenomen van een collega van mij die dat altijd deed en ik heb haar manier naar mijn idee nog meer verfijnd want ik werk alweer sneller dan toen ik begon; maar het is nog steeds niet ideaal want het kost met name als we het eenmaal naar Excel hebben geëxporteerd nog heel veel tijd. Dat is eigenlijk wat het meeste tijd kost. En volgens mij moet dat beter kunnen maar daar zijn we dus nog niet achter.

Je gebruikt Excel er ook echt bij, dat is nodig?

Nou, we versturen de adresbestanden in Excel naar de drukker. Dus in Excel moet het perfect in elkaar zitten voordat we het naar de drukker kunnen sturen.

En wat stuur je dan naar de drukker?

Naam van het bedrijf, afdeling, echt de adresgegevens. En die drukken ze dan op van die kleine papiertjes die dan meegaan in zo'n plastic dingetje waar het relatiemagazine in zit. Dus wij maken het helemaal netjes aan met vijf, vier of drie adresregels en dan gaat dat zo naar de drukker.

Nou had ik voor mezelf en ook omdat we nu Inge, die bij de balie zit nu is aangenomen en dit van mij weer gaat overnemen straks, heb ik deze procedures gemaakt. Wij hebben ook een ander bestand en daar staan alleen prospects in. Mensen die wij zelf hebben geworven en die dus nooit een offerte hebben aangevraagd. Die nooit naar ons zijn toegekomen maar waar wij alleen maar naartoe zijn gegaan; daar willen we langzaam vanaf want we gaan nu helemaal over op AV maar dit bestaat nog wel en daar moet dus ook uit gemaild worden. Die maak ik ook altijd, dat gaat alweer wat makkelijker, en dan maak ik dus die uit AV dat bestand.

[4:14] We mailen vanuit contactpersonen want onder de relatie hangen natuurlijk de contactpersonen en die moeten gemaild worden, bepaalde bedrijven hebben meerdere contactpersonen staan; dan **A1** moet ik een scherm met kolommen maken, die heb ik in mijn eigen ding [procedure] opgeslagen, even kijken [leest stap 1 eigen procedure]... relatienaam, gebouw moet er nog bij, adres, postcode plaats... alleen moet ik hier, even kijken, OK: zo sta ik dan in het bestand. Dit is een beetje altijd lastig, we hebben op relatieniveau [een aankruisveld] "geen mailing" maar ook op bedrijfsniveau hebben we [een aankruisveld] "geen mailing", daar hebben we dit vinkje aan staan. Dat is een aankruisveld. Dat betekent dat als er op relatieniveau "geen mailing" staat dan moet niemand die iets met die relatie te maken heeft een mailing krijgen. Maar soms hebben we wel twintig contactpersonen bij een relatie hangen en dan zit er bij sommige contactpersonen staat geen mailing aangevinkt. Dat betekent dat in principe mensen wel een mailing moeten krijgen maar die die aangevinkt staan, niet.

Maar dat is nogal onhandig omdat ze allebei hetzelfde heten. En nu moet ik altijd goed kijken welke welke is. Maar volgens mij, eh...

Je kan ze een andere naam geven.

Ja, dat had ik ook moeten doen, maar nu zie ik het wel aan waar de meeste kruisjes staan welke het is.

Ja, kijk, gezien deze kruisjes die hier staan is dit op contactpersoon en dit op bedrijfsniveau. We sturen dan, dit scherm gebruik ik dan met het beeld dat ik hier heb gemaakt: hier [6:41] heb ik dat opgeslagen, onder "relatiemagazine versturen". Maar dit is ook voor Inge gemaakt, die moet dat natuurlijk nog aanmaken; dan moet ik hier [in de procedure] eigenlijk erbij schrijven dat ze dat moet opslaan. Even kijken, [stap 2 eigen procedure] **A2** nou moet ik de VT-contactpersonen selecteren. Zo zijn ze opgeslagen, VT betekent vertalingen,

Het soort dingen dat je voor ze doet

Precies, via de business units. Ze zijn onderverdeeld naar business unit en deze zijn bijvoorbeeld en voor vertalingen interessant maar ook voor onze EU-afdeling. Dus zo hebben we dat verdeeld. En een contactpersoon krijgt altijd zo'n kenmerk toegekend maar bij de relatie hoeft dat niet zo te zijn; want je wordt pas klant VT als je een keer een opdracht hebt geplaatst, en niet als je alleen een offerte hebt aangevraagd. Dus daarom maken we ook vanuit contactpersonen het mailingbestand. Want als je het op relatie zou doen, kom je niet goed uit.

Even kijken hoor [zoekt, mompelt] Oh kijk, hij staat er nog in. Nou deze gebruik ik dus altijd. Even kijken [leest stap 2 eigen procedure] "zo krijg je bij soort CP dus dat is deze overal een ingevuld veld", OK. [praat over hoe lastig het is dat je niet alle selecties meteen in VIS kunt doen, alleen deze.] Ja, mooi. **A3** [stap 3 eigen procedure:] "Kies Rapporten, Lijst, Extra en dan Exporteren. Geef een datum en naam aan het Excelbestand..." Nou, hij loopt eroverheen... [9:25] OK, dan kan hij naar een Excelbestand en die doe ik naar mijn H-schijf, mijn eigen schijf. Dus daar gaat hij heen. Even kijken... "klik daarna op Annuleren anders wordt het hele document geprint" niet onbelangrijk... "Het Excelbestand komt standaard op je H-schijf terecht" dus nu, en dan is dus wat ik daarvan heb gemaakt, even kijken: hier staat hij dan en dan is dit de Excel die we daaruit krijgen.

Maar nu begint eigenlijk pas de ellende. [eigen procedure stap 4] **A4** Nu moet ik overal de contactpersonen met True waar de bedrijven geen mailing hebben, dat is deze, ja dat hadden we net gezien, dat is die eerste. Die moet ik weghalen omdat dat betekent dat die dus geen mailing mogen krijgen. Volgens mij had ik die bovenaan gezet dus dan doe ik even weg. OK, nu heb ik dus in kolom K alleen maar False staan dus dat klopt. En nu doe ik dan ook die anderen, dus bij de relatie "geen mailing", maar die moet ik dan eerst even sorteren... ja het is een immens bestand... deze moeten we dus allemaal hebben. Daar is dit over, 2600 contacten, ja dat klopt wel aardig. Even kijken, [eigen procedure stap 4] **A5** nu kan ik kolom K en kolom L weghalen die heb ik niet meer nodig en ook kolom J kan ook weg. Want die hebben we verder niet nodig om naar de drukker die informatie door te sturen.

Nu heb je alle namen en adressen, de adresgegevens

Ja maar meestal vullen we zowel postadres als gewoon adres in in AV want dat is natuurlijk wel belangrijk allebei; we gebruiken voor facturering postadres maar als we een offerte aanmaken staat daar het gewone adres van een bedrijf op en niet hun postbusadres. Even kijken hoor. [eigen procedure stap 5] "Overal waar geen postbusadres staat" want in principe wordt het relatiemagazine wel naar het postbusadres gestuurd, "moet het gewone adres komen. **A6** Bij een contactpersoon met zowel postbus als gewoon adres moet het gewone adres verwijderd worden." Dus hij gaat bij voorkeur naar het postbusadres. "Je kunt dit makkelijk doen door Data Sort Column Ascending en dan rechtermuisknop Delete en Shift Cells Left." Dat klopt. Dan ga ik, dan kijk ik naar waar een postbus

Wat heb je hier trouwens, is dit in orde?

Ja nee, daar moet eigenlijk ook nog het woord "postbus" voor... maar dat genereert AV niet zelf, soms, dat is een klein foutje daarin. [13:20]

Daar kijken we straks eens naar.

OK, eh, dan ga ik kolom D dus kijken want dan zie ik waar overal postbus in staat; nou staat dus hier helemaal niks, dan weet ik dat ik daarvoor dit adres zou moeten gebruiken. En verder [14:00] [onduidelijk tot 14:30]

En ik zie dat je er hier helemaal een paar zonder adres

Ja die zitten er ook tussen; en die gaan er dan ook uit. Dan kijk ik wat de reden is dat daar geen adres bij staat maar dat kan van alles zijn, bijvoorbeeld dat dit alleen een keer is gebruikt als factuuradres bijvoorbeeld, of alleen gebeld en iemand heeft niet het adres achterhaald. Dat zijn geen goeie dingen maar het gebeurt wel.

A7 Nou nu kan ik deze even kijken dus wanneer dat is, hier, kan ik dit helemaal naar boven toe weghalen, zo, en dan doe ik Delete en dan doe ik shift cells left en dan gaat dat OK, en dan blijft hij op de adressen nog steeds hetzelfde. En dan hier, verder naar onder, kan ik kijken waar ik nu op kolom G wel iets heb staan want die kunnen ook allemaal weg, al deze informatie. Dus ik zou nu in een keer naar beneden ook kunnen trekken, dat kan ook, maar het kan ook zo en dan doe ik even kolom G, OK, en dan kan ik hier onderaan kan ik dat helemaal weghalen want hier heb ik ten slotte ook een kijk, dit zijn ook foutjes; dat zijn Enters volgens mij. Dat zullen we zo ook nog tegenkomen, dat sommige adressen ook en ik denk dat dat gekomen is van toen we overgingen op dit systeem want we zaten eerst alleen AV en nu hebben we ook APlus en toen zijn er wel dingen niet helemaal goed gegaan en ik denk, ik denk dat het daar mee te maken heeft. [16:40] Nou, naar beneden... zo even kijken: nu heb je dus een heel compleet bestand in principe, dan ga ik daarna... [eigen procedure stap 6] "Nu heb je voor elke contactpersoon maar één adres staan. **A8** Pak de kolom postcode en woonplaats samen door de twee kolommen te kopiëren in Word: Paste Special" moet ik dan doen; "je ziet nu niet meer de lijnen van Excel in je Wordbestand. Haal dan de spatie en de Tab weg en plak alles in één kolom terug in Excel. Let erop dat de juiste volgorde gehandhaafd blijft." Nou, dat moeten we dus doen omdat we dit niet in één blokje in Excel kunnen krijgen en de drukker heeft het wel in één kolom nodig en we weten niet hoe je dat moet doen, hoe je dat in één kolom moet krijgen. Dus ga ik altijd dan

Dat weet ik wel voor je, hoor!

Mooi! Hier zit een tab tussen, zeg maar, als je hem als je hem dus naar Word kopieert gaat er een tab tussen zitten [17:30] Nou ik doe even een voorbeeld want het is niet zo zinvol om dat nu helemaal te laten zien maar dan kun je wel zien wat ik doe. Even kijken, dan start ik Maart op, die moet op mijn eigen desktop staan, en dan deze, dan krijg ik er dus zo een in Word en dan doe ik zo

Wacht even, dit is te snel...

A9 ik vervang een tab, door spaties.

Eén of twee?

Eén.

De PTT doet er geloof ik twee [tussen postcode en plaatsnaam]

En bij deze gaat dat inderdaad altijd goed maar bij sommige adressen zitten sommige tegen elkaar en dat is heel onhandig.

[18:48 – 20:00] [F/E toont hoe deze vervanging met een algemene zoek-en-vevangactie in ieder geval al weer sneller kan]

OK, nou zo ga ik dus dan alles langs zodat dan, dan pak ik dat weer op

Je kan het ook allemaal in hoofdletters zetten als je dat wilt...

Kan dat ook met één druk op de knop?

[20:17-21:19][F/E toont een paar simpele handige Worddingetjes]

Even kijken hoor, nou, **A10** dan pak ik het allemaal weer op, dan kopieer ik het weer en dan zet ik het weer terug in Excel; dan zegt hij past niet en dan zeg ik OK, en dan haal ik deze weg. Alleen de eerste. En dan staat het er dus zo in en dan kan ik dit gebruiken. Dus dat doe ik dan met alles uiteraard en dan ga ik door naar ja, hier staat het ook: "Kies Data-Sort" en dan de kolom de adreskolom dat is in dit geval kolom D en "bij postbusnummers waar geen woordje Postbus voor het nummer staat moet dat toegevoegd worden. **A11** Kopieer die cellen naar Word en **A12** voeg er Postbus aan toe." Dat doe ik dus inderdaad door plakken de hele tijd want ik weet niet hoe ik dat daarvoor dus in moet voegen. Stel dat ik deze pak en ik plak het hier weer in met Paste Special weer want anders krijg ik... dan moet ik dus voor deze moet ik allemaal "postbus" typen en dan doe ik dus één keer typ ik dat en dan pak ik dat en dan plak ik het ervoor.

[22:33-23:55] [F/E doet ook dit met een algemene zoek-en-vervangactie en legt die uit]

OK, en dan plak ik deze **A13** die plak ik dus ook weer terug en zo ga ik dan weer helemaal verder [enkele minuten gesprek over zoeken en vervangen en hoe handig dat is] ... nou dit is dus weer de volgende stap even kijken, punt 8: "kies Data en Sort kolom C", die heb ik hier, even kijken. Nu ga ik weer eens kijken waar een contactpersoon bij zat, gewoon even sorten want natuurlijk heb ik uiteraard een contactpersoon omdat ik op contactpersoon heb geselecteerd; maar om

Wat doe je als je een relatie hebt zonder contactpersonen?

Dat staat niet in dit bestand, dan maken we altijd een afdeling aan. Dus zeg maar als iemand bijvoorbeeld zegt die werkt er niet meer, dan zeggen we Nou naar wie kunnen we dan nu het toesturen en dan vullen we bijvoorbeeld een afdeling in of een nieuwe contactpersoon. Dat wordt heel streng onderhouden om altijd wel een contactpersoon in te voeren. Even kijken, nou, nu ga ik nu heb ik hier dan niks voor staan, hier is geen heer of mevrouw en hier staat nu dus De heer; en dat moet eigenlijk worden Ter attentie van de heer. Dus die pak ik weer allemaal die kopieer ik en **A14** die stop ik hier in Word en **A15** daar gebruik ik dan wel de replacefunctie voor want dan wordt "de" wordt "ter attentie van de". En dan heb je dus deze weer terug. Maar hier gaat er iets mis. Omdat hij De heette dus, dan moet ik het anders doen, anders pakt hij de verkeerde op. Ja nu doet hij het wel. En zo ga ik het hele rijtje af. Zelfde bij mevrouw ook, en ook nog er zijn er ook bij met alleen voorletters: daar plakken we Ter attentie van de heer/ mevrouw voor.

Dus deze mensen die we net hier tegenkwamen, deze, plakken we dus Ter attentie van de heer/ mevrouw voor. Maar dat zou ook raar worden want hoe kan ik dat dan, als ik dit hier even pak, en ik plak dat hier in, en ik wil hier voor als ik er een heleboel heb...

[28:50-29:21][F/E stelt een complexe zoek-en-vervangactie op]

OK. Dit komt dus meestal niet in hele grote hoeveelheden voor want dit hier heb je dan nog allemaal de heer en de heren ook mevrouw heb je nog **A16**

Is het niet handiger hoe dan ook om dit in AV goed te zetten, zodat je dat niet elke keer zo hoeft te doen?

Ja daar zijn we wel mee bezig geweest want dat is best veel werk om dat allemaal voor elkaar te krijgen om overal die voorkant in te vullen. Maar je zou natuurlijk, tenminste.

Nou even kijken, dan heb ik dus de heer en mevrouw heb ik dan aangepast en die ook met die voorletter waar ik dat dan voor ga zetten; en **A17** als laatste dan ga ik kijken van achter uit ga ik deze zeg maar Kolom F dan zie ik waar daar niets staat en die kunnen gewoon eruit, want daar hebben we geen adres bij staan. Die haal ik dan weg. En dat doe ik bij E ook en dan zo van achteren naar voren, dat het steeds kleiner wordt. Dit zijn buitenlandse allemaal die gaan we ook niets sturen, ook omdat het magazine in het Nederlands is. Dus die worden allemaal niet verstuurd.

En je houdt geen taal bij in het systeem?

Soms. Ik doe dat wel als ik een nieuwe klant heb, maar daar selecteer ik dus niet op als ik dit bestand aanmaak. En deze staan er allemaal al heel lang in, dus dat is waarschijnlijk door de conversie dan weer niet aangepast daarmee.

Nou even kijken, D, dat is allemaal niets, nou deze zou ik dan allemaal aangepast hebben intussen en deze natuurlijk ook; dus eigenlijk heb ik geen kolom F. En hier hetzelfde maar dat is natuurlijk weer een ander verhaal want deze hebben allemaal geen afdeling erbij. [32:01] Sommige hebben we en een contactpersoon en die zit dan op de afdeling Communicatie en die voeren we dan in op die manier, en dan moet er dus ook een afdeling bij het versturen bij [in de adresgegevens]. In de stamgegevens zit dat bij Gebouw, ik zal dat even laten zien.

We hebben maar weinig afdelingen, dat is ook iets dat we... je kunt het ook op een andere plek invoeren, het zijn er maar weinig zo te zien. En dan hebben deze dus maar zo weinig kolommen en de anderen hebben er veel meer, één kolom extra. **A18** Nou en van deze maak ik dan vierregelige een werkblad voor en voor deze maak ik een vijfregelig Excelblad. Zo sturen we het dan naar de drukker en er zijn ook drieregelige adressen, en dan kan hij makkelijk de blaadjes drukken daarvoor. In deze Excel voeg ik al die drie bladen samen, ook die drieregelige die uit het afzonderlijke prospectbestand komen.

Er staat hier [instructies punt 9] ook: "Maar aparte worksheets met adressen met drie, vier en vijf regels en voeg de twee bestanden samen zodat je uiteindelijke een Excelbestand met daarin verschillende worksheets met het aantal regels per adres overhoudt." [34:47]

Christy

Activity

Some of our contacts are to receive an attention during the Christmas holidays. A list is drawn up by my colleagues, and using that list I will mark those contacts in VIS that get the bottle of wine or whatever it is we'll do this year. So now I want to make sure that everything is ready when the time comes. Most importantly, I want to compose and save the accompanying letter that will be used for the mail merge. In December I'm always terribly busy, so what I want is for all the settings to be there and the letter to be there, so that in December all I have to do is set it all going after which the letters come off the printer.

Minimal path

Coded PARI sequence

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A1	To click the icon that seems to have something to do with mail merges.	3	I know how to make a selection; and when I've done so, there is an icon that looks like a letter so I guess that's what I need now.	sit	*A dialog box is presented, which does nothing to reassure the TE she's on the right track (even though she is).*	S: MPA3
A2	To press Ctrl+Ins.	3	I want to create a new "standaardbrief", and creating new things is always done in this manner.	proc	The dialog box for the new "standaardbrief" is presented.	A

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A3	To work throught the controls that are presented.	3	I am following the instructions in the manual. They make sense: I am linking VIS to Word here.	proc, conc	*Error message, which in the manual is described as to be expected.*	A
			TE does not realize that not any Word document is a main document ("hoofddocument"). This was explained by the F/E, who really should have kept quiet. Fortunately, this mistake did most likely not affect the subsequent chain of events.	*conc*		
A4	To make the "hoofddocument" in Word.	2	I know what I want to do here, this is similar to how it used to be when we took the data from Excel rather than VIS.	sit, conc	*At some point, a list of values has disappeared.*	S: MPA2
A5	To close and re-open the "hoofddocument" in Word.	2	Things don't just disappear in Word, you can always get them back.	conc	*TE fails to find the merge data file that has been exported from VIS.*	A
A6	To find the merge data file that has been exported from VIS.	3	I had expected it to be presented, not to have to type the full filename.	*proc*	Proceed.	A
A7	To decide on which fields to insert into the "hoofddocument".	3	I want to pick just those that I need; that's difficult, you just don't know what is what.	conc, *sit*	Proceed.	A
			This is true for all other fields but not for the address fields: all seven must always be present.	*proc*		
			The TE is sidetracked into following a Word "Wizard".	*conc, proc*		
A8	To evaluate the result so far.	2	I can only know if things are going well if I see the results. I've saved it so I'll get everything back.	sit, conc	*Some fields don't seem to work out.*	N: MPA1 A

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A9	To finish making the "hoofddocument".	2	The letter is almost done.	strat	Proceed.	S: MPA2
			The TE does not realize that the fields she selects should also be filled with the correct values in the VIS records. If she did, evaluating the results (A8) would have been more productive.	*conc*		
A10	To re-open the "standaardbrief".	3	The manual says to go back to this.	strat	Proceed.	S: MPA3
A11	To inspect the remaining fields for the "standaardbrief".	3	Some fields look like I should use them.	sit, *conc*	Proceed.	A
A12	[Prompted by the F/E: to save the "hoofddocument".]	3	I'd forgotten to save it.	*proc*	Done.	A

Audio trace

Wat gaan we doen?

Ik heb twee dingen: ik heb nog geen standaardbrieven in mijn pakket, die ik wel graag wil gaan gebruiken aansluitend op mijn relatiebeheer wat ik heb; en ik moet bezig met relaties die een kerstpakket krijgen. We hebben wel een standaardbrief, maar die is niet gekoppeld aan AV.

Maar dat heb ik dus nog nooit gedaan!

Wat denk je dat je gaat doen?

Ik heb wel eens gezien bij mijn relaties, die heb ik meestal allemaal open, en daar heb ik dan ook de contactpersonen dan wel bij aan, en daar staat dus zo'n icoontje van een standaardbrief. **A1** En dan ben ik dat wel aan het aanklikken geweest maar dan moet je dus een brief maken. En ik weet niet hoe je een brief moet maken, dat je hem dus gekoppeld krijgt aan AV.

Uitgaande van de situatie dat je zegt, Ik heb bepaalde relaties en die wil ik met de Kerst een flesje wijn gaan sturen. Waarom denk je dat je in dit stadium een brief wilt maken; waarom ga je daar naartoe?

Omdat je die brief voor meerdere personen tegelijk wilt gebruiken. Een standaardtekst, en je wilt die ook voor een ander persoon adresseren. En om te voorkomen dat je bij honderd relaties ook honderd keer het adres en de naam moet gaan intypen... Je hebt de gegevens, dus dat moet toch aan elkaar te koppelen zijn. En ik weet dat je dat vroeger in Excel kon doen en dan kon je koppelen met een Wordbestand en dan had je zo honderd brieven met de juiste namen. En nu staan mijn relaties niet in Excel maar in VIS en het zou wel heel mooi zijn als dat op die manier kon.

Ga je ze allemaal een kerstpakket sturen?

Nee. Ik weet dat ik een selectie moet maken; ik heb in het verleden de selecties gemaakt bij de contactpersoon, als ik die opende, en bij de gebruikersvelden hier om dat in te vullen en dan verschillende mogelijkheden: of hij krijgt niks, of een groot pakket, een kaart, een klein pakket... Dat is ook aangegeven voor een nieuw contactpersoon het jaar daarop dat je die in ieder geval kunt selecteren; en een fles wijn. Ik weet dat op basis van wat je invult kan je een selectie maken. Dus die selectie zou je dan aan die standaardbrief moeten koppelen. En die selectie kan ik best wel maken, als ik van mijn collega's te horen heb gekregen welke relaties dat dan dit jaar moeten zijn, dan maak ik hier een view aan en dan kan ik op basis daarvan de selectie gaan maken. Dan heb ik de selectie en dan krijg ik nog geen standaardbrief.

Dus zo zou ik beginnen: aangeven welke relaties wat moeten ontvangen; die selectie maken en dan zou ik daar een briefje bij willen hebben.

OK: briefje maken.

In Word hebben we wel standaardbrieven maar ik weet niet of ik dat gewoon zo in kan voegen. Die heb ik dus al in Word, de brief die ik zou willen gebruiken.... Kijk, hier is hij, met onze layout die we natuurlijk blijven houden in verband met het briefpapier, dan is het herkenbaar.

Herken je dit venster?

Ja, als ik hier Ctrl+Ins doe dan moet ik volgens mij toe kunnen voegen. Zal ik dat eens proberen?

Maar als ik iets niet herken dan word ik altijd een beetje huiverig want ik ben niet zo'n computerfan. Om te voorkomen dat ik het hele systeem weer in het bedrijf in de war schop dan heb ik iets van, ik geloof dat ik het maar even anders doe! Maar het moet er toch een keer van komen.

Ik beloof dat we hem af krijgen! Als je er echt zonder mij niet uitkomt dan ga ik gewoon tips geven. We krijgen hem af vandaag.

Dus dit is wel goed? **A2** Hier moet ik het inderdaad mee doen? Normaal maak je hier geen tijd voor... en een handleiding was er toen nog niet, die heb ik niet. [8:25] [leest mompelend de handleiding]

Wat ben je nu precies aan het doen?

A3 Ik ga nu een document hierin toevoegen, ik moet het omschrijven volgens mij als zijnde een brief bij het kerstpakket en hieronder bij document moet ik gaan invullen wat de originele naam is van het document in Word. Ik ben nu de koppeling aan het maken tussen mijn standaardbrief om die in te voeren in AV. [vult het dialoogje stamgegevens standaardbrief in] Voor dat document kan ik natuurlijk ook altijd even hier bij het vergrootglas kijken. Hij vind hem niet... maar ik heb toch in Word wel een hoofddocument... nee ik heb hem net opgeslagen...

Ik denk dat ik je hier onderbreek... wat je met net liet zien in Word was geen hoofddocument. Dat was gewoon een brief, die je misschien wel gebruikt als voorbeeld; maar het was geen hoofddocument zoals Word dat ziet.

Wat is dan een hoofddocument?

[uitleg mail merge, met codes op de plaats van variabele gegevens]

OK, dan laten we deze nog even leeg. [leest verder in de handleiding] Komt hij automatisch in het notitieveld te staan?

Als je dat hier opgeeft, dan komt hij daar

En dan zie dat in de notitie bij de contactpersoon?

Ja.

Ik geloof niet dat ik dat nodig vind. Want ik weet wel wat er in zo'n standaardbrief staat, als ik maar weet *dat* die contactpersoon die brief heeft gehad. [leest verder] Kijk ik heb al geleerd dat je nooit op OK moet drukken maar altijd op Volgende; dat scheelt weer een hoop openen![20] OK, dus dan krijg ik van mezelf, want in dit geval ben ik de huidige gebruiker, krijg ik een activiteit zodat ik daar een vervolg aan kan geven. Ik gebruik de activiteiten heel weinig; ik gebruik wel de agenda en verder het enige dat ik doe is de activiteiten die ik heb gedaan die vink ik aan. Ik heb daar een selectie op gemaakt want we zijn begonnen in 2005 [anders wordt de lijst te lang]. Ja, van mij mag hij op standaard afgewerkt. En die naam is als je hem door een ander wilt laten opvolgen.

[foutmelding bij opslaan: documentnaam is niet ingevuld.]

Dus dan moet ik toch een documentnaam invullen!

Kijk nog eens in de handleiding, wat daar staat... Hee, dat is een foutje in de handleiding!

Dus nou moeten we gaan samenvoegen. Even kijken [handleiding]: het hoofddocument maken in Word. Maar we hadden toch al een hoofddocument aangemaakt? Daar pak ik die standaardbrief voor. Ik kijk even... Selecteer het nieuwe standaarddocument... Enter! [25:03] OK! [leest handleiding verder] Een melding verschijnt dat het document nog niet is aangemaakt... het dialoogvenster verschijnt... zorg ervoor dat het vakje niet is aangevinkt...

Ik ga je even onderbreken!

Ehm, dan ga ik naar een willekeurige contactpersoon... "een dialoogvenster verschijnt met de melding dat de brief niet kan worden samengevoegd; klik deze weg met OK". Doe ik. "Het dialoogvenster aanmaken samenvoegbestanden verschijnt; zorg er voor dat het vakje niet is aangevinkt en klik op OK". "Het samenvoegbestand is nu aangemaakt..." [leest zachtjes verder] [Word inmiddels open] **A4** Nu ben ik echt aan het samenvoegen en dat is ook het stukje dat ik herken van vroeger uit Excel en Word. Ik ga dus nu mijn Wordbestand kiezen en ik kan straks de gegevens daarin samenvoegen. Ik zit nu echt in het gedeelte Word waar dan straks de brief komt en waar ik dan AV aan toevoeg. [leest verder in de handleiding]

Je hebt weer dat ding weggeklikt

Oh ja. Hoe krijg ik die nu weer terug?

Weet ik niet...

[probeert de stappen te volgen] Wil ik het huidige document gebruiken? Dat is leeg. En ik wil eigenlijk mijn bestaande document gebruiken. Mijn brief. [30:52] Ik heb hem anders genoemd [zoekt, opent een brief] **A5** Dus nu is het, "het huidige document gebruiken". En "een bestaande lijst gebruiken". Dus "bladeren".**A6** [zoekt AV merge bestand, kijkt eroverheen; wordt op de handleiding gewezen waar staat hoe ze het kan vinden] Dus ik moet naar schijflocatie C! [kan het nog steeds niet vinden, wordt weer op de handleiding gewezen] Hee! Kijk! Je moet dat dus echt intikken! [leest verder door de instructies in de handleiding]

Gaat goed toch?

Ja, ik vind het wel mooi! ... moet ik dit hier dan helemaal selecteren? **A7** OK... maar dan moet je dus wel weten welke wat is van die zeven adresregels. Eén, twee, drie, vier, vijf, zes, zeven... maar nou staat volgens mij alles achter elkaar. **A8** Ik ga eerst maar eventjes sluiten en even kijken, dit kan ik altijd weer terughalen natuurlijk. [37:45] Even kijken hoe het er nu uitziet. Hee, dat is niet handig.

Volgens mij heb je ze gedeleet...

Kijk, zo staan ze er weer wel. Ik heb ze nog alle zeven, onder elkaar.

Twee en drie staan nog achter elkaar

Ja maar adres2 is dan man of vrouw denk ik, en adres3 is dan de naam. Zoals deze adresregel wordt weergegeven zo zou ik hem niet willen hebben: geachte de heer Rademakers.

Waar denk je dat dit dialoogje vandaan komt? Dit komt uit Word, dit heeft er verder niets mee te maken. Je bent nu bezig met de velden van AV. Die staan allemaal in dit lijstje hier. Je hebt nu de adresvelden ingevuld, maar bijvoorbeeld je datum, zou je die niet willen hebben?

Ja! **A9** Dan kan ik dus hier de datum uit gaan kiezen. Nou, gaan we even kijken hoe het eruit ziet. Okee, mooi. En zo ga ik dat dan natuurlijk hier ook doen.

Als het goed is staat hier in de handleiding een overzichtelijk spiekbriefje van alle velden

Oh die moet ik dan pakken... waarom pakt hij hem nou niet?... Dan hebben we die *dear* dus niet nodig. Dan moet ik gewoon toch hier Geachte typen.

Laten we nu even doorgaan en dan straks zoeken we op hoe we dat moeten fixen; want dat deugt inderdaad niet. En je hebt hier ook nog allerlei dingen die in gevuld moeten worden

Dit ga ik weghalen want dat is alleen maar van toepassing bij projecten. Het gaat me met name hierom, het adres en de persoonlijke aanhef. En voor de rest is het gewoon de standaardbrief even aanpassen en mijn initialen. [45:15] En daar zou ik dan mijn volledige naam willen hebben. Staat die er ook bij? Want als ik die ook *Employee* zou maken dan komt mijn voornaam erbij. [blijkt een wens] Maar dat is niet erg, want als ik dan in de vaste tekst

dit is de vaste tekst

Jawel, maar is dit dan mijn vaste tekst voor al mijn brieven die ik voor de Kerst ga sturen? Dus bij een verhuizing maak ik dan een andere... Dus die wizard heb ik niet meer nodig, zei je. Mooi spiekbriefje trouwens! [49:19] **A10** Oh, in dat vakje. **A11** Dan zou ik dat dus bij mijn omschrijving wel moeten aanklikken...

Wil je de omschrijving van de gebruikersvelden ergens gebruiken in je standaardbrief?

Oh in de brief zelf? Nee, dat is niet nodig.

Misschien wil je nu eventjes... hier staat toch "sla het document op"...

Jeetje ja, dat is wel handig, even opslaan! **A12**

Het gaat hartstikke goed!

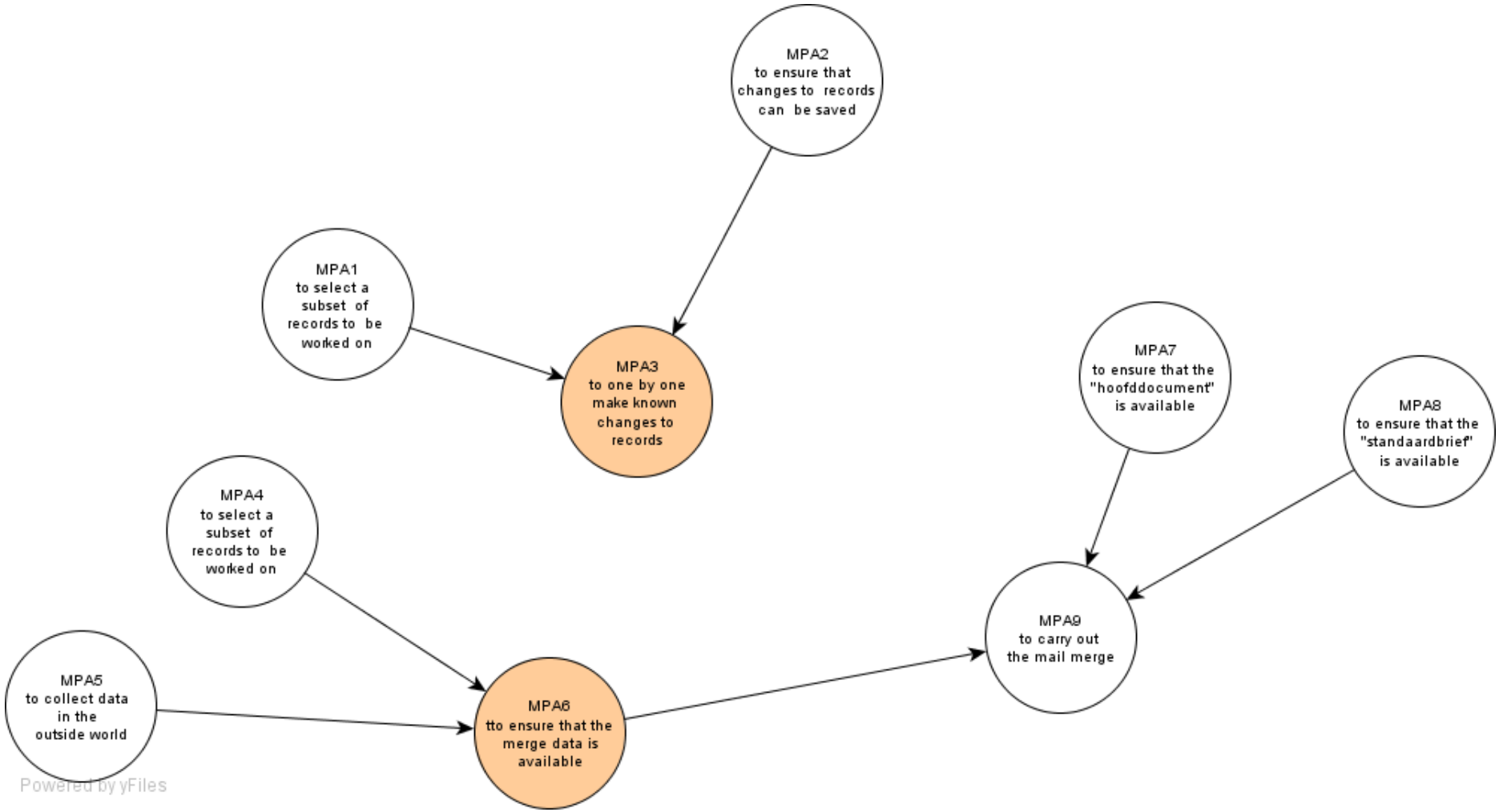
Ja hè? En het lukt ook.

Christa

Activity

When we first acquired VIS, we exported all our customer data from our old system and read them into the new one. Inevitably, the data must now be cleaned up. For example, we need to make the contact type obvious in the contact code. This is because we could have more than one record for the same company, where a company can have different roles. I really should get those codes right. This is one main concern right now. Another one is more urgent, because we need to send an invitation by e-mail to all ninety or so contacts within one particular company. Many of those we don't have an e-mail address for, so they must be found and then I must enter their e-mail address if I can find it.

Minimal path



Coded PARI sequence

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A0	To create the "hoofddocument".	2	All I had to do was change the data source for an existing document, you can't do a mail merge without this.	strat	[not observed]	S: MPA7
A1	To show an overview of only those contacts that may need changing.	2	Once I have all customers in one place, I can change those code fields one by one if and when required.	strat	It is not clear what to base the selection on.	S: MPA1
A2	To select only contacts of a particular type.	2	I am not quite sure which field to look for.	sit	Proceed.	A
A3	To modify those records that seem wrong.	2	I need to inspect every single one to see if it's right or wrong. If it's wrong, I need to correct it.	strat	*There is a second field, not currently under consideration, for which a value is mandatory yet not always present or valid (due to incomplete conversion). When this is the case, the record cannot be saved and an error message is displayed.*	N: MPA2 S: MPA3
A4	To repeatedly: click away an error message; go to a different tab; fix a corrupt field value; and save again.	3	The message tells me to do this.	sit	Annoyance.	A's (series)

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A5	To change the value of the offending field for all selected records.	2	If I set that pesky mandatory field to the most commonly occurring value for all records in one go, all I have to do afterwards is modify it in those few cases where I need a different value. And then I can set all those codes without worrying about forgetting that separate tab and thus being unable to save the record.	strat, conc	*TE shows all contacts, then picks the menu option. The dialog box does not offer the field the value of which she wishes to set.*	S: MPA2
A6	To find the field the value of which is to be set.	3	It should be here somewhere.	sit	*TE cannot find the field she's after.*	A
			It is a special type of field, the names of which can be found under a common label.	*conc*		
A7	To inspect one random record.	2	If I can see what I'm after, I can deduct the name from the values I see in a real-life example.	strat	Proceed.	A
A8	To finish the sweeping change (A3).	2	I now know which to select.	sit	*Field value is not offered for the selected field.*	A
A9	To select the field to change and the value to put in it.	3	I've obviously picked the wrong one.	sit	*Processing continues but is very slow.*	A
A10	To cancel the change.	2	It's so slow, perhaps I should try again.	strat	System asks for confirmation of cancellation.	A
A11	To cancel the cancellation so that the process is resumed.	2	I've no choice really.	strat	Proceed.	S: MPA2

	action (A)	**level**	**precursor (P; italics indicate precursors identified by the F/E as missing)**	**type**	**result & interpretation (R&I; italics indicate the result being unexpected)**	**CI**
A12	To show all contacts belonging to a particular company.	2	Now that I know how to go about it, I'll leave the code change to some other time. Let's move on: we wish to target all our contacts at XXX.	strat	*Result looks OK-ish but not convincingly so. View in which the result is presented is carried over from the previous time.*	N: MPA3 S: MPA4
A13	To change the selection.	3	After all I've just been tinkering with those codes.	conc	Proceed.	A
A14	To sort out the ones for which an e-mail address is present.	3	If we don't have an e-mail address for them, then it's no good trying to mail them.	strat	Proceed.	A
			There is no need to highlight particular records by sorting the overview: this could have been included directly in the selection.	*conc*		
A15	To carry out the mail merge.	2	This will result in a Word document containing all the e-mail addresses. Those I can then cut and paste into the separate e-mails in Outlook.	strat	*Error message: "for some contacts, the e-mail address is not present. Do you wish to proceed?" Puzzlement.*	S: MPA9 N: MPA5 N:
			The process could have produced the complete mailing, in formatted HTML mail through Outlook.	*conc*		

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
			If for any reason you wish to manually use Outlook for the mailing, the addresses could quite easily have been taken directly from the overview; there is no need for the complicated export to Word.	*conc*[1]		MPA6
A16	To click away the dialog box.	3	I've no idea what this means; after all I selected only the ones with an e-mail address so the message must be nonsense. I'll proceed and see what happens.	strat	*List of e-mail addresses is created in Word, despite the error message.*	A
			Unknowingly, the TE has asked for a particular e-mail address to be included in the data set, which was not in all cases available.	*conc*		
A17	To check the resulting Word file against VIS overview.	2	If it looks good, I'll be happy to use it.	sit, strat	Some e-mail addresses are obviously wrong.	A
			The Word file is constructed from e-mail addresses from a different field (the one that was confirmed to be filled in A12, not the one that the error in A13 referred to).	*conc*		
A18	To collect printed lists, screens and the XXX company website.	2	During conversion from our previous system, some e-mail addresses got corrupted. These are immediately visible, they look all wrong.	conc, sit	Proceed.	S: MPA5

[1] The TE knows how to do this: it is the simple technique she uses in A18.

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A19	To check and where appropriate fix every selected contact's e-mail address.	2	There is no reason to proceed unless we've got them all.	strat	Proceed.	S: MPA6

Audio trace

We kunnen wel even onder relaties kijken—wat bij ons hier aan de hand is, wij hebben zeg maar een structuur, dat wij voor relaties hebben wij een apart veld aangemaakt even kijken, ik pak even een goeie erbij bijvoorbeeld dit: in relaties staan bij ons de crediteuren, debiteuren en relaties. Nu hebben wij daar bepaalde zoekcodes voor aangemaakt, voor een debiteur bijvoorbeeld dat heeft deze opbouw. Drie letters, drie cijfers. Voor een crediteur is dat drie letters, vier cijfers, zoals deze bijvoorbeeld; en we wilden voor de relatievelden wilden we dus drie letters, twee cijfers doen. Zodat we dat zeg maar meteen kunnen onderscheiden.

En als je relatie nou straks een klant wordt? Wat toch iets is waar je naar streeft? Moet je dan de code veranderen?

Nee, dan kopiëren we hem gewoon, dan staat die daar in principe dubbel in, maar wij hebben een beetje moeite met de afleveradressen want we werken met hele grote instituten, bijvoorbeeld XXX in Utrecht, die heeft verschillende adressen bijvoorbeeld een onderzoeker die kan op adres A zitten maar een product moet bezorgd worden op adres B. En dan kan je juist, ja dan hangt die persoon in het relatiebeheer aan adres A en daar moeten ook alle brieven naartoe gestuurd worden en alle offertes naartoe gestuurd worden; maar die producten die moeten naar adres B en vandaar dat we dat uit elkaar hebben getrokken in het relatiebeheer.

Dus je kan iemand er twee keer in hebben, een keer als klant en een keer als degene die... tenminste een bedrijf heb je er dan twee keer in.

Ja, precies, een bedrijf wel een contactpersoon niet maar een bedrijf wel en dan puur om te gebruiken als debiteur zijnde en puur om crediteur zijnde. Maar omdat we heel veel uit ons vorige programma voor relatiebeheer hebben overgenomen staan er bijvoorbeeld ook nog deze codes in, alleen drie letters, bijvoorbeeld dit; en die moeten dan allemaal aangepast worden naar de juiste debiteurencode eh relatiecode.

Ik snap het; of niet helemaal, waarom je al die moeite zou willen doen, maar toch.

We hebben wel geprobeerd om dat te integreren zeg maar; maar het is gewoon heel lastig.

Ja, je hebt natuurlijk toch altijd heel duidelijke plannen van wat je wilt.

Ja, inderdaad ja. En we hebben het er ook met de fabrikant over gehad van ja hoe kunnen we dan doen, want het liefste willen we dat ook eigenlijk wel, maar het was gewoon niet mogelijk om bepaalde redenen. Even kijken, dit was iets wat ik nog steeds moet gaan doen. **A1** Ik ga even een selectie maken op basis van relaties maar dat heb ik eigenlijk nog niet gedaan hoor, **A2** even kijken hoe je dat moet doen. Ehh.. hij staat er niet bij, kijk hier, AccountPlus Relaties en dan Type dat type soort type dit is hem denk ik niet, dit is hem ook niet.

Hmm, dat is de verzamelrekening... en wat zit hier dan nog meer onder?

Relatietype, voor Nee, dit is een andere, die hebben wij eh ??? [5]. Hee, nu zit hij vast... Hij is een beetje langzaam**, A3** Ik zal dat even aanpassen, gewoon één voor één in gaan typen; eigenlijk moet ik deze ook veranderen maar dat kan natuurlijk niet. Dit kom ik vrij veel tegen, we kunnen het op zich wel maar je werkt natuurlijk ook met meerdere mensen en meestal doen we dat dan om zes uur of als iedereen eruit is, dan kan je het gaan bijwerken. **A4** Maar wat ik op dit moment wel kan doen dat is die zoekcode aanpassen, dat wordt dan F001. Oh ja. Die hebben we zelf toegevoegd of zo. OK. Nou kijk, hier hebben we dus, zullen we er even uitgaan—hij is langzaam! [...] Ja kijk, nu hebben we dus ook al een andere AAPR [7:30] maar meestal beginnen mensen dan met 10 of zo... hij is langzaam maar dat komt denk ik omdat ik een selectie gemaakt heb die vrij groot is...

Wat is daar die "soort klant" die je in de gebruikersvelden opvoert? Wat bedoel je daarmee als je daar kiest klant?

Ja dat hebben we snel even ingevoerd dat gaan we nog aanpassen qua termenmaar een selectie wat betreft is het een leverancier, is het een klant, is het een overige zakenrelatie; dat is die onderverdeling in een relatie.

Dat snap ik toch nog niet helemaal, je weet toch ook al of het een debiteur of een crediteur is?

Ja nee dat is dus het nadeel dat je het relatiebeheer los hebt van je crediteuren en debiteuren. Die heb je daar los van. Dus alles wat je al met crediteuren en debiteuren hebt, die heb je dus ook in het relatiebeheer en dan heb je niet die onderverdeling debiteur crediteur.

Die heb je toch wel?

Dan wordt het type "relatie" en we mailen dus ook uit het type relatie dus niet uit debiteur of crediteur. Dat is dus het nadeel, vandaar dat we dat hebben moeten aanpassen.

Kijk, XXX, dat is dus een klant... [bladert] Ik moet eerlijk zeggen, ik heb die handleiding nog niet gezien.

Hebben jullie die niet gehad?

Mijn baas misschien maar ik heb die in ieder geval niet gezien! Ik dacht toen je belde hee, hebben we een handleiding wat handig! [...] [10]

A5 Nou je kan bijvoorbeeld volgens mij, je kan *alle* doen, ik weet net hoe veel dat er zijn; dat zijn er 719; ik denk dat het gros dat is klant. Ik denk dat er maar een paar tussen zitten die leverancier zijn of overige zakenrelatie. Je kan natuurlijk alles "klant" geven en dan kijken hee welke wijken af en die kan je dan handmatig die paar die afwijken handmatig aanpassen.

En die kan je dan weer hier op het scherm markeren en dan...

Precies! En dat kan je dan weer aanpassen inderdaad. Met 719 moet dat nog wel lukken. Dat kan volgens mij met optie eh Veld wijzigen; relatietype was daar.

Was dat niet een van die gebruikersvelden?

Ja, klopt! Soort relatie. Ik zet hem er gelijk in. **A6** Hij staat er niet tussen, hij moet er wel tussen staan...

Het was een gebruikersveld, toch?

Oh ja natuurlijk, kijk. Gebruikersveld nummer 2. Ik ga even er uit, **A7** oh, lijstveld nummer 3, nee nummer 2. Als je de juiste hebt dan hangt die lijst ook erachter, waar je uit kunt kiezen. Ja. Ik denk dat die nu alleen voor XXX zijn als ik dat doe. [...]**A8** Mmm, ik heb aankruisveld gedaan. [13:30] Lijstveld moet ik hebben... **A9** Hij blijft weer een beetje steken! Ja. Ik heb hem nog nooit zo langzaam meegemaakt. **A10**

En dat gaat hij dan 719 keer doen. Hee, ga je nu annuleren?

Nee juist niet, ik ga juist dat afbreken annuleren. **A11** Hij gaat al wat sneller. De Wordkoppeling zou ook heel handig zijn want eigenlijk moet het VIS-pakket de databank worden van iedere medewerker en nu is het zo dat bijna niemand met VIS werkt.

Jullie gebruiken dus ook de Agenda en Tedoens niet?

Nee, we doen nu alles via email dus als iemand belt, dan sturen we gewoon een email van hee, je moet die en die terugbellen; of briefjes, maar dat moet toch ook gewoon via het pakket kunnen!

Ja, het kan, maar als het via email ook goed werkt, dan kan je je natuurlijk afvragen in hoeverre je dat wilt veranderen, je moet niet gaan veranderen alleen omdat je iets nieuws hebt gekocht...

Maar er zitten ook voordelen aan want vooral nieuwe contactpersonen die kun je dan in je relatiebeheer updaten dan heb je gewoon alles er wel goed in staan. Maar onze mailingen dat werkt al heel goed bij ons, dat doen we heel veel en dat gaat prima. Alleen waar wij heel erg mee zitten is dat we vanuit het pakket willen we ook graag offertes versturen via email. Op dit moment is die koppeling er wel... maar hij kan geen plaatjes versturen. En dat lettertype dat is nu gewoon Times New Roman nummertje elf; geen opmaak verder.

Maken jullie gebruik van het idee van contactpersonen of werk je alleen maar op relaties?

We gebruiken juist die contactpersonen heel veel, eigenlijk zitten we juist niet in relaties te werken; vooral om telefoonnummers op te zoeken, emailadressen op te zoeken, dat soort dingen... Maar ik moet straks toch nog even die zoekcodes aanpassen.

Maar in ieder geval krijg je nu niet meer elke keer die foutmelding, er staat nu in ieder geval iets in!

Laten we **A12** die selectie gaan maken voor die mailing, we hebben een mailing klaargemaakt om per email te versturen aan alle mensen die we kennen bij XXX, en dan kan ik die allemaal gaan mailen. Laat ik dat meteen doen, dat je mee kunt kijken. [19] Het is trouwens heel leuk altijd ook als iemand van de fabrikant langskomt, dan denk je toch hee hij doet dit op die manier, of dat, dat je denkt dat kan dus allemaal veel sneller. Ik ben echt heel benieuwd wat er allemaal nog meer mee kan. Hee hij is klaar! [...] Contactpersonen werken we het meeste mee moet ik zeggen. Die kolommen die heb ik nog staan van de vorige keer. Maar laten we die selectie gaan maken voor die mailing. [21] Het nadeel is dat we nog steeds geen mailtjes kunnen versturen via VIS en dus in een Wordbestand en dat je dan emails kunt versturen; omdat juist die opmaak neemt hij niet mee. Dus dat doen we dan eigenlijk nog steeds handmatig. De Wordbestanden maken we wel, kijk hier hebben we een hele lijst en die hangen we dan met de hand aan een email. **A0** Kijk, ik heb hier een document aangemaakt en daar verzamelt hij alle emailadressen achter elkaar en die kan je dan knippen en in je email plakken. [22]

Ik ga even een kalender aanmaken; maar die zoekcode, oh die staat hier natuurlijk op bedrijven, zodat die activiteit ook aan de klanten komt te hangen... ik **A13** vraag me af of ik nu een goede selectie heb gemaakt omdat ik met die zoekcode natuurlijk heb zitten pielen... verwijderen... even kijken... **A14** Even kijken of ze allemaal email hebben. Kijk die is niet leeg, volgens mij moet je die hebben. Zo heb je degenen die allemaal email hebben. Nu zijn het er minder, 48.

Dat kan er mee door.

Nu ga ik die allemaal markeren **A15** maar eigenlijk moet ik nu een aparte activiteit aanmaken... Een nieuwe aanmaken zodat die activiteit ook aan de klant komt te hangen van hee, we hebben toen een mail gestuurd en dan is daar een activiteit van in VIS. [25] Is dat hem, ik zie hem niet? Ja, dat is hem wel... Wacht even, ik ga hem even anders noemen. [Daar is dat dialoogje, wil doorklikken]

En dan adressen, anders denkt-ie dat het een echte uitnodiging is.

Dit klaagt hij wel de hele tijd over; even kijken, hier: selectietype is mailing en dan hebben we hier eentje aangemaakt voor e-mailing. [tikt] "E-mail uitnodiging roadshow"... ik heb 'm nog niet eerder gehad hoor... Oh, hij heeft dat ook overgenomen. Dit hoeft allemaal niet, medewerker dat vult hij vanzelf wel in.

Je wilt er geen vervolgactiviteit aan hangen?

Nee gewoon een uitnodiging en dat is het. Dus dat is allemaal OK. Activiteit toevoegen, nou dit is daarna wat ik wil, Voltooien.

[foutmelding] Dat is vreemd, want je had een selectie gemaakt. [28:30]

A16 Ik ga er even uit. **A17** Ik ga even kijken wat er gebeurt dan. Hij heeft ze allemaal!

We hebben de verkeerde selectie gemaakt!

Ik weet niet waarom hij dit doet maar ik wil wel kijken bij het samenvoegbestand, misschien dat er daar wat aan de hand is. Kijk die zit er dus wel in. Dat zijn ze allemaal! Dat is toch mal, dat klopt niet, dat kan niet allemaal. Maar dat zijn ze allemaal dus dit is de goede. Misschien dat dat het toch is, dat hij zegt het is toch tekst. Ik ga deze even afsluiten. [30]

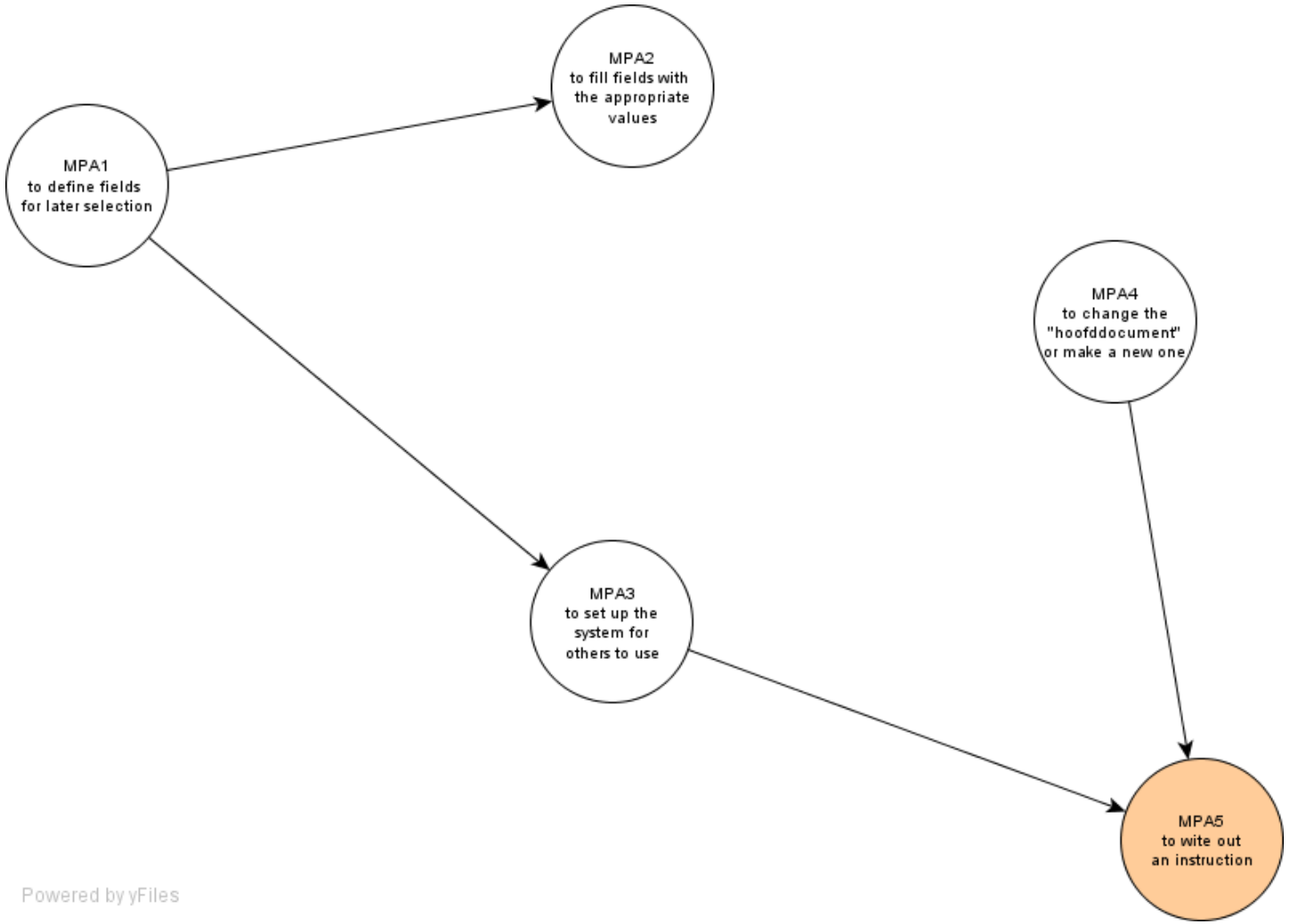
Ik ga ze even doorlopen... die klopt, die niet... [...] Dit is ook allemaal afgebroken door het vorige programma dat we hadden. [...]Wat ik eigenlijk wel interessant vind is dat als we van iemand het adres niet hebben om daarvan het adres wel te krijgen want die wil je eigenlijk toch wel mailen. **A18** Kijk, die wil ik eigenlijk even hebben, die ga ik allemaal even wijzigen. Want de adressengids van XXX staat op hun website en die kan je dan allemaal gaan opzoeken. Nu ga ik dus deze even uitdraaien. Ik ken geen goeie manier om dat te doen, Selectie markeren... ja 48... ik ga die denk ik gewoon exporteren. Rapporten, Lijst, Extra, Exporteren. Dan heb ik daarin alle mensen van XXX waarvan we geen email hebben. Want we willen die mailing wel gaan doen zeg maar. En precies de helft zeg maar. **A19** Dus die moeten we dan even gaan opzoeken want dan kan je ze gaan mailen. [35]

Clara

Activity

We acquired VIS because our organization is expanding, and we need to ensure that everybody works with the same customer data. The application managers will be the first to really start using VIS. But they can wreak havoc, so I want to make sure that all the fields are there and have the appropriate values, and then I need to tell them what definitely not to touch. So I'm writing an instruction for them which includes screen dumps. And I'll be setting up their views and such, so that they always have a baseline to return to. In addition, the one standard letter that we use has been changed recently and now it no longer works, so I need to fix that.

Minimal path



Coded PARI sequence

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A1	To ensure that the appropriate value is set for two related key fields.	2	These two fields have a special purpose in our set-up. They need to be right before we can do anything else.	strat	Proceed.	S: MPA2
A2	To create a new "hoofddocument" and edit the "standaardbrief" to call it.	2	Our ideas as to what we want to communicate have changed. That goes in the "hoofddocument". The "standaardbrief" is what links the merge data (from VIS) to the Word environment.	conc	*Testing the new setup reveals that the data is not picked up in Word and no merge takes place. An error message states that no data source is present.*	S: MPA4
A3	To inspect the "standaardbrief" for clues.	2	As the data are not picked up, there must be something wrong in the link; and the link is in the "standaardbrief".	conc	*Nothing looks wrong; dead end.*	A
			The "hoofddocument" must be a special sort of Word document, which cannot be created by copying and pasting from a previous "hoofddocument".	*conc, proc*		
A4	To give up and ask for help. (On request, the F/E inspects the "hoofddocument" for clues and fixes the error.)	1	I don't know what to do and this must be fixed before I can proceed.	strat	*Testing now results in the merge taking place, but a different error message is displayed.*	A N: MPA4
A5	To click away the error message.	3	This message cannot possibly be important; I get it often, yet the results are always fine. I'm too busy to find out what it's about.	sit	The resulting merged document looks fine.	A

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
			The message stated that some fields cannot be updated; i.e., that up-to-dateness of the result cannot be guaranteed. Thus, even though all data seems to be present, it may well be wrong. (F/E fixes the "hoofddocument" in two respects, as a favour.)	*conc*		
A6	To work out how the system is best set up for others to use.	2	I need to play with it, to see what's available; then after I know what I want to do, I can print the screens and use those screen shots not only to quickly do the same setup on the other machines, but also as illustrations in the instructions I'm going to write.	strat	Proceed.	A
A7	To set up the system for others to use.	2	The more I can restrict them and guide them, the less harm they can do to the setup and the data.	strat	Proceed.	S: MPA3
A8	To write out simple instructions.	1	If I write it all down, they know what to do and are less likely to get things wrong.	strat	Proceed.	S: MPA5
A9	To add and modify fields and values as and when required.	2	Whenever we see some interesting possibility, we make a field or decide to use a particular field for a particular piece of information. If later we find that things could have been done more appropriately, then we may start again from scratch, but only if there's time.	conc, strat	Proceed.	S: MPA1 S: MPA2

Audio trace

Hebben we hier Hoofdcontacten. Die is bij ons gekoppeld aan... ons systeem is sowieso gekoppeld aan het systeem dat berichten zeg maar vanuit de IT-afdeling dus vanaf de server in de facturatie plaatst. Dus het is een gekoppeld systeem bij ons. De bovenste, het hoofdcontact, is de tekenbevoegde die de certificaten heeft ondertekend. Dus dat is van belang dat dat blijft staan. Op die persoon. Niet dat iemand denkt van hee, dat is mijn hoofdcontact, laat ik daar eens iets anders neer gaan zetten want dat vind ik. Blijf er af, blijf er af! Dat is ook de boodschap die ik daar ga doorgeven! Het administratiecontact, dat is het contact waar de factuur naartoe gaat, dus dat moet per se zo blijven staan. Dat zijn van die dingen waar je niet wil... zoals twee weken terug, vraag me niet hoe, maar toen zijn er een paar mensen in het systeem gekomen, bewust hoor, om adressen erin te stoppen en alles was weg; hoofdcontact, administratiecontact. **A1** Dus ik heb drie dagen zitten kloppen met z'n tweeën. Dat moet je dan allemaal weer in de mappen na gaan zoeken wie de tekenbevoegde zijn en waar de factuur naartoe gaat. Dus dat was niet echt fijn. En daarna ben je dan nog scherper. Voorkauwen, hoe je dat doen moet, ik heb echt een paranoïde reactie op het feit dat mensen in "mijn" systeem zouden zitten werken!

Gebruik je die twee velden ook voor het aanmaken van correspondentie in de Wordkoppeling?

Nee, deze twee velden hebben we daar niet per definitie voor gebruikt.

Want in de Wordkoppeling hebben die twee velden een speciale functie.

OK... dat wist ik dus niet; zo ver ben ik nog niet. Wat wij gebruikt hebben wat betreft de Wordkoppeling is de brieven, als de mensen een eerste factuur krijgen dan doen we daar een brief bij en **A2** die is dus net ook vernieuwd, en dat werkt niet. Dus ik denk, ik laat dat even lekker staan en dan kunnen we samen uitknobbelen wat ik verkeerd heb gedaan! Ik weet dat wel zo ongeveer, maar dat doe ik dus te weinig om uit mijn hoofd te weten hoe zat dat ook weer. En ook in de handleiding, daar heb ik wel eens wat moeite mee van waar ga ik dat vinden. [zoekt, praat over de handleiding, wil register, 5 min.] Kijk, ik heb hem hier in gezet. Er stond een andere en ik denk dat het handiger is om die [brief in Word] te bewerken. Want die staat er in, die is gekoppeld en deze is niet gekoppeld schijnbaar. Ik denk van oh dat is makkelijk die zet ik daar neer, maar dat gaat dus niet; dat werkt niet zo. [Word pikt de waarden niet op uit het databestand.]

Wat bedoel je met niet gekoppeld? – Hee kijk, daar [administratiecontact] gaat vanzelf de brief naartoe.

Ja, die gebruik ik dus wel! Onbewust gebruik ik dat goed... Ik maak er nu eentje voor die geselecteerde maar dat gaat nu niet werken want ik heb hem niet gemarkeerd; of hij is niet goed samengevoegd; in ieder geval hij doet het dus niet. **A3** Kijk deze velden stonden er wel in maar ik heb dat document aangepast in Word en teruggezet op de plek waar die andere ook stond. Maar het is een nieuw bestand met een andere naam en die herkent hij niet. Dat wou ik graag met jou oplossen! **A4** Kijk, dit was de eerste versie, die stond er, en die heb ik er gewoon naast gezet. Dan moet je 'm dus helemaal via die samenvoegvelden en zo weer opnieuw activeren?

Daar kijken we even naar. Je hebt wel de goeie brief geselecteerd, die bovenste? Of is dat hem niet?

Ja, dat is hem. Of moet hij hetzelfde heten misschien?

Nee, dat niet. Kijk, dit staat netjes op C:Vis, met een voorkeur op postadres, het is een brief dus hij gaat meteen naar Word; je laat hem niet automatisch opslaan; je genereert geen activiteit. Klopt?

Klopt.

Nou, laten we dan eens kijken wat de foutmelding zegt. Dit zou hij gewoon goed moeten doen maar ik heb dit vaker gezien [Word-melding dat databestand ontbreekt].

Die oude brief, die eerste versie, die heb ik vorige maand nog gebruikt en die doet het wel. Maar dit is schijnbaar niet gekoppeld.

Ik heb er gisteren nog wat over gelezen, waar heb ik dat nou gelezen... daar is hij, OK. [koppelt databestand aan brief]

Gaat hij nou nog verder?

Nee, dit is 'm al. Dit is de brief die je gemaakt hebt, alleen voor de geselecteerde relatie. Je had er maar een geselecteerd dus je krijgt er maar eentje, dat klopt. Wat er gebeurd is is dat hij niet dat databestand heeft gevonden dat uit het systeem is geëxporteerd, en dat heb ik 'm nu handmatig verteld. Als het goed is doet hij het nu wel. Kunnen we dat hoofddocument even openen? Even schakelen met dat abc-gebeuren, kijken hoe dat eruit ziet. OK, ga je gang, doe het nog eens, kijken of hij het nu wel doet.

Kijk, dat doet hij dus nu ook, en dan **A5** doe ik dit [andere foutmelding vanuit Word] weg en dan is hij goed. Dat heb ik vorige maand met allemaal andere brieven ook gehad.

En die foutmelding, heb je die gelezen voor je 'm wegklikte?

Nee, die doe ik dus dan dicht.[12:10]

Kijk, dit komt uit Word: "er zijn vergrendelde velden aangetroffen." Vis gebruikt de mail merge functionaliteit van Word en doet daar dan heel erg slimme dingen mee.

"Vergrendelde velden..." dat klik ik maar weg, want de goede brief zit daar gewoon achter. En ik kan daar niets mee en met de factuurronde moeten er zeshonderd facturen uit met die brieven erbij en daar ben je dan razend druk mee en dan heb je helemaal geen zin om daar naar te kijken. Dat is wel leuk om dat uit te zoeken maar het werkt toch wel, dus dan klik ik dat weg want ik heb wat ik hebben wil. Als er fouten zijn zie je dat gauw genoeg. Wat je wil zien, staat er goed in, dat zie je meteen. Hee... hij is toch wel anders dan het voorbeeld. [14] Dus hij doet wel iets anders dan wat ik wil. Kijk hier staat hij, dat faxformulier begint hier [afdruk oude brief] op de volgende pagina en bij deze staat hij hier [middenop pagina in nieuwe brief].

En hoe heb je ervoor gezorgd de eerste keer dat dat faxformulier op de volgende pagina begint?

Ik heb hem gekopieerd uit een ander document en daar achter geplakt. Ik weet niet hoe hij eerst wel op de volgende pagina begon. Ik ben gewoon hier gaan staan en toen heb ik hem erin geplakt.

Kijk, dit is wat er gebeurd is. Je hebt nu geen zeven adresregels. Die zeven adresregels kwamen zo uit dat dat faxformulier op een nieuwe pagina begon, omdat dat net zo uit kwam; maar nu heb je maar drie adresregels en begint hij eerder. En niemand heeft Word gevraagd om een nieuwe pagina te beginnen. [Corrigeert het hoofddocument en slaat het op.]

Toen we eraan begonnen heb ik hier wel naar gekeken maar wat trouwens de functionaliteit is van die zeven adresregels dat ben ik even kwijt, hoor. Ik dacht, die hebben we niet allemaal nodig.

Kijk, laten we eens teruggaan naar dat dialoogje. Hier geef je op welke gegevens je uit het systeem wilt halen. En hier is ook echt waar alle slimmigheid in zit. Hij pakt uit al die verschillende stamgegevens en al die verschillende tabbladen pakt hij de gevraagde gegevens. Aan de stamgegevens van zus hangt weer een andere soort stamgegevens en zo verder; maar je weet dus nooit hoe veel adresregels je hebt.Buitenlandse adressen bijvoorbeeld hebben vaak meer regels. Dus het kan zijn dat, bijvoorbeeld als een buitenlands adres wordt samengesteld, dat je er wel zeven nodig hebt. Het maximum is zeven, ik weet ook niet hoe al die slimmigheid werkt. Maar daarom moet je dus eigenlijk altijd al die zeven adresregels ook in je brief opnemen, omdat je niet van tevoren echt kunt voorspellen welke het zijn.

[...]

Ik zit nu hier in het systeem alsof ik mijn collega ben; maar die ondertekening is daar niet variabel op. Die is hard opgenomen in de brief, die brief komt altijd van ons. Kijk, hier zijn de bevoegdheden laag. Terwijl hier bij mezelf in mijn eigen account heb ik alle bevoegdheden. **A7** En nu wil ik voor die collega's de kolommen instellen voor hun werk als afdeling Helpdesk zodat zij er prettig mee kunnen werken en alle informatie hebben die ze volgens mij nodig gaan hebben. Zo hebben ze ook als ze verder nog van alles veranderen, handige basisinstellingen bij de hand, hoe veel ze er ook mee rommelen. [speelt met de weergave van de kolommen in het overzicht] Wat mij is opgevallen is dat telefoonnummers dat is een beetje vreemd, bij contactpersonen heb je twee telefoonnummers die zijn dan voor de persoon en voor het bedrijf maar je ziet het verschil niet.

Dat is vaker zo, heel lastig is dat. Maar daar klaag ik elke keer over en daar kunnen ze niets aan doen zeggen ze.

[mompelt] dit hoeft niet dat hoeft niet; postcode... **A6** Ik had dit thuis gemaakt [geprint voorbeeld met schermafbeeldingen], ik zit thuis nog wel eens wat te rommelen, en dan dacht ik dat neem ik dan over wat ik uitgevist heb voor mijn collega's. Ik geef het de naam Beheer of zo en dan eh...

En dan doe je hetzelfde voor de contactpersonen, voor die meeloopinformatie.

Ja.

We hebben dit pakket nu denk ik al wel een half jaar maar je bent heel erg aan het zoeken nog. We zijn er zo'n drie maanden geleden echt mee begonnen en je blijft constant zoeken naar mogelijkheden die er zijn en af en toe per ongeluk vind je wat dat je denkt wat handig! Zo leer je er wel meer van maar ik ben er vast van overtuigd dat we een heleboel functionaliteit niet gebruiken vanwege het feit dat we het niet kennen. En dat je de tijd er niet voor neemt. En het is dan ook weer zo, we sturen bijvoorbeeld serviceberichten of nieuwsbrieven uit en dan is het supermakkelijk om maar te blijven selecteren; selectie over selectie over selectie. Dan loopt-ie uiteindelijk wel vast maar dat is bijzaak.

A8 Kijk, dit is de eerste opzet voor de beheervrienden. En dat doe ik dan voor elk van die collega's afzonderlijk, dan log ik in als die persoon en dan ga ik dat zo aanpassen, dan stel ik dat zo in.

Je zou eens kunnen vragen of dat niet handiger kan, met gebruikersgroepen bijvoorbeeld of zo. Maar helaas, die standaardfunctionaliteit van het onderliggende systeem weet ik niets van. Maar ik zou zeker eens bellen, je weet maar nooit.

A9 We hebben trouwens al wat zitten stoeien, met die stamgegevens, kijk, onder contactpersonen hebben we hier die aankruisvelden, branche vanwege het feit dat we soms meerdere branches willen invoeren dus is dit niet voldoende dus vandaar dat we dat hier hebben gedaan. Interesses stond er wel al maar dit niet, volgens mij hebben we dit vakje expres erbij gemaakt. Omdat sommigen dus meerdere branches bedienen. En die bedrijf aankruisvelden daar hebben we van het begin af aan heel erg mee zitten stoeien, van waar moet je wat neerzetten. Onder contactpersonen staat dus servicebericht, nieuwsbrief, kerstkaart. En hier [lijstvelden] heb je dus meerdere mogelijkheden. Al doende komen we daar steeds verder mee; dit is onlangs toegevoegd, omdat een collega wilde bijhouden wie een vaste bedrijfsafspraak heeft en wie niet. [29] [...]

Even kijken, wat hebben wij nog meer aangepast. Ja, die hoofd- en administratiecontacten, wat ik vertelde, dat het belangrijk is dat er blijft staan wat er staat; voor de rest is het niet zo heel erg spannend. Financieel is hier dood maar wordt wel gebruikt in de boekhouding.

Doe je ook nog wat met de contactpersonen?

Ja... dit is allemaal standaard behalve dan die relatiefunctie dat ik had geschreven, Afblijven... daar kunnen ze dus bij. Dat [waarde in veld relatiefunctie] is die tekenbevoegdheid van die contactpersoon en dat is dan weer gekoppeld aan die twee vakjes van hoofdcontact en administratiecontact... of nee dat is niet zo dat dachten wij maar dat is niet zo.

Ik kan me dat hele ding niet herinneren eigenlijk. [bladert in handleiding] Tabblad Algemeen, pagina 34... De relatiefunctie: welke rol deze persoon vervult en die kunt u later gebruiken voor het maken van selecties.

Kijk dat hebben wij dus hier neergezet bij Functie terwijl we het hier hadden moeten neerzetten. Maar het zijn er een hele hoop geworden ondertussen...

Ja, deze functie is hun functie binnen hun bedrijf; terwijl wat je hier hebt is meer de functie naar jullie toe. Wat is hij voor jullie, die persoon, tekenbevoegd bijvoorbeeld. Maar dat is wat anders want als ik jou vraag wat is jouw functie hier bij het bedrijf dan zeg jij niet, Tekenbevoegde.

Dit is meer wat er op het visitekaartje staat. Medewerker Helpdesk of zo.

Ja, en dat kan je dan ook eventueel meenemen in de adresgegevens.

Kijk, het is nu allemaal hier neergezet en dat is natuurlijk heel wat inmiddels.

[35] Kijk, dit staat allemaal bij Functie. Zoals EDI-beheerder; maar nog veel meer dus. En de bedoeling was dus wel datgene wat op het visitekaartje staat. Dus ik denk wel dat ik dat ga wijzigen maar nu even niet, aan het eind van het jaar is het altijd drukker en daar is nu geen tijd voor. Ik vind het eigenlijk wel jammer dat we dat zo hebben gedaan; en het is nog pas ingesteld, ook.

Hoeveel heb je er in zitten eigenlijk?

Dat vroegen we ons toevallig vanmorgen net af. Of er een telfunctie in zit, dat kan natuurlijk via een draaitabel in Excel [doet dat]... kijk... ruim vijftienhonderd records maar die zijn natuurlijk niet allemaal gevuld. Hoewel het is overal van belang, ook bij relaties en ook bij debiteuren. Bij crediteuren gebruiken we het nog zo niet echt. [...]

En het zijn niet allemaal echte mensen [ziet nepcontacten, zoals Support]

Ja dat komt uit Outlook, dat de jongens weten waar ze naartoe moeten bellen. Maar daar schrijf je geen brieven aan natuurlijk en met al die selectiemogelijkheden is dat ook niet erg die haal je er zo uit. Er zijn er natuurlijk altijd zat die je alleen op functie aanspreekt, de Helpdesk of zo.

[...]

Kijk, deze hier heb ik allemaal laatst als relaties aangemaakt onder de branche ABC. Dat is zo, wij leveren aan ABC, dat is de klant, maar in technische zin hebben wij met deze bedrijven te maken en die moeten allemaal als relatie hier bekend zijn met telefoonnummers en gegevens maar voor de rest doen we alleen maar zaken met ABC. Dus hebben we gewoon een branche aangemaakt ABC, anders hadden we al die mensen als contactpersonen onder hetzelfde bedrijf moeten hangen en het zijn allemaal verschillende bedrijven. Dus daar moet je eventjes over nadenken hoe zal ik dat inrichten en dat hebben we uiteindelijk zo gedaan. [41]

Ik geloof dat je in de stamgegevens van een relatie wel iets kunt zeggen over dat-ie gekoppeld is aan een andere relatie.

Dat had ik inderdaad gezien en daar heb ik nog niets mee gedaan. Ik kwam het tegen en ik dacht daar moet ik nog eens een keertje naar kijken, maar dat heb ik niet gedaan. Ik probeer dat nog wel eens in een testrelatie. Je kan dat natuurlijk als kolom bijplaatsen en dan is dat duidelijk, ja.

Ik geloof niet dat het systeem er verder heel veel mee doet. Maar als dat voldoende informatie is dan houd je wel je database wat schoner.

Bij het invoeren van visitekaartjes van contactpersonen binnen een bekend bedrijf, een debiteur, maar die contactpersonen zaten dan op een andere vestiging. Bij debiteur heb je maar 1 mogelijkheid om een adres in te voeren; of in ieder geval een bezoekadres en een postadres. En binnen de contactpersonen heb je dan weer de mogelijkheid om een privé-adres in te geven maar dat vond ik ook weer niet helemaal passen, om van een andere vestiging om dat hier neer te zetten. Dus uiteindelijk hebben we onder dezelfde naam een relatie aangemaakt. En mensen hebben ook een EDI-postbus; kijk hier is bijvoorbeeld een bedrijf met vier EDI-postbussen die allemaal een factuur moeten krijgen; dus hebben we uiteindelijk vier debiteuren aangemaakt onder dezelfde naam alleen 1 2 3 en 4 met eigen debiteurnummers die dan in het centrale factureringssysteem daar weer aan gekoppeld zijn. Dat is allemaal hier in huis gebouwd, dat is op zich best mooi. [laat zien] Zelfs kunnen klanten allemaal hun eigen gegevens zien, het werkt allemaal met elkaar samen. [...]

[47] Wat ik de afgelopen tijd gedaan heb is het invoeren van contactpersonen en relaties; zodat het bestand zo meteen gevuld is voor de Verkoop.

Wat ga je met al dat werk uiteindelijk doen? Nu staat er maar 1 standaardbrief in...

Tot nu toe hebben we het basis-boekhoudpakket gebruikt voor de facturatie en zo en we hebben nu VIS aangeschaft omdat we een grotere club beginnen te worden en informatie van elkaar niet meer overkomt, met name activiteitenbeheer en contactpersonen; voor Sales bijvoorbeeld, op het moment dat de klant belt, ook naar de Helpdesk, dat je precies kan zien wat er gebeurd is. Dat is de opzet waarom we eraan begonnen zijn. Plus voor de beheerafdeling, alle contactpersonen gewoon binnen hetzelfde programma zichtbaar; voor de afdeling marketing het selecteren van groepen contacten om een nieuwsbrief aan te versturen; dat zijn de functies die we het gaan geven; waar we nu aan het werk te zijn om dat te organiseren. En als eerste de afdeling beheerders die het gaan gebruiken, de technische club zeg maar, het beheren van die EDI-postbusklanten en zo; en daarna marketing. Uiteindelijk is het voor iedereen van belang dat je weet wat er bij een bepaalde klant gebeurd is. Want als je iemand spreekt en je weet niet dat je collega daar vorige week geweest is, dat komt een beetje raar over. Toen we nog klein waren met een paar man dan weet iedereen alles van elkaar, maar dat wordt natuurlijk steeds minder.

Als je straks brieven gaat versturen aan meer dan een persoon denk er dan nog extra om dat je in het begin heel goed alles erin stopt. [50:30]

[52] Als ik iets niet weet dan spiek ik altijd even bij een ander, hoe het daar staat.

Veel discussie en in de resultaten kijken over het toevoegen van een aanspreektitel en hoe dat precies moet; aanspreektitel 1 en aanspreektitel 2; voor dan wel achter de naam.

Weet je wat het ook is, voor elk liflafje waarvoor je belt daar krijg je een rekening voor. Dan laat je het op een gegeven moment wel uit je hoofd, dan denk je ik zoek het zelf wel uit. Zoiets hoort schijnbaar ook niet bij het onderhoudscontract.

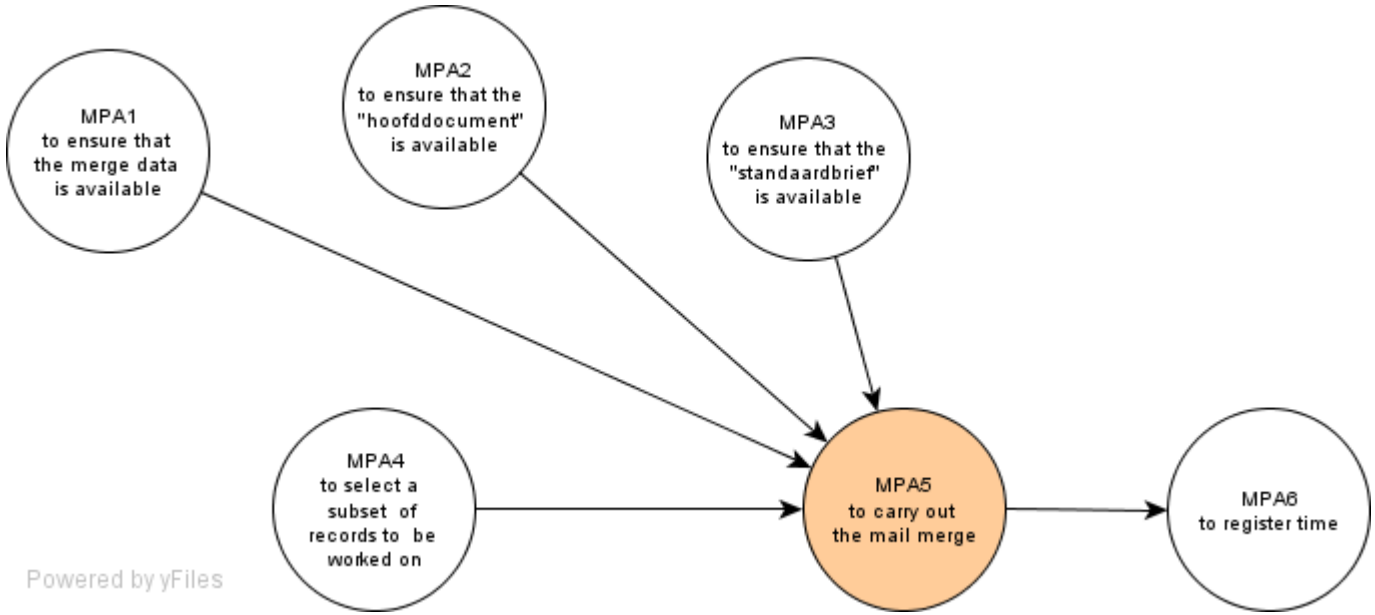
[Uiteindelijk door F/E in de handleiding gevonden en stamgegevens voor ir. en Ing. opgevoerd. Bleek onder de onduidelijke categorie Vrije lijsten te vallen.]

Rob

Activity

We never send out mass mailings; what we use the system for is send one standard letter of a certain type to or on behalf of one particular contact. I regard the setup of the system as serious work; we have a strict procedure and coding system for entering all our relations and also there's a strict filing system for paper copies of outgoing correspondence. I spent quite some time setting it all up and things now work really well, although there are one or two things that I'd like to automate further. Most importantly, I almost always have to slightly edit the letter that is generated by the system.

Minimal path



Coded PARI sequence

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
A1	To ensure that all the merge data is present.	2	I know that this is vital, and I make sure that our system is rigorously adhered to.	strat, conc	Proceed.	S: MPA1
A2	To ensure that the "hoofddocument" is present.	2	I know that this is vital, and I copy from an existing one to ensure correctness.	strat	Proceed.	S: MPA2
			The "hoofddocument" can be customized further than by simple copying from what the supplier initially set up.	*proc*		
A3	To ensure that the "standaardbrief" is present.	2	I know that this is vital, and I copy from an existing one to ensure correctness.	strat	Proceed.	S: MPA3
A4	To find and select the contact for whom the letter is sent.	2	The strict coding system that I have made ensures that I can find any contact relatively easily.	sit	Proceed.	S: MPA4
A5.1	To produce a printed letter.	2	This is what I want to do.	strat	Proceed.	S: MPA5
A5.2	To select the "standaardbrief" to use.	3	The strict coding system that I have made ensures that I can find the letter relatively easily.	sit	Proceed.	
A5.3	To modify the document that is generated.	3	Some letters simply are not standard, and the body of them must be written. Others must be modified because what comes out of the system is not one hundred percent what I want.	conc	Slight annoyance as to certain minor elements of the document that is generated.	

	action (A)	level	precursor (P; italics indicate precursors identified by the F/E as missing)	type	result & interpretation (R&I; italics indicate the result being unexpected)	CI
			One of the annoyances can easily be fixed in the "hoofddocument".	*proc*		
A5.4	To close Word.	3	If I don't close Word, another instance will be opened when I next make a letter.	strat	Proceed.	
A6	To register the time spent on the letter.	2	This is the final step in our procedure.	strat	Done.	S: MPA6

Audio trace

Wat gaan we doen? Jij hebt een klus en dat wil ik zien.

Goed, we gaan een briefje maken. Sinds kort kan dat in één keer, dat is wel leuk, dat is pas sinds kort. Ik heb hier een paar icoontjes [zelf eerder aangemaakt] waaronder Tedoens

Je gebruikt dus ook de Tedoens en de Activiteiten.

Ja, kijk hier staan ze. Genoeg te doen! Klik ik die aan dan kom je in VIS. Daar heb ik een eigen indeling gemaakt, wat voor ons handig is, we hebben een codering, om het een beetje systematisch te maken, die heel erg handig is: 1 voor debiteuren, 2 voor crediteuren, dan 5 voor projecten; en vervolgens op alfabet. Dus de eerste A die ik tegenkom is 1A01 en dan 1A02; dus binnen de letter staan ze niet op alfabet maar ik heb wel alle A-tjes bij elkaar en dan alle B-tjes; dus**A4** zoek ik een klant en die heet Komfoortje dan druk ik op 1K en kom ik in de buurt daarvan. Daarop zoeken wij, niet de relatienaam of de zoekcode of zo. En vervolgens heb ik een aantal dingen die ik van belang vind in de kolommen neergezet: email-adres, en onder andere ook over de omzetten en zo die ik graag zou willen zien, die zijn weer verdwenen dus daar heb ik straks een vraag over. Van hieruit maken we de brieven; wil ik voor een klant een brief maken, bijvoorbeeld voor een stichting moet ik een paar jaarverslagen maken, die zijn bijna klaar

Even voor de duidelijkheid: dit doe je in jouw eigen administratie, dus niet in die van de klant?

Ja dat klopt, het maakt dus niet uit in welke administratie ik zit als ik dat op deze manier doe. Ik ga naar Bestand en dan Openen; welke boekhouding ik kies maakt niet uit of waar ik dan zit, in het grootboek of op een andere plek – vroeger werkte ik met de DOS-versie daar kon je alles met het toetsenbord doen maar dat kan niet meer zo goed. Standaard als ik iets wil opzoeken klik ik deze aan, of nee klik ik deze aan, en dan ben ik naar de tedoen-boekhouding gegaan, dat is onze eigen administratie, en daar staan al die relaties in. De eerste serie, de grootste groep, de debiteuren, daar moet je meestal de brieven voor maken. Maar het kan ook zijn dat je voor rubriek 2, de crediteuren dat je naar een crediteur een briefje stuurt; rubriek 3 is bij ons de privé-personen, de IB-cliënten; en dan heb je weer een ander fiscaal nummer nodig en je kan denk ik niet makkelijk een brief maken voor een contactpersoon dus die heb ik allemaal hier. Wil ik dan voor deze klant een brief maken naar de belastinginspecteur bijvoorbeeld dan staat hier zijn SOFI-nummer in en die neemt hij dan in de brief over. Rubriek 4 zijn de overige relaties, veelal belastingdiensten en zo. En groep 7 is voor het kantoor dat we gaan starten in Almere, die klanten die staan al apart dat ze zo direct mee kunnen gaan. Dus zo is de structuur.

Deze brief is voor een stichting, die heeft wat spullen afgegeven of we daar een jaarverslagje van willen maken, en dat is klaar dus daar **A5.1** gaan we even een briefje voor sturen. Nu heb ik daar ook een codering voor bedacht omdat we toch vrij veel brieven krijgen [in het systeem]; de eerste letter bepaalt wat voor soort het is; A staat voor Algemeen, I voor Inkomstenbelasting, L voor Loonbelasting, O voor Omzetbelasting en V voor Vennootschapsbelasting. Dus moeten we een briefje sturen inzake de omzetbelasting dan moet ik bij de O zijn. Een drietje staat voor Derden en een 1 staat voor de relatie zelf en dan de B voor brief en de F voor fax. In dit geval moet ik een algemene brief naar de relatie sturen dus dat is de eerste **A5.2** [selecteert standaardbrief uit de lijst]. Dit [dialoogje] laat ik allemaal staan, dat komt altijd goed uit. [06]

Dan krijgen we hier de adresgegevens [toont brief], de referentie, sinds kort gebruik ik hier de datumnotatie. Ik wist niet dat dat kon... dus 2006 09 28 en eventueel een volgnummer. Beste... blijkbaar staat nog niet ingevuld hoe de beste man heet, normaal moet die naam naar boven komen... dat is voor mij ook een vraag, hoe kan ik dat relatiegedeelte verbeteren. Meestal toetsen wij zelf hard in Beste en als de voornaam ingevuld staat, dan pakt hij dat op. Of anders Geachte heer. Nu is dit echt een standaardbrief dus is er geen voorgedrukte tekst. Nu staat daar wel een aftiteling R N Takken; ik zou daar liever mijn voornaam in hebben maar dat heb ik nog niet voor elkaar gekregen. Ik kan het wel hard intikken maar dat is niet handig, dan staat dat er altijd. [**A5.3** tikt brieftekst]

Dat is klaar, nog even mijn eigen naam neerzetten; afdrukken op een briefpapiertje en het staat allemaal goed. Meestal sluit ik dan alles helemaal af **A5.4**, anders blijft hij iedere keer een nieuwe versie van Word opstarten. En dan is hij klaar. Ik **A5.5** [print en] maak een kopietje voor in de map en klaar is Kees.

De volgende brief. Meneer Burger van XYZ Solutions. Nummer 17 van de B-tjes, daar is hij. Die heeft een voorlopige aanslag gehad met een te hoge rente. [...] Dus ik ga een bezwaarbrief naar de belastingdienst maken. Dat is dan Vennootschapsbelasting, V, de derde. Nou heb ik nog niet de goede brief, de bezwaarbrief, die moet ik nog aanmaken. Bij de omzetbelasting ook niet... nou dan pak ik de algemene bezwaarbrief maar, dat werkt ook; dat is een derdenbrief dus dan vraagt hij naar wie die moet gaan. [selecteert ontvanger] Kijk, deze sorteert hij ook weer op zoekcode dus dat gaat prima. Dat is 'm... contactpersoon hoeft niet. Betreft, fiscaal nummer; staat allemaal goed. [tikt de tekst en drukt de brief af] [12-15]

Het gaat supervlot. En we hebben ze nog mooier, bijvoorbeeld, ik heb ook iemand voor wie ik het financieel verslag moet deponeren bij de KvK; A3KvK en dan deponeren verslag; volgende; oh nee, Annuleren want dat is 'm niet. Dit is een testbriefje dus hij hoeft 'm niet te bewaren. Kijk [toont brief], hier hoef ik helemaal niets aan te doen want de tekst staat er allemaal al [drukt brief af]. Dat is helemaal een mooie brief en dat is waar we nu mee bezig zijn. Daarom hebben we zo veel standaardbrieven. Dat komt heel vaak voor, dat het echt een standaardbrief is. Vooral de loonadministratie die brieven worden nu nog vaak los gemaakt maar die willen we er ook in hebben. En vennootschapsbelasting adreswijzigingen. Dat willen we er ook in hebben.

Nu willen we dat natuurlijk ook allemaal doorbelasten aan de cliënt en daarom ga ik meteen naar de Weburen, **A6** om de bestede tijd in te voeren. Dan gaat dat verder vanzelf. Ik houd daarbij dezelfde codering aan dus als het goed is is dat ook 17. Een brief kost altijd even veel. [voert tijd op] Dan moet ik End doen anders kan ik daarachter niets typen... brief belastingdienst... kan ik gewoon open laten staan en dan kan ik weer door. Beide modules gebruiken we naast elkaar, dat is de werkwijze.

Ik ben degene die voor het hele kantoor probeert dit soort dingen te organiseren. Ik ben voortdurend bezig met hoe kan ik dat beter organiseren en indelen; het vraagt heel veel tijd maar dat betaalt zich wel terug. Maar het vraagt heel wat wijzigingen steeds weer. Want dan zie je wat en dan denk je Ja dat moet ik eigenlijk toch... dan is het te groot of te onoverzichtelijk en dan moet ik daar weer iets anders voor bedenken... Nu gaat het nog wel maar ik heb inmiddels 22 B-klanten. En dan moet ik toch al zoeken... waar is die ene klant ook weer gebleven?

Maar waarom zoek je dan niet op de relatienaam? Die ken je toch altijd?

Nee want kijk, C Pieterse Holding, waar zoek je dat dan op? Maar in je hoofd heb je dat onder de P. En zoekcode is ook vaak weer niet makkelijker. Deze coderingen zie je overal weer terug [toont papieren dossier, ordners.]

Als ik dan een brief terug wil zien dan is dat meer stappen, meer bladeren. Dan kijk ik met Alt+7 in de activiteiten en daar komen al die brieven weer naar boven; en dan zoek ik die brief op. In de activiteit kan je de brief ook zien denk ik? Maar ik weer niet precies hoe dat werkt. Dan krijg je de brief zonder boven- en onderkant te zien toch?

Ja, en hij komt in het notitieveld. Dus je hoeft die brief niet helemaal te openen in Word.

Maar dan moet ik bij iedere brief een actie ondernemen, dan moet ik dat aangeven, dan moet ik extra iets doen. Dus dan moet je de afweging maken; hoe vaak wil ik een brief terugzien, en ze zitten allemaal in de map dus dat wil ik niet doen, dan hoef ik niet bij iedere brief aan te geven dat hij teruggelezen moet worden.

[25:20] Vervelende bijkomstigheid van deze is dan dat hij hier aangeeft gewoon weer de nieuwe datum, dus als de brief een maand eerder is geschreven zet hij hier toch in de standaardbrieven de datum van vandaag; maar dat heeft met de inrichting van de brief te maken. [toont standaard date-veld van Word; heeft dat blijkbaar in het hoofddocument staan en niet het datumveld uit het VIS] Ik wil graag de datum hebben waarop hij daadwerkelijk gemaakt is! Nu is het wel zo dat ik hier de invoerdatum van de brief kan zien; dus ik kan wel zien wanneer de brief gemaakt is.

Toen we het pakket kregen toen zijn een aantal standaardbrieven voor ons gemaakt en die kopiëren we dan door; maar er zit een aantal dingen in waarvan we zeggen, ja, dat zou eigenlijk anders moeten maar dan moeten we uitzoeken hoe dat precies zit. [26:23]

Ik pas in het algemeen niet de notitie aan [in de stamgegevens van een standaardbrief]; kijk hier [in de naam zie je] het soort brief; dat vind ik te veel werk. We hebben een serie standaard brieven en die naam geeft het al zowat aan en dan kom je al een heel eind. Ik wil zo weinig mogelijk hoeven doen om een brief te maken. Dat zou wel makkelijk zijn voor terugvinden maar dat vind ik de moeite niet waard. Ik wil zo weinig mogelijk hoeven doen om een brief te maken en te versturen. We koppelen dus ook niet door naar de tedoens en we zetten ook niet dat vakje "afgewikkeld" aan, daar kijken we toch niet naar; alleen bij de tedoens wel eens. Maar tedoens maak ik ook niet voor elk wissewasje aan, alleen als iemand anders iets voor mij moet doen. Want dan heb je enorme lijsten, dus dit zijn meer de wat grotere objecten die je in kaart wilt hebben. Veelal ook om aan een ander door te geven. Dus als ik zeg ik heb iets en ik wil graag dat iemand een aangifte voorbereidt of zo, nou dan maak ik een tedoen aan die stuur ik naar de persoon. Op het moment dat die dan gedaan is zetten ze hem weer terug en dan staat hier de prioriteit Beoordelen, of Afgewikkeld of zo; en dan krijg ik hem weer terug en dan doe ik dit vinkje hier weer weg en dan kan ik er weer mee verder. En als het dan klaar is verplaats ik naar een activiteit, en dan wil het nog wel eens gebeuren dat ik zeg, nou ik vink even Afgewerkt aan. Maar het maakt me eigenlijk niet zo veel uit. Of als het meer een aantekeningetje was gooi ik hem weg.

Maak je wel eens mailings, dus brieven aan meerdere mensen?

Nee, dat komt nauwelijks voor en ik weet ook niet hoe ik dat zou moeten doen. [30] Ik geloof wel dat dat is gedaan toen we van bijna alle klanten een kopie van het paspoort moesten hebben, we hadden er wel een hoop maar ook een hoop niet, en toen hebben we een brief gestuurd en volgens mij is dat wel gedaan op die manier, van selectie aangegeven en dan de brieven aangemaakt.

En dan heb je natuurlijk wel brieven waaraan je eigenlijk weinig hoeft te customiseren. Dat is toch allemaal In verband met de wettelijke verplichtingen...

Klopt, maar goed dan is het toch wel weer vaak van bij de een zeg je Beste die en bij de ander zeg je dat moet ik misschien anders doen; dus dat wil ook nog wel eens soms wil ik alleen van de persoon, soms ook van de partner; dus dat vraagt evengoed nog wel weer maatwerk maar

En dan moet je de afweging maken... dat zou je allemaal kunnen doen met gebruikersvelden, maar of je dat zou willen...

Ja, daar wilde ik ook nog iets over vragen, over gebruikersvelden. Is dat wel handig om te gebruiken.

Ze zijn heel handig voor bepaalde dingen.

Ja, ik kan gewoon fulltime met het pakket bezig zijn hoor, om te kijken en dingetjes opstarten. Ik vind dat hartstikke leuk, prachtig om in te richten... Hiervoor hadden we AAA [relatiebeheer los van de boekhouding] en dat was een beetje hetzelfde idee maar veel opener, daar kon je zelf veldjes aanpassen. Maar toen waren we een stukje kleiner en was dat nog te doen maar nu merken we nu moeten we alles dubbel in gaan voeren en dat wordt te lastig dus hebben we de overstap hiernaartoe gemaakt [geïntegreerd met debiteuren/crediteuren want bovenop boekhoudpakket]. Maar op zich, om dingetjes te maken, rapportjes te maken, layouts te bedenken... dat vind ik leuk werk.

[32:24] Even kijken... kijk ik heb hier zo nou **A1** kijk die zoekcode is voor ons dus van wat minder belang; ik zet wel wat neer maar dat is alleen van belang als je naar een belastingdienst toestuurt of zo, dan zoekt hij snel op plaats of zo. Maar debiteurnummer dat moet natuurlijk goed staan. Hij genereert een gek nummer en dat moet je dan wel overschrijven, anders kun je het niet meer aanpassen. En waar vul je wat in? Vul je een mobiel nummer, als er alleen een mobiel nummer is, in bij zakelijk of voer je dat juist bij de contactpersoon in? Is er een apart postadres moet je weten; maar dit is wel redelijk standaard. Ook hier, BV zonder puntjes, soms zet hij puntje puntje achter elkaar. Omdat hij de punt van de V heeft en dan sluit hij de brief af met ook nog een punt. En dat soort dingen moet je allemaal bedenken.

Hier heb ik een aantal codes bedacht waarvan ik dacht, nou, dat is misschien wel handig om te hebben; entiteit bijvoorbeeld, we hebben heel veel groepen van bedrijven, allemaal verschillende bedrijven die eigenlijk bij elkaar horen; daarvoor heb ik dan entiteit dan is het makkelijker om die allemaal terug te vinden. Zo'n bedrijfsnaam zegt iemand misschien niks, waar moet ik nu de opgeslagen bestanden vinden? Niet zozeer brieven want die zitten hier onder, maar jaarverslagen en zo, waar staan die nou? Waar kan ik die terugvinden?

Heb je die in Alchemy zitten?

Nee, dat gebruiken we niet. Kijk heb je hier entiteit Huppelepup als je dan ziet bij ... ga ik even naar Excel, Bestand, Openen, voor de inrichting: kijk dit is de indeling: onze eigen bestanden, werknemersbestanden; die zijn allemaal beveiligd, dus ik kan alleen bij mijn eigen bestanden komen en niet bij die van een collega; maar verder schermen we zo weinig mogelijk af maar iedereen heeft recht op een eigen privé-directoy. Verder heb ik Cliënten Algemeen; dan is het geen BV en dan is het niet een entiteit; gesorteerd omdat het anders veel te groot wordt.

Waarom haal je de BV's eruit?

Dat is een grote groep, dus om een splitsing aan te brengen, anders heb ik er hier nog meer staan dus ik deel dit zo in dat het te overzien is; moet ik een klikje extra doen maar dan heb ik hem wel sneller dan wanneer ik helemaal door moet bladeren. Dan heb ik hier de Cliënten BV, twee groepjes, want de meeste BV's vallen binnen een entiteit, daar hangen gelijk meerdere BV's aan vast; behalve hier, dit zijn gewoon enkele BV's. Deze hebben ook een andere indeling, daarom splits ik dat, want die hebben ook een takje VPB en KvK en AvA dat hoeft een eenmanszaak niet te hebben bijvoorbeeld. Dit is nog niet honderd procent op orde maar iedere keer stuur ik dat weer wat aan en als ik weer tijd heb dan verzin ik weer wat nieuws en dan moet iedereen weer zich daar aan aanpassen... De belangrijkste groep eigenlijk is de entiteiten en dit zijn alle entiteiten die we hebben. We hebben bijvoorbeeld de SSS Groep en die mevrouw is daar de verantwoordelijke voor en daar vallen vier bedrijven onder. Zie je; en die [namen] lijken dus ook in dit geval niet op elkaar dus ja, je moet anders maar net weten... dus dan is dat makkelijk om dat zo terug te vinden. Je hebt soms bedrijven die heten bijna allemaal hetzelfde en dat is dan wel duidelijk... Normaal gesproken hebben we hier dus onder zo'n dingetje ook Correspondentie en daar sloegen we dan de brieven onder op maar nu is dat anders, nu komen hier vrijwel geen brieven meer want die gaan nu via VIS.

Maar je kunt toch via VIS ook bedenken waar je je brieven wilt hebben?

Ja, maar je kan niet zeggen van iedere brief is weer in een heel andere directory. Je kan wel zeggen dit is een brief aan de belastingdienst dus die gaat in de directory Belastingdienst, maar daar zie ik het nut niet van in. Wat we nu hebben is we hebben een standaard brievendirectory, ik heb maar even een icoontje gemaakt, oh nee hier staan de VIS-standaardbrieven. Maar het opslaan van die brieven had ik dacht ik ook een icoontje voor; oh ja, Snelkoppeling naar Verzonden Brieven. Kijk, dit zijn al die brieven die staan dus in een tabje 2006 Verzonden. Dat lijkt mij ook het meest logische, om ze centraal te hebben maar om ervoor te zorgen dat het niet te groot wordt zouden we dan voor 2007 ze in een directory 2007 willen zetten. We proberen altijd zoveel mogelijk jaardirectories te maken want dan kun je na zeven jaar zeggen, Ik gooi eens wat weg; anders dan groeit het maar en groeit het maar en groeit het maar. Maar nu is dus het nadeel, kwam ik net achter, hier staat keurig 2006 Verzonden, nu moet ik straks bij alle standaardbrieven dus de directory aanpassen. Als ik vijftig brieven heb moet ik die allemaal aanpassen als ik naar een andere standaarddirectory wil gaan.

En als je de datum opneemt in de bestandsnaam? Dan kan je aan het begin van het jaar die van het vorige jaar overhevelen naar een archiefdirectory.Je sorteert gewoon op bestandsnaam dan.

Dat zou kunnen inderdaad. Kijk **A3** we zijn begonnen zie je hier met nummering op volgorde, dat loopt door tot bijna duizend; maar toen kwam op gegeven moment van Hee je kan ook een datumnotatie krijgen. Kijk, hier begonnen we met de datumnotatie. Dus inderdaad, vanaf nu kun je zeggen dat blok dat verplaats ik gewoon. En dan kan je de naam van de directory waarin ze terechtkomen gewoon op iets algemeens als Verzonden houden. Inderdaad, de oplossing. Dus dat zou betekenen dat ik dat eenmalig voor allemaal moet gaan veranderen. Maar je kan ook zeggen ik moet brief 978 hebben en dan kan je er op deze manier ook heel makkelijk komen. Maar die datum [in de dagtekening, die altijd vandaag geeft], dat vind ik dus heel storend.

Ja, dat zou ik ook heel storend vinden.

Maar dat zit dus in die standaardbrief [hoofddocument]. Kijk.

Ja, dat veld komt uit Word; dat is geen VIS-veld.

En is daar dan wel een VIS-veld mogelijk dan?

Ja.

Nou dan moeten we die maar eens gaan aanpassen straks. **A2** Want de rest is er wel allemaal; dit is een adresblok dus daar hoef je nooit meer iets aan te doen

Altijd die zeven regels

Dat is heel handig, dat is heel mooi gedaan. En dit is dan het subnummer, dat is de projectcode. Of nee, het relatienummer. 1B7, ja, het relatienummer. En het subnummer, wat is dat...

Handig, zo'n spiekbriefje!

Ja, dat wist ik ook niet hoor, dat die er in stonden. Die kwam ik opeens tegen.

[zoeken in handleiding] *Kijk hier is het subnummer, dat is het klantnummer.*

Dat klopt, 1B17, de 1 is dus het relatienummer en niet de projectcode. Prima. Die zijn bijna hetzelfde natuurlijk. En dan hier het documentnummer, dat is nu ook duidelijk. Kijk dan heb je hier dus ook Beste Firstname staan; beste Kees of zo; en dit kun je dus waarschijnlijk dan helemaal inrichten, dat het de ene keer Geachte heer is en de andere keer Beste.

Dat kan je in de stamgegevens van je contactpersonen zetten.

Daar kun je de keuze bepalen. Dat wil ik graag straks even proberen, kijken hoe dat werkt. En hier onderteken je.

Daar is helaas geen andere mogelijkheid voor, die stijl van ondertekening.

In algemene brieven naar een klant wil je graag je volledige naam neerzetten, en in brieven naar derden kan je dan dit [initialen plus achternaam, uit stamgegevens medewerker] laten staan. Het zou mooi zijn als je dat zou kunnen splitsen. [klaagt een tijdje over Word. Geeft toe soms brieven in Excel te schrijven omdat daar geen automatische frutsels worden toegevoegd.]

Heb je ooit zelf helemaal een standaardbrief gemaakt?

Helemaal vanaf niks? Nee, we hebben een paar brieven gekregen en die hebben we doorgekopieerd steeds. Dit zal misschien de eerste brief zijn geweest. En dan Opslaan Als en dan ga je sleutelen. Het is ook een beetje onzin om dat hoofdgroepje, dit, ik weet ook niet precies waar je het vandaan moet halen; dat staat gewoon goed, dus waarom zou ik dat veranderen. Dat wil ik niet eens want deze is precies afgemeten [vensterenvelop] dus dan ga je niet helemaal vanaf nul weer beginnen. [gaat daar nog even over door]

Dit is een derdenbrief, dan heb je altijd Betreft en daar komt dan onze klant altijd achter...

Dit is een afdrukbrief, geen standaardbrief. Maar je haalt hem wel uit diezelfde directory

Nee kijk, je kunt hiermee switchen. Kijk, dit is weer helemaal een standaardbrief, ieder jaar moet voor de meeste klanten de omzetbelastingbrief weg; aanklikken en weg is hij. Alleen het jaar moet dan nog veranderd. Net als bij andere belastingen... kan je dat ook nog net als de maand bijvoorbeeld ergens uit vandaan halen?

Hmmmm... in Word wel in ieder geval. Maar dan verandert die dus ook weer als je de brief opnieuw opent.

Dat is wat we zeker niet willen, hij moet niet steeds geupdated worden. Nou, dan ontkom je daar niet aan [hardgecodeerd jaar veranderen]. Ook bij de loonadministratie is dat zo, iedere maand pas je dat daar aan. Ik heb wel ergens, ik weet niet of dat hier was, dat je de mogelijkheid had om te kiezen voor de optie Huidige maand, Vorige maand, Volgende maand; en de loonadministratie doe ik altijd in de huidige maand dus als je die hier hebt staan dan gaat hij goed.

Word kan natuurlijk, net zoals hij de datum hier uithaalt, ook de maand eruit halen; en je kunt met Shift-Control-F9 dat dan bevriezen.

Maar dat moet je dan elke keer weer doen.

Ja, als je hem print.

Nee, dat is geen optie. Maar hoe kunnen we die datum aanpassen?

Dan moeten we naar het VIS...

Oh, vanuit het VIS? Hier heb je al die coderingen toch? [47:30] [...] en die documentreferentie, waar is die voor nodig?

Die kan je ook laten meenemen als referentie in zo'n brief die je maakt. Het is eigenlijk een extra vrij veld. Als je die invult dan kun je hem straks gebruiken, het veld heet docref. Maar je hoeft hem natuurlijk niet te gebruiken, net als alle andere VIS-velden. Het is een vrij veld voor een brief van dit type.

Dus die kan je hier opgeven [in de stamgegevens van de brief] of in de tekst van de brief. Dat maakt dus eigenlijk niet veel uit.

Ja, dat is een interessante opmerking. Hmmmm... je kunt natuurlijk verschillende stamgegevens hebben [met verschillende waarden als docref] en daar toch hetzelfde hoofddocument in Word aan hangen. Dan is het niet 1 op 1.

[F/E legt uit wat het verschil is tussen Word-velden en VIS-velden en vervangt in het hoofddocument het Word-veld voor de datum door een VIS-veld.]