

# Informal Notes on Technology Use as a Mechanism for Knowledge Representation and Transfer

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## Abstract

The use of informal documents to support users of information technology is taken for granted in organizations and largely ignored in academic research. Yet these notes can capture much more than just tips and shortcuts on how to use a particular technology; we contend that they are an overlooked knowledge resource capable of providing insights into the organization itself, including its culture, structure, mores, and business processes. To that end, we describe and categorize the nature and use of informal documents for supporting users of an enterprise resource planning system in a Fortune 500 company. Users ranging from novices to experts still rely on these notes years after the system implementation. This study is a first but necessary step in analyzing the types of information that can be derived from informal notes so that organizations can more fully utilize the knowledge they represent.

**Keywords:** informal notes; informal knowledge repositories; knowledge transfer; knowledge reuse.

**Suggested track:** Managing organizational knowledge and competence

## 1 Introduction

Organizations capture and codify knowledge in a variety of ways, as demonstrated by the wide and growing body of literature on knowledge management (Alavi & Leidner, 2001) and knowledge reuse. This research has led to a large number of categorizations and taxonomies of knowledge, with one of the best known being the distinction between tacit and explicit knowledge (Nonaka, 1994). Another relevant dimension is the level of formality: some forms of knowledge representation are highly formal and structured by the organization within which the knowledge is captured, while others are highly informal, without organizational authorization or a predefined structure. The main focus of this paper is on informal notes, an explicit but informal mechanism for knowledge representation that is widely used in organizations and often

referred to as “cheat sheets.” Users of various information technology solutions create and maintain these informal notes to support their own or their colleagues’ efforts to use the technology successfully. We are not referring in this research to training or instruction manuals created through formal organizational processes or bought in from outside the organization, but rather to notes that are created by an individual or a small group without any managerial directive requiring or encouraging this activity. “Informal” in this context does not refer to the level of attention paid to formatting and layout or the level of effort spent on developing and finalizing the notes; informal here refers specifically to the lack of formal organizational process leading to the creation (or purchase) of these instructions. We believe that prior research has not given this form of knowledge representation the attention it deserves as a mechanism for codifying and storing organizational knowledge.

It is a very common practice among both individual and organizational users of information technology solutions to maintain informal instructions that describe, often at an excruciating level of detail, how an employee or a group of employees should perform specific tasks and obtain specific goals with an information system. Sometimes, these cheat sheets focus entirely on technical aspects of a narrow task, but at other times they are rich descriptions of business processes that contain essential information about the “real way” to get things done (as opposed to the prescribed process). Based on anecdotal evidence, cheat sheets are widely used as a source of information by IT system users. . There is little academic research, however, on the needs that informal notes address and the types of information they contain. In addition, it is likely that what these notes capture goes well beyond the basic steps they are describing; indeed, they have the potential to provide important insights about the organizational norms and structures via the window they open into the actual practices within the organization.

A particularly interesting characteristic of informal notes is that they are not, by definition and as noted above, formally approved (or disapproved) by the organization within which they are used. Yet, in many cases, they have the potential to have a stronger impact on the organization’s norms and structure than more formal, explicitly defined policies. Depending on the requirements of the distribution format, it may not even be clear to employees who later use these notes if their content represents a formal company policy or an individual employee’s perception regarding the most effective way of getting things done.

This study is the first step in a systematic analysis of the role of informal, user-generated instructions regarding the use of technology in organizational life. We start by describing the theoretical context for this study and reviewing existing academic research on the use of various types of informal notes as a mechanism to represent and capture organizational knowledge. This is followed by a qualitative, empirical analysis of a large set of informal notes, which is the core of this paper. These notes were created within a division of a Fortune 500 company for supporting users of a globally-implemented enterprise resource planning (ERP) system. We first analyze ten interviews with employees in that division in order to provide a context for the creation and use of those notes. We then categorize by content a sample of the hundreds of informal instruction sheets gathered from that organization. The notes that are analyzed are all intended for a relatively broad audience (either a workgroup or a department), presented relatively formally (as well-structured word processing or presentation software files), and describe the business processes being captured by the ERP system as well as the technical details associated with system usage. While our qualitative analysis is exploratory in nature and cannot capture the full richness of the information conveyed by these informal notes, it demonstrates the breadth of knowledge we can gain about several types of organizational characteristics and provides tentative validation of the potential these notes have for revealing important insights into a company's inner workings.

## **2 Background**

Informal notes can be seen as a vehicle for supporting knowledge reuse. To position them as such in comparison with other forms of knowledge reuse, we will discuss informal notes in the context of Markus's (2001) classification. Markus (2001, p. 60) divides knowledge reuse into four stages: a) capturing or documenting, b) packaging, c) distributing or disseminating, and d) reusing knowledge. Intuitively, it appears that informal notes are related to all of these stages: The creation of the notes captures and documents knowledge. Often, the individuals or teams creating the notes later clean, polish, and restructure them (all components of packaging). Moreover, the notes are used for distributing knowledge, and, therefore, are part of the knowledge reuse process. Markus's (2001) categorization of mechanisms used for capturing and documenting knowledge does not, however, include a category into which informal notes fit well, because the creation of these notes is not a "passive by-product of the work process" since the notes are deliberately created to serve a specific purpose. In

most cases, they are also not a part of a deliberate before- or after-the-fact knowledge reuse strategy, as the creation of the notes is not a deliberate organizational action.

Markus (2001) and Davenport, DeLong, & Beers (1998) provide some indirect support for the idea of using informal notes as a mechanism for knowledge reuse. In her classification of repositories, Markus refers to Davenport & al., suggesting that stored knowledge can be divided into external knowledge, structured internal knowledge, and informal internal information/knowledge. The latter of these is the most interesting and applicable category from our perspective. Markus and Davenport & al. both present discussion databases and conferencing systems as examples of repositories for informal internal knowledge, but neither author acknowledges the existence of informally (but intentionally) created and maintained documents that capture structured knowledge.

In terms of knowledge reuse situations, the context in which we identified and observed the use of informal notes was closest to the *shared work producers* and *expertise-seeking novices* in Markus's typology (Markus 2001, p. 63). *Shared work producers* are those who create and reuse the knowledge themselves, whereas *expertise-seeking novices* are users of the documents who seek information that they do not currently possess and rarely need.

There have been very few studies that have explicitly recognized the existence and the importance of informal notes as a mechanism for knowledge reuse. Ackerman & McDonald (2000) identify the importance of capturing "informal information" as part of the organization's collective memory framework. They focus almost entirely, however, on "informal flows of information and communication" (p. 333), which refers to a relatively high level of synchronicity and exchange of information between different members of the organization. Their main contribution is the introduction of two systems designed for computer-supported cooperative work, again suggesting a focus on communication structures. Informal notes may or may not be intended for communication through a structured system; we definitely cannot assume that they are because these documents are often stored locally, in individual repositories, although it would be better from an organizational perspective if they were more widely available.

Dingsøyr and Røyrvik (2003) explore the use of an unstructured knowledge repository called Well of experience, or WoX, in a software consulting company. From the perspective of this paper, WoX is a repository for informal notes that are referred to as

“experience notes.” The authors describe it as “a small tool for capturing knowledge that would normally be written on yellow stickers.” Even though the informal notes that are our focus here are typically longer and more structured than a “yellow sticker,” they still share some of the same characteristics, and an example of an experience note given by Dingsøy and Røyrvik (2003, p. 88, Figure 3) is very similar to the documents we observed. Dingsøy and Røyrvik identify five different uses of WoX: 1) Solving a technical problem, 2) gaining a general overview of a problem domain; 3) avoiding the need to explain the same solution to a large number of people; 4) improving individual efficiency in the use of IT tools; and 5) finding sources of expertise. These uses bear much in common with those we found for the informal notes examined in this paper, as described next.

### **3 Qualitative Empirical Analysis**

In this section, we first present a qualitative analysis of interviews with ERP users in order to provide a context for the creation and use of informal notes within their organization. Then, we analyze and categorize a subset of those notes that were created by one employee for widespread use. Our intention is to illustrate the breadth and depth of knowledge being maintained outside of any formally defined information repository and heighten awareness of the value inherent in such resources.

#### **3.1 On-site Interviews**

Ten interviews were conducted with ERP users in one division of the aforementioned company approximately three years after the system had been implemented. Informal notes emerged in these interviews as an important tool for sharing, storing, and organizing knowledge. Most importantly, we found that the notes were used not only as a mechanism to distribute technical information about the use of the system, but also, in many cases, as an important source of information about the organization’s business processes. All of the notes discussed here were informal in the sense that their creation and use was not originally planned as part of the system launch process or specifically sanctioned at that time by the organization.

The interview processes led to the following observations regarding the informal notes, where ‘Q’ refers to the interviewer, and ‘A’ refers to the interviewee:

- 1) The amount of their usage depended on the stage of the system implementation process. For example, a manager who had an important role in the process of introducing the ERP system to the organization indicated that cheat sheets were

important during the first year following the system's introduction, but their importance quickly subsided after that. He did, however, suggest that they would again become necessary as part of the major system upgrade for which the organization was preparing.

*A [Employee 1]: "First year, there's really that steep curve. People are just afraid to touch it and then over the last year, like a lot of cheat sheets, I don't see them out there."*

*A [Employee 1]: "We're looking at training requirements [for the upgrade] and we set up these ... little cards, quick reference cards, laminated, which tells people hey, keep these and if you ever got to go through this, this is how you go do it."*

- 2) The perceptions regarding the importance of the informal notes varied, depending on the organizational role of the person who evaluated them. The manager whose views were discussed in #1 above genuinely believed that the cheat sheets were no longer used, and this same view was shared by a warehouse supervisor:

*A [Employee 1]: "No, actually those [cheat sheets] helped us for the first couple of months and then we didn't need them anymore. There may be some around someplace"*

Several other users, however, specifically mentioned that they still benefitted from the informal notes and some people perceived that they were becoming more formalized.

*Q: Do you still use those notes at all?*

*A: [Employee 2]: These are the warehouse screens and everything. Everything that you see in front of you, and of course, what they've done, what she [Employee 3] has done, she's added on through the years.*

*Q: So you still use it.*

*A: [Employee 3]: Yes, and you explore more and more.*

*Q: Now, do you still use those sheets at all to help you? Or do you -- you do?*

*A: [Employee 3]: Definitely. I have an actual Excel file in the computer that -- a number of the processes I know off the top of my head, but some that I don't use very often, I still have my cheat sheets.*

- 3) The form and level of formality of the notes varied greatly. Some were small and intended to be used as a quick reference, yet were formalized to the point of being laminated; others were very comprehensive collections of notes maintained either in large three-ring binders or as a collection of diverse types of electronic files. As indicated in #2 above, the notes could also be stored in a standard file maintained by office automation software.

*A [Employee 4]: And even the training resulted in some sheets being made out with the **laminated plastic**, with walk through menus for the inspectors, what to process, why you would process it and things like that; that were very beneficial.*

*Q: [Employee 2] showed us when we met with her this **rather large three inch binder**. Is that the handbook? Actually there were two of them.*

*A [Employee 4]: Yes, correct.*

Graphical representations in the form of screenshots, flowcharts, or a combination of both are clearly an important part of the notes, as was indicated by the enthusiasm of the following person. Her concern was to find the best way to communicate an organizational process to other employees.

*A [Employee 2]: But I'm just saying, like give them a chart or give them something like this. We even went as far as to say look, here, all you have to do is know these four little screens. Four! That's it! It's a very powerful slide. ... It's called 'We're all connected'.*

This "slide" was a graphical view of four different data entry screens and the interdependencies between them. The key point here was that conveying the structure of the system was very difficult without the graphic. The employees, therefore, utilized screen captures and additional connecting graphical elements to demonstrate the complex dependencies between the business process and the system transactions.

- 4) The situations in which the notes were created varied greatly. Based on the interview material, it appears that a large number of the notes were composed in situations that were related to training (either in preparation for running a training session, or after a training session, in order to address observed deficiencies).

*A [Employee 5]: I took the processes that we were training everybody in, their feedback, and made something called the "ERP Communications Book" and I divided [it] up between disciplines.*

*A [Employee 4]: Right. And that's what the training did. The training actually gave us handbooks and gave us the materials to identify the transaction description and basically what it meant and how to execute it.*

Sometimes process analysis, problem resolution, preparation for training, training itself, and the creation of the informal notes were mixed. It appears that, at least in the case cited below, there was strong motivation to codify the results of a problem solving process and record them in informal notes.

*Q: Did you have notes that you took or cheat sheets or anything that you used for that part?*

*A [Employee 5]: I ended up doing a lot of [this] but this was after Go Live; during training I made notes and I drew things out. But the best training I had is when we had the user group down and we would have a problem and then I would go to the user group and say okay. And things were such a mess and the user group would try and fix it and they did a lot of fixing. But I wouldn't let them fix it unless I wrote down how to fix it and that's how I learned the system; it's all problem resolution.*

In some situations, the notes were created to help a somewhat reluctant and insecure user group start using the system:

*A [Employee 2]: but we wanted to give them somebody that made them feel confident, that if you did it this way all the time, this is how you're going to do it; it's going to achieve it. ...We said okay guys, look. We armed them with everything they possibly can and this is the majority of the screens that they are going to need and what they are going to use.*



At times, it was very important for the instructions to be step-by-step and presented at a very detailed level so that specific processes would be followed. The organization did not have mechanisms for enforcing the processes through the software package and so used the informal notes instead. ("We" in this case refer to a group of professionals whose success depended partially on another group's use of specific system features; thus "We" had a strong incentive to encourage the other group to use the system.)

*A [Employee 2]: So what we actually did, when we tried to get them to do what we wanted to do, we went in and we did these screen shots and we tailored them to -- like say, you were just going to sit down and you were going to do it for the first time -- all you had to do was go through these books and they'll tell you screen by screen, any time you're doing a button or whatever you're putting in, this is what you're going to come up with, even in errors.*

Some individuals continued to maintain their own informal notes so that they could use them in relatively rare situations or share them with their less experienced colleagues. In those cases, the notes were maintained continuously.

*A [Employee 3]: ...I still have my cheat sheets. ... Whenever something new is coming out, [a manager will] forward it over to the [group of professionals to which this person belongs] that this is a new one. Go ahead, try it out, see what you think.*

*Q: But then you make your own notes on it?*

*A [Employee 3]: Right.*

*Q: Do you share them within this group?*

*A [Employee 3]: Yes, within this group*

- 5) Some of the informal notes were used to provide a mapping between the vocabulary traditionally used by the business units and the vocabulary of the system. The users perceived a very clear disconnect between these two and found it very important to provide that mapping.

*A [Employee 5]: I put together a glossary of how the vocabulary changed from pre-[ERP] to post, because people didn't understand the terms.*

*A [Employee 6]: That we put the list of words – [ERP] was down here, and then we checked off the ones that had -- that were the same as legacy, and then we had no checkmarks. Every word we had was different, but we actually made a glossary.*

The issue of language is, of course, a critically important one from the perspective of knowledge transfer. It is very difficult for an employee to understand an organizational process, an overall approach to using an ERP package for performing a business task, or the details of a particular transaction, if that employee is unfamiliar with the language used in the ERP context. The existence of the vocabulary notes, therefore, facilitates the use of other types of notes.

From the information presented above, it is evident that the creation and use of informal notes within this organization varied along a number of dimensions, including: the stage in the process (with greater usage early on), the role of the user (with higher-level personnel less aware of the need and use of those notes), the level of presentation formality (from handwritten notes to laminated, color-printed instruction sheets), the intended audience (from personal to departmental), and the information codified in the notes (detailed technical advice vs. business process understanding vs. terminology). To understand the role informal notes can play in an organization, one must be aware of variations in users, uses, and presentation, all of which affect the meaningfulness and usefulness of the content. Next, we present a categorization for that content in order to develop a more complete understanding of the valuable role fulfilled by these documents.

### **3.2 Evaluation of Informal Notes**

We reviewed and performed a detailed analysis of approximately 80 informal documents that span hundreds of pages of illustrated notes and were prepared by a single middle-level manager. All of these documents were created to support ERP system users in the previously mentioned division. The format of their content varies from purely textual, unstructured descriptions to annotated screen shots. In terms of the information that they provide, these documents can be categorized as follows:

1. System-usage instructions (“how-tos”).
2. Business process descriptions with references to the appropriate system resources.

3. Glossaries of system terminology and the related business/legacy system terminology.
4. Explanations of various data items, the business processes they are involved in, and the implicit system rules that apply to them.

Any of these content types may simultaneously be present within a single document. For example, many how-to guides also contain descriptions of various data fields and system controls, as well as explanations for the different types of errors. In addition, they may describe important ramifications of user actions, both correct and erroneous, that are not readily discernable. A single document may also include instructions on system usage as well as descriptions of the underlying business process. Alternatively, separate documents may provide in-depth detail on each of these areas. Descriptions of complex business procedures may be accompanied by relevant system and personnel resources.

When evaluating the value of these documents and classifying their content, it is, once again, important to bear in mind that their creation was not sanctioned by any managerial authority; rather, it is likely that it was triggered by some sort of *breakdown* in the use of the system, for which training and/or documentation was inadequate or unavailable. Breakdowns can be characterized as arising from a *user-related problem* (such as forgetfulness), a *system-related problem* (such as an unclear error message), or a *business practice-related problem* (such as an exceptional situation that is outside the boundaries of the system). The following table summarizes these types of breakdowns, identifies some possible causes, and describes the content of the informal notes related to them, as identified by a careful analysis of those notes.

The breakdowns shown in Table 1 occurred after the system was in use and the formal training of system users had already taken place. As the author of the informal notes stated, these notes were created "*In the throes of disaster*" in order to:

- Support inexperienced users who were unable to use the system, either because of the *system's* failure to provide an intuitive user interface, or because of the *user's* fear of the technology.
- Develop solutions for a user-group involved in addressing a massive crisis that occurred soon after the launch of the system.

**Table 1.** Informal Note Categorizations

Breakdown Category	Sample Causes	Informal Note Content
User	<ul style="list-style-type: none"> <li>• Failure to enact or recall a simple transactional sequence.</li> <li>• Fear of technology</li> </ul>	<ul style="list-style-type: none"> <li>• Click-based instructions for performing relatively straightforward system tasks.</li> </ul>
System	<ul style="list-style-type: none"> <li>• Failure to communicate the business semantics of data or processes.</li> <li>• Failure of system to guide the user through the required sequence of transaction steps.</li> <li>• Failure to communicate important implications of certain user actions.</li> <li>• Failure to diagnose/explain/fix the cause of an error.</li> <li>• User/system vocabulary mismatch.</li> <li>• Unintuitive or poorly identifiable GUI controls.</li> </ul>	<ul style="list-style-type: none"> <li>• Elaborate, multi-page, illustrated, how-to instructions.</li> <li>• Text-based explanations of data sources/situations/implications (e.g. if this happens, that means...)</li> <li>• Text-based error diagnostics and procedures for fixing the problem.</li> <li>• Screen shots of particular transaction interfaces</li> <li>• Text-based vocabularies of system terms</li> <li>• Visual representations of graphical interface features.</li> </ul>
Business Practice	<ul style="list-style-type: none"> <li>• Exceptional situation: an out of the ordinary business situation or a situation requiring non-standard treatment.</li> </ul>	<ul style="list-style-type: none"> <li>• Elaborate descriptions (including text and illustrations) of a business process with references to ERP system resources (reports/transactions) and groups of people involved.</li> </ul>

The documents created in response to a *business practice* breakdown typically contained detailed, step-by-step specifications of some critical process that was particularly complex to implement with the system. These processes were generally related to exceptional situations that rarely occurred, such as accounting for missing or broken parts, or were not well supported by the system, such as exchanging parts between two manufactured products. As noted by the author of the notes:

*A [Employee 5]:.. when we had the user group down and we would have a problem and then I would go to the user group and say okay. And things were such a mess and the user group would try and fix it and they did a lot of fixing. But I wouldn't let them fix it unless I wrote down how to fix it and that's how I learned the system; it's all problem resolution.*

*... But it basically says you do this transaction and then somebody else does this transaction, you do this transaction. If they have a problem, this is what you do, if you have that problem, this is what you do. It's that type of style, but it's the business side of it.*

*Q: Do you still use those notes at all?*

*A [Employee 5]: Absolutely I formalized them, standardized them, put them online for everybody to use.*

It is particularly important to note that, even though most of the informal notes were created during the early stages of the ERP system's implementation, they were maintained and used routinely by even the most experienced users. In this respect, they do not, strictly speaking, fit within any of Markus's typology (Markus 2001, p. 63) of knowledge reuse situations. This suggests a fifth category of reuse that could be termed "Expertise-Seeking Practitioners." While novices need access to knowledge that they rarely use, and so cannot be expected to remember it, these practitioners are well-versed in the tasks they are performing. It is the complexity of the tasks themselves, rather than the frequency with which they are performed, that necessitates access to a knowledge repository.

## **4 Conclusions**

The informal documents that are the subject of this paper were developed by employees to support themselves and their fellow employees in the effective use of an ERP system. These documents range from handwritten cheat sheets created by an individual for personal use, to laminated instructions sheets shared by a group of users, and on to hundreds of pages of bound and/or electronically stored notes produced by one employee for widespread use. None of these documents were created in response to a company mandate, nor were they created at the start of the implementation process. Rather, they were developed in response to the overwhelming complexity of

the system, which had not been adequately addressed by either training or vendor-supplied documentation.

The content of the informal documents provides a rare view into the nature of the difficulties experienced by the users, including the mismatch between the users' and the system's vocabulary, the lack of transparency between underlying business process and the corresponding system transaction sequence, and communication shortcomings arising from an unintuitive graphical user interface. We have categorized the documents in terms of the informational content they provide and the "breakdown" they are intended to correct (i.e., user, system, or business process), and have described some typical causes for those breakdown.

Though their use is largely unacknowledged by management, these documents are still actively relied upon several years after the successful implementation of the ERP system. What's more, users ranging from novices to experts make use of these documents on a daily basis. Knowledge reuse by experts caused by system complexity is, to the best of our knowledge, an unstudied phenomenon deserving of further investigation, as is the differences in the types of information sought by the users with varying degrees of expertise.

While only a preliminary evaluation, this study lays the foundation for a framework that classifies informal documents on the basis of creation, content, and usage characteristics. Furthermore, it highlights the value such documents hold for organizations; the informal notes that were basis for this study shed light on the types of problems faced by ERP system users and can provide insights to organizations in targeting their training efforts and to ERP system providers for improving the usability of their systems through careful analysis and design. In addition, an organization can use the informal notes created by its employees as a way to analyze possible areas for business process improvement. Multiple potential uses for informal notes suggests that they should be taken seriously and seen as a valuable resource.

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