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The Institute for the Learning Sciences

TAXOPS: GIVING EXPERT ADVICE TO EXPERTS

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*You never know what's out there,
until you take a look (Ron Fulks).*

1. Introduction

TaxOps, the Tax Opportunity Advisor, is a case-based consulting system that delivers expert advice to tax professionals. This advice is in the form of "war stories", anecdotes, and professional opinions, all gathered from videotaped interviews with a group of the world's foremost tax experts. TaxOps places the user within a network of these video clips and, by motivating a tour of the network, engages the user in an interactive video dialog with these experts.

2. The Problem

Arthur Andersen & Co. is a "big six" accounting firm and their tax division generates \$600 million annually. The senior partners of the tax practice are the "stars" of the division. They are the "rainmakers" who generate the most income and they know their business inside-out. These experts are creative problem solvers who devise solutions to what are sometimes extremely complex business problems.

These experts are also specialists. There are 20 service lines, or practices, in the Tax Division: State and Local Taxes, Personal Financial Planning, International Tax Services, and so on. Partners are generally expert in only one or two of these areas, and often their acquaintance with other practices is minimal. As a consequence there is relatively little collaboration among the different practices. This is unfortunate for at least two reasons: Additional business is generated when the practices "cross-sell" for each other (that is, help other practices sell services to their clients). In addition, the "war stories" that belong to each practice form an important part of the "corporate memory", and insularity prevents this from being shared.

The problem is at least partly an educational one. The senior partners need to know more about the firm in order to think more globally about opportunities for service. More junior members need to learn about the firm and need to be exposed to the expertise of the partners through apprenticeship and assimilation of the corporate memory. The problem is also partly sociological. The

senior partners are very busy indeed; they are hard to get in touch with, and they have little time to spare for any one person or problem. Junior people, in any venue, are concerned about not making their ignorance public and about wasting an expert's time. The TaxOps solution is to try to capture a "roomful of experts in a box" by placing the best stories on a video format and making them accessible when the user is ready to view them.

TaxOps is an advisor that seeks to connect (potential) clients with services. It is also a system for case-based teaching. Teachers use stories and anecdotes to present material and to reinforce their points. It is often the stories and the examples, rather than the more formalized elements of instruction, that students take away with them. The trick is to know what story to tell, and when to tell it. Even a good story will fail if the student is unprepared to hear it, or if the student's interest lies elsewhere (Schank, 1991; Schank and Jona, 1991). TaxOps teaches through cases by giving good examples of problem-solving in specific situations. The examples are good because they relate to a business situation, a client or potential client, that the user is personally concerned with at that moment.

3. Methodological Overview

In a typical session TaxOps analyzes a business situation, which the user describes, then computes the salient features of that situation. The "case" built in this process is matched against a library of previously known cases and, if a sufficiently similar case is found, this matching is used to augment the new case. The augmented case is evaluated in terms of tax-related services. This produces a ranked list of "entry points" into the video network. These entry points give direct access to the video clips most relevant to the business situation being analyzed. From there the user navigates freely from clip to clip and from expert to expert (see figure 1).

The user, a tax professional with a (potential) client, a public or private organization, or an individual or family, in mind, interacts with TaxOps by describing the client and then pursuing a line of questioning through the network of video clips. Every clip is identified with the questions it raises and the questions it answers. Questions raised by a clip lead the user to clips that answer those questions. These clips raise other questions, and this in turn leads to further clips. In this way users negotiate a sequence, that has not

been pre-determined, particularly relevant to them. Their questions control the the progress of the dialog. Users follow their own curiosity and interest, wherever that may lead.

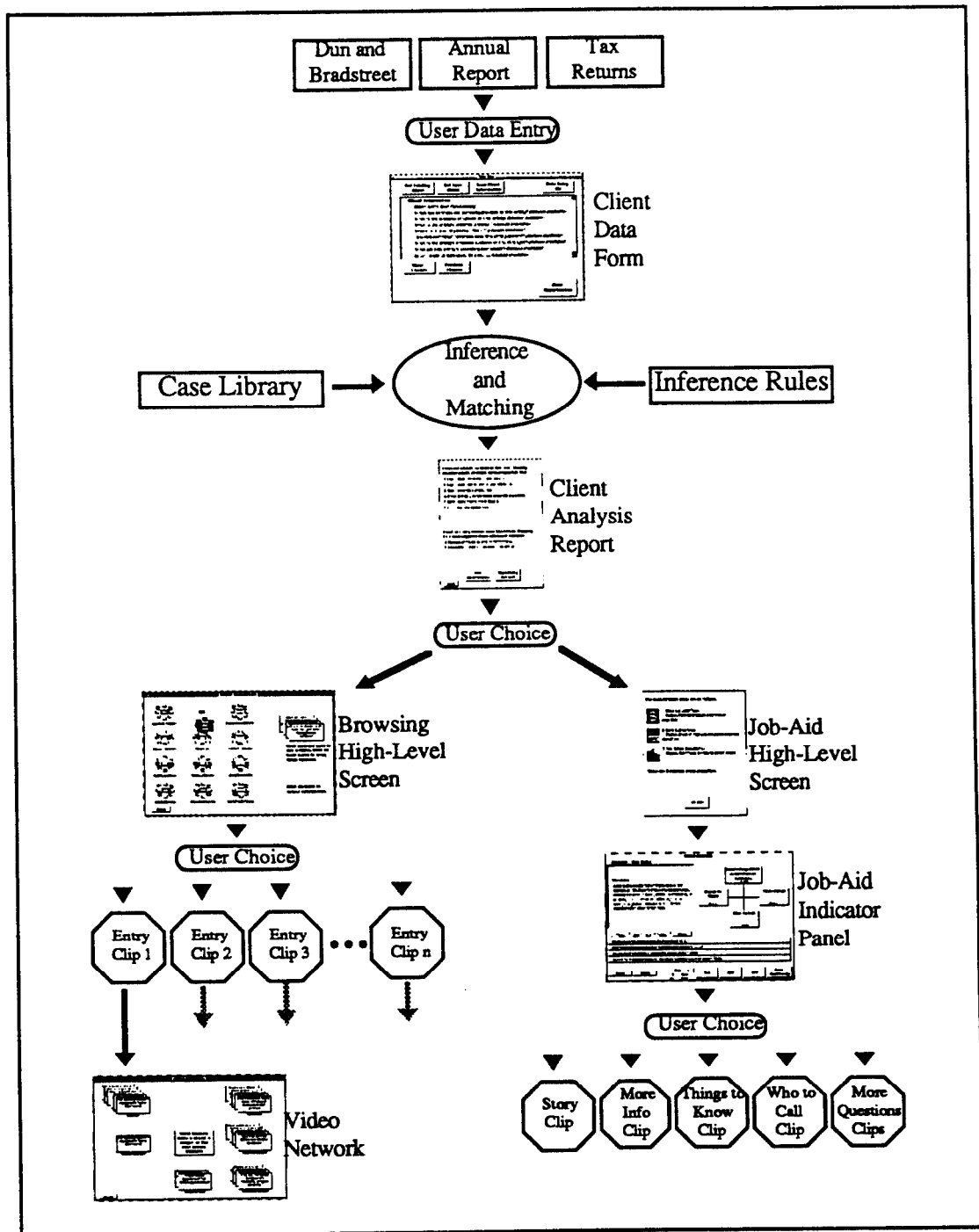


Figure 1: TaxOps Flow of Control

4. Knowledge Representation

TaxOps is a case-based system. The knowledge of the system is captured in Memory Organization Packets (MOPs) (Schank, 1982). The basic algorithm is one where information is gathered to form a case, then memory is searched in order to find relevant similar cases (Kolodner and Riesbeck, 1990). TaxOps is in the interpretive family of case-based systems (Kolodner and Jona, 1991). Some Case-Based Reasoning (CBR) systems use retrieved cases as a source of examples for analogical problem solving, often by adapting solutions connected to the retrieved cases. TaxOps is not solving a problem of this sort; rather, TaxOps is designed to be suggestive, and to give abstract advice that covers the kinds of recourse available without specifying what must be done.

TaxOps works by connecting the new case (the client or potential client) within a dynamic memory of cases. The memory structure is overlaid onto a network of video clips. Cases in memory are thus situated within the video network in a meaningful way. Access to video from cases is a significant feature of the system which provides a large advantage over those systems principally devoted to case retrieval. Knowing which cases are most like the object of interest is valuable but it is better still to also be able to browse through related stories, and to be able to follow an independent or tangential line of questions. In addition to retrieved cases, the output of the system is the exposure the user gains from traversing the video network.

TaxOps helps the user recognize potential opportunities in a business situation and points out company services that apply to those opportunities. TaxOps also puts experts and their stories in front of the user in a motivated way in order to reveal the corporate memory, and does so in a memorable way that benefits the user.

4.1 Industry Trends and Features

Tax opportunities sometimes vary according to industry type, and the relevance of various economic and financial features varies widely according to industry. In a high growth industry like electronics manufacturing, for example, a 1.0% annual increase in revenues would be evidence of a failing company while that rate of growth in a railroad would indicate a wildly successful operation. Other industries have experienced narrowing margins and a negative balance of trade in recent years. The European community, meanwhile, plans to implement new trading regulations that promise increased opportunities for U.S. exporters. Certain industries have

recently experienced a large number of hostile takeovers, and the aftermath of this trend has certain far reaching tax implications for those, and other related industries. Governing and regulatory bodies, at all levels, often change the rules of an industry requiring companies to alter their operations and strategies. This sort of knowledge is necessary for evaluating and comparing business cases and the opportunities that relate to them. These structures were gathered from textual sources (i.e., Department of Commerce, 1990), and from consultation with tax managers.

4.2 Opportunity Indicators

The Tax Division of Arthur Andersen & Co. has developed a system for taking industry and corporate conditions into account, and for associating tax opportunities with service lines. Whenever an analysis of a client reveals the "planned or actual acquisition of facilities" a tax manager knows that the client probably needs the Real Estate Practice to perform a Facilities Assessment. If analysis reveals "aging management with no logical successors" or "a company with cash flow problems" there are tax practices with services that are specifically relevant to that. These formulations, describing business events and states, are referred to as "opportunity indicators". They form a basis for matching client needs with service lines, and TaxOps encodes a table of these relationships along with the industry-related knowledge structures described above.

4.3 Rules of Inference

The TaxOps program is able to recognize certain features of a business situation and map these onto the opportunity indicators listed in the Arthur Andersen & Co. Tax Awareness booklet. The process of recognizing and mapping features requires the application of a set of rules of inference.

The data entry form, described below, is the first opportunity for the user to interact with the TaxOps program. Users can either retrieve previously existing business descriptions or they can create a new description. The data entry form allows the user to enter the business name, the location(s) of operation, principal and secondary industries, as well as other items including relevant financial information.

The rules of inference are described below. Each is of the form, "IF certain facts are known to be true, THEN a particular opportunity indicator applies to this situation". The number associated with each opportunity indicator gives a position on the list of 94 indicators in the Tax Awareness booklet.

Some of the TaxOps inferences are straight from the data that is gathered from the data entry form.

IF the principal industry is listed as "Real Estate"

THEN

9. "Active in real estate acquisition/development/management"

IF the number of U.S. locations is listed as "three or more"

THEN

17. "Multi-state operations in the U.S."

IF the business type is listed as "Tax Exempt"

THEN

26. "Tax exempt organization"

IF one of the secondary businesses is "Real Estate"

THEN

66. "Significant ownership of real estate"

IF the principal industry is listed as "Banking"

AND the business type is listed as "Fiduciary"

THEN

83. "Bank Trust Department"

Some of the TaxOps inferences are based on a combination of data that is gathered from the data entry form and other knowledge of the contemporary business world. Much of this other knowledge comes from a U.S. Department of Commerce publication, "1990 U.S. Industrial Outlook", but this has also been augmented through personal communication with Arthur Andersen & Co. partners and managers.

IF the MOP representing the principal industry of the business situation inherits from a MOP that has the "capital intensive" MOP stored in an "industry feature" slot

THEN

1. "Capital intensive business"

IF the MOP representing the principal industry of the business situation inherits from a MOP that has the "rapidly changing technology" MOP stored in an "industry trend" slot

THEN

3. "Rapidly changing technology"

IF the MOP representing the principal industry of the business situation inherits from a MOP that has the "highly competitive" MOP stored in an

"competition" slot
THEN

5. "Highly competitive industry"

IF the MOP representing the principal industry of the business situation inherits from a MOP that has the "industry restructured" MOP stored in a "recent event" slot
THEN

6. "Recent hostile takeovers in the industry"

IF the MOP representing the principal industry of the business situation inherits from a MOP that has the "inbound investment" MOP stored in a "recent trend" slot
THEN

7. "Inbound investments"

Information about the (potential) client's business situation comes from the "financial data" section of the data entry form. Information for these inferences can be taken from a variety of sources: annual reports, Dun & Bradstreet reports, or income tax returns. The information to be recorded on the data entry form is easily obtainable, usually available to the public, since it will often be the case that the business situation of interest will be a non-client, hence no great level of detailed information will be available to the system. In addition, easily obtainable information can be entered by persons with little or no domain expertise, allowing the tax professional to delegate this data entry task. The rules of inference that are applied to this information were gathered from conversations with Arthur Andersen & Co. partners and managers.

IF "ownership sector" is "code 21" (in the private sector)
AND "business type" is "partnership"
OR "business type" is "S-corporation"

THEN

39. "Stock ownership closely held"

IF 39. "Stock ownership closely held" (see above)
AND

IF the current ratio is less than 1.0

OR

IF the Dun & Bradstreet "summary rating" is "unfavorable"

OR

IF the current ratio is less than 2.0

AND net profit is less than 0

OR the Dun & Bradstreet "revenue trend" is
"decrease"

THEN

12.1. "Financially troubled, closely held business"

IF "ownership sector" is "code 21" (in the private sector)
AND "business type" is "corporation"

THEN

40. "Stock ownership widely held"

IF 40. "Stock ownership widely held" (see above)

AND

IF the current ratio is less than 1.0

OR

IF the Dun & Bradstreet "summary rating" is "unfavorable"

OR

IF the current ratio is less than 2.0

AND net profit is less than 0

OR the Dun & Bradstreet "revenue trend" is
decrease"

THEN

12.2. "Financially troubled, widely held business"

IF the Dun & Bradstreet "summary rating" code is one of "ER1" "ER2" or "ER3"
(for greater than 1000 employees, 500-999 employees, and 100-499
employees)

THEN

43. "Large employee population"

IF the Dun & Bradstreet "summary rating" is one of "5A1" "5A2" "4A1" or
"4A2" (where "5A" means "estimated financial strength" in excess of \$50
million, "4A" means "estimated financial strength" in the \$10-50
million range, and a third digit of 1 or 2 means a "composite credit
appraisal" of "high" or "good" respectively)

OR

IF the Dun & Bradstreet "summary condition" is either "Strong"
or "Good"

AND

the Dun & Bradstreet "summary rating" is one of "ER1"
"ER2" or "ER3" (see above)

THEN

28. "Group of highly compensated corporate executives"

IF the "net profit" is less than zero (net profit is found on the Profit/Loss or
Income statement found in the Annual Report or on many Dun &
Bradstreet reports)

THEN

45. "Short of cash"

IF the Dun & Bradstreet "summary rating" has a "composite credit appraisal"
rating of 3 or 4 (where this appraisal is the third digit of the code, and 3
or 4 means "fair" or "limited")

THEN

51. "Debt service problems"

IF the "current ratio" is greater than 2.5 (where current ratio is the ratio of
"current assets" over "current liabilities" found on the Balance Sheet of
the Annual Report or on many Dun & Bradstreet reports)

THEN

64. "Significant cash or cash equivalent buildup"

IF "net profit" is less than zero
AND
"owner equity" exceeds one-third of the "current assets"
THEN
70. "IRS or state tax penalty potential"

5. Case-Based Reasoning

Case-based reasoning (CBR) systems stand in opposition to systems for rule-based reasoning (Riesbeck and Schank, 1989). First, knowledge acquisition for CBR is different since the CBR knowledge base is populated with cases rather than rules. Cases are preferred to rules because there is considerable evidence that experts solve problems in case-based ways, and that novices are more prone to attempt to apply rules to problems. Rule systems are notoriously difficult to build and maintain. Learning is almost always a part of case-based systems because the new cases constructed are saved in memory, while rule-based systems carry nothing from session to session and so make the same mistakes repeatedly until they are explicitly changed. Partial matching and "best guessing" are built into the case-based strategy because it is rare to find two complex situations that coincide in every particular, while a rule-based system must have rules that explicitly match the problem, otherwise the problem cannot be recognized and solved.

6. General System Description

The goal of TaxOps is to present users, tax professionals, with video segments that are relevant to them in terms of a specific business situation. The situation of interest might be an existing client, but is more probably not. TaxOps is intended to familiarize the tax professional with a general range of opportunities and associated service strategies, not to perform an in-depth analysis or propose highly specific options for service (though TaxOps does recognize service lines and general types of services, linked to opportunity indicators, that are relevant). Meanwhile, users arm themselves with stories about opportunities and services. The expectation is that these stories will surface in users' minds at some point, possibly in a client interaction/engagement (perhaps a client other than the one under consideration in the TaxOps session), and that users will benefit from having these stories at hand and being able to refer to them and tell them at a felicitous time.

There are three parts to a TaxOps session: 1) data gathering; 2) analysis and matching; and 3) video interaction and browsing.

6.1 Data Gathering

We imagine the following hypothetical situation to be prototypical of the way TaxOps will be used.

The busy tax professional is riding to work on the train in the morning. The Wall Street Journal is open and contains a short news item about a company, say, the Duet Cup Corporation. The item is not particularly novel or earth-shaking; maybe a founding chairman is seeking early retirement, or perhaps the company is buying up its own stock. These sorts of events may or may not be significant. They do not necessarily mean anything much by themselves. Nonetheless, the tax professional is curious enough to write the name "Duet Cup" on a scrap of paper and, upon arriving at the office, hand the note to a staff member or administrative assistant.

The staff member is charged with doing a library search of some sort to find whatever information is publicly available about the Duet Cup Corporation. Sometimes, in the case of a non-client, this search will yield nothing more than a published annual report. If the subject of the search is a client, their income tax returns might be available.

In the most likely scenario a Dun & Bradstreet (D&B) report for the Duet Cup Corporation would be the primary source of information. Dun and Bradstreet provides a widely used, voluntary, financial reporting service. Companies disclose the nature of their business, the industries they participate in, and the general nature of their financial situation, including some specific dollar amounts, such as current assets and annual sales. The D&B also contains coded information relating to general financial strength and credit history.

However the information comes to hand, filling in a short form is the first step in a TaxOps session. The form has eight top level questions (Figure 2). Questions are answered by filling in the blanks or checking boxes. Several of these questions have subparts. The financial section of the form, in particular, has several questions that call for filling in numbers and identifying trends (like whether net sales are up or down from the previous year).

The screenshot shows a window titled "Tax Ops" with a menu bar containing "Get Existing Client", "Get New Client", "Save Client Information", and "Data Entry Aid". The "Data Entry Aid" menu item is selected. Below the menu bar is a large text area titled "Client Information" containing the following text:

Client Name *Duet Cup Company.*

Which tax services are currently provided to this entity? *(choices available)*

What is the business structure of this entity? *(choices available)*

What is the entity's ownership sector? *(choices available)*

Where is this entity headquartered? *(choices available)*

In which additional locations does this entity operate? *(choices available)*

What is the entity's principal business or industry type? *(choices available)*

What are this entity's secondary businesses? *(choices available)*

Enter financial data about this entity. *(choices available)*

At the bottom of the window, there are three buttons: "Show Choices", "Previous Choices", and "Show Opportunities".

Figure 2: This is the first screen of the data entry module. This screen facilitates entry of data about the (potential) client, for each of the branches, at the highest level.

It is not necessary for the user to completely answer every question, and missing data values are expected. For example, the available data for Duet Cup includes figures for income, current assets, and current liabilities, but nothing for Net Profit or Shareholder's Equity (Figure 3). The object of the form is to capture information about the situation of interest in the form of a MOP structure; that certain data values are missing just means that the picture is incomplete (not an unusual situation in case-based reasoning).

This snapshot of the Duet Cup Corporation is the case that TaxOps reasons about and which provides the focus for subsequent video interaction. The first several clips TaxOps will make available are selected as potential entry points because they contain material judged relevant according to the analysis of Duet Cup.

6.2 The TaxOps CBR method

Evaluation in TaxOps is a matter of discovering which opportunity indicators are true of the case of current interest. There are two steps that accomplish this: 1) the data values found in the form are evaluated and features, or indicators, are associated with the case as a result of this evaluation; and 2) the case, as developed

in step #1, is matched against the case-base of businesses, and the nearest plausible match, if there is one, is used to augment the features inferred in step #1.

6.2.1 Case Analysis

The data entered into the input form are evaluated with a view towards assigning features to the case of interest, in this instance the Duet Cup Corporation. The features, also called opportunity indicators, are the bridge for linking business cases to services and service lines. Each indicator has an inference rule attached to it, and the case is linked to every indicator whose rule evaluates to true. In this way the case of interest becomes linked in MOP memory.

The opportunity indicators are partitioned into classes: industry conditions, business conditions, assets and asset management, and so on. Different kinds of knowledge are necessary for inferencing in these sub-domains. Industry condition indicators are calculated as a function of memory access. For example, one of the industry condition indicators is "capital intensive industry" and another is "recent history of hostile takeovers in the industry"; the first of these is principally true of manufacturing industries, and is always true of these industries. On the other hand, there are several industries with a recent history of hostile takeovers, but this sort of characterization will change over time. For this reason the industry condition knowledge structures are subject to periodic revision.

By contrast, business condition indicators are calculated by rule application. One of the business condition indicators, for example, is "significant cash or cash equivalent buildup" and another is "debt service problems". According to Arthur Andersen & Co. tax managers, the first of these is true if the ratio of current assets to current liabilities (referred to as the "current ratio") is greater than 2.5 and revenues have increased over the previous year. The "debt service" indicator is directly inferable from coded information in the D&B. Another indicator of the business condition type is "potential for an IRS audit". There are several circumstances that make this indicator true, among them is a net profit less than 0.0 with a shareholders equity that exceeds one-third of current assets.

The result of the case analysis is a set of links from the case of interest to opportunity indicator MOPs. The TaxOps memory organization also has links from opportunity indicator MOPs to video

clips. These links connect business cases to entry points in the video network.

The screenshot shows a window titled "Tax Ops" with a menu bar containing "Get Existing Client", "Get New Client", "Save Client Information", and "Data Entry Aid". The main area is titled "Client Information" and contains the following text: "Enter financial data about this entity. From Recent Income Tax Return(s)". Below this are several input fields: "Income" with the value "352000000", "Net Profit" with an empty field, "Assets" with the value "11557000", and "Shareholder's Equity" with an empty field. There are two dropdown menus: one for "Are Assets up or down from the previous year?" with the selected option "INCREASE", and another for "Are Liabilities up or down from the previous year?" with the selected option "Decrease". At the bottom left, there is a "HELP..." section with the text: "From Schedule L, page 4, of IRS form 1120, enter the sum of lines 16(d), 17(d), and 18(d)". At the bottom right, there is a "Show Opportunities" button. There are also "Show Choices" and "Previous Choices" buttons at the bottom left.

Figure 3: This is the lowest level of detail in the data entry module. The HELP facility provides the specific location where information can be found.

6.2.2 Case Matching

When the analysis phase is complete, the newly connected case is matched against a library of existing cases. The goal of this search is to find the most plausibly similar case in hopes of discovering further opportunity indicators. In the Duet Cup example, six indicators are inferred through the analysis phase; two more indicators are associated with Duet Cup because of the strong similarity found with another case: the Ideal Paper Company (Figure 4).

The rationale behind this association is rooted in the foundations of case-based reasoning. If the current case and a pre-existing case are connected to the same indicators, and if that pre-existing case also has other connections, then it is reasonable to talk about the new case in terms of all these features. One example is a medical diagnosis in which the symptoms, according to reference literature, point to a particular disease, but personal experience indicates that these conditions are commonly associated with another disease. In the Duet Cup example, TaxOps has found that

there is "significant cash or cash equivalent buildup", but matching with the Ideal Paper Company indicates that "acquisition of facilities" is also relevant. This makes sense because acquisition is a productive method of handling a cash buildup.

These calculated features of Duet Cup Company indicate potential client service opportunities:

1. Significant ownership of real estate
2. Significant cash or cash equivalent buildup
3. Stock ownership widely held
4. Group of highly compensated corporate executives
5. Multi-state operations in the U.S.
6. Capital intensive business

**There is a very similar case: Ideal Paper Company
This case suggests these additional features:**

1. Planned or actual relocation of facilities
2. Planned or actual expansion or acquisition

[Back](#) [Best Opportunities](#) [Opportunity Network](#)

Figure 4: This is the profile for the Duet Cup Company. The opportunities discovered during routine analysis of the data entered are presented at the top of the screen. The opportunities discovered through case-based reasoning are presented at the bottom of the screen. The "Best Opportunities" button places the user in the job-aid interface. The "Opportunity Network" button places the user in the training interface.

In TaxOps, the case-based matching is strictly constrained. This produces conservative associations. This is desirable since users are interested in concrete advice and implementable strategies. It seems generally true that highly motivated, goal-directed users receive suggestions better when they are down to earth and to the point, rather than far afield or over ambitious. By limiting opportunity indicator associations TaxOps focuses the user's video options.

The case matching phase usually results in a small set of indicators being added to the list of things to consider relevant to

the current case. This is not always so: the conservative TaxOps matching strategy can also find that no pre-existing case is similar enough to warrant further consideration. There are almost always enough indicators true of the current case to allow a non-default entry to the video network.

TaxOps ranks the opportunity indicators according to "interestingness" (i.e., the "cash buildup" business condition is more pregnant with opportunity than the "capital intensive" industry condition) and ranks the service lines according to their ability to respond to these indicators by offering services relevant to particular indicators. By making a calculation about the current case, the interestingness of its indicators, and the services each practice offers in response to those indicators, TaxOps is able to prioritize the entry points to the video network. Specific video clips are in this way identified as most relevant to the current case, and these are the first clips the user sees.

6.3 Video Interaction and Knowledge Navigation

After analyzing the Duet Cup case, TaxOps lists the eight opportunity indicators relevant to the case (Figure 4). There could be several entry point clips for each of these features: one for every service line in the Tax Division. However, not every tax practice offers a service that relates to every opportunity indicator.

The entry points are the first look the user gets at the video library. The entry point subnetworks are clips substantively concerned with a single opportunity indicator (and grouped by indicator). Many other kinds of clips exist in the network: clips that address background issues, or that list questions to ask a client, or that discuss how different indicators relate to each other, or that discuss problems or mistakes and how to handle or avoid them. These and other clips in the network answer follow-up questions and provide contextual or otherwise related information.

TaxOps ranks the video entry points. Users still have the option of entering the network at whichever entry point they choose, and from there they are free to traverse from clip to clip as they wish. As mentioned above, the method the user has for making this traversal is via questions: questions raised in the user's mind that are answered by video clips.

7. Knowledge Acquisition

Knowledge acquisition for TaxOps was performed in a three step process: 1) interviewing experts, 2) content assessment, and 3) posing questions.

7.1 Interviewing Experts

The first stage of knowledge acquisition for TaxOps was accomplished by interviewing a dozen senior partners at Arthur Andersen & Co. The partners were selected from various tax practices: State and Local Taxes (SALT), Real Estate Consultation, Appraisal and Valuation, Personal Financial Planning, and others. Each interview generally lasted from two to four hours and yielded between fifty and one-hundred usable clips. These clips ran from thirty seconds to four minutes in length.

The interviews were conducted in an exploratory fashion. It was not paramount that the video clips from any interview be cohesive or externally thematic, rather, it was important to collect as many good stories as possible. The interviews were, therefore, somewhat informal and conversational. The purpose of the interviews was to collect a set of business "war stories" that could be shared with other senior partners and managers as a way of encouraging cross-selling, communication, and cooperation among members of the various service lines.

The TaxOps video library was also constructed to support a tool for computer assisted training for junior members of the firm. As the interviewing progressed, certain recurring themes were identified, and these were intentionally pursued in later interviews. For example, in light of the recent world economic picture, many of the partners had stories relating to "downsizing" or other strategies for corporate retrenchment and cost cutting. Since each service line provides services complimentary to those of the other lines, each partner was able to cast light on business situations from the perspective of their specialty. The Appraisal expert, the Real Estate expert, and the Personal Financial Planning expert could, for instance, suggest ways to think about hostile takeovers that might not normally have occurred to experts in State and Local Tax.

Another theme that emerged in the interviews was the notion of the "key indicator". Each partner was asked to talk about key features of business situations that indicated an opportunity for their group to provide service. These ranged from the predictable (i.e., any time there are transactions where the dollar values are

large experts in appraisal and valuation should be consulted), to the obvious (i.e., a company planning to relocate to another state needs the services of the State and Local Tax group), to the unexpected (i.e., clients that operate in only one location might risk significant tax exposure in other states if they do not consult a State and Local Tax expert - this is because SALT's practice is thought of as primarily having to do with multi-state clients, but even companies operating in just one location often have interstate transactions that carry liabilities that are unexpected or hard to identify). Similarly, each partner was able to reel off "key questions" to ask prospective clients in order to determine whether opportunities existed to sell services from that partner's service line.

Although the interviewer's voice was audible on the master tape, no effort was made to incorporate the interviewer's questions into the links (questions raised to questions answered) that eventually connected the clips in the video network. The links were formed by having tax professionals view the clips, with the interviewer's voice edited out, and generate the questions they thought each clip answered and raised. This task was executed by senior managers, one step below partners in the Arthur Andersen & Co. hierarchy.

The tax experts were interviewed by a non-expert, and this influenced the way that answers were framed. The rules of conversation (Grice, 1975) require an expert to voluntarily define terms and flesh out background issues while in conversation with a non-expert. This is a matter of courtesy to the non-expert, although it usually goes unnoticed. When experts view footage of an expert speaking to a non-expert it is clear (and sometimes annoying) to them that seemingly "obvious" things are being spelled out for the benefit of a non-expert. This did not affect the pragmatic value of the clips' contents but it did affect the delivery, and thus the users' perception, of the clips to some extent.

7.2 Choosing "viable" clips

The first step in indexing for TaxOps was to view videotaped interviews with experts in order to break the continuous interviews into sets of separate clips. The video tape used for this task had a clock display (that is not shown in the final, edited version of the interview). The minimal criteria for usable clips are that the expert should speak without interruptions from the interviewers, in a coherent manner, with no major errors in delivery, on one subject or

several related subjects. At this stage we did not distinguish clips according to their quality or any aspect of their content beyond their basic coherence and delivery. For practical purposes each usable clip has to have a cosmetically acceptable beginning and end, and has to stand alone (without depending on references to things established earlier in the interview). In some cases it is possible to edit disparate pieces of tape to make one clip, or to cut the middle out of a protracted discussion. In our experience, however, usable clips were most often delivered without the need for cut-and-paste editing.

Each time the expert being interviewed seemed about to deliver usable material the indexer noted the starting time and the first phrase or the first few words of the story (in order to eliminate ambiguity about where the clip begins the indexer's assessment of starting and ending times is necessarily imprecise compared to the standard of a tape editing facility). If the clip delivery turned out to be flawed, the remainder of the information was left out, and this indicated to tape editors that a clip was not usable. If, however, the delivery was adequate, the indexer watched for the end of the clip, noting the ending time and phrase. This method allowed the process of clip identification to proceed fairly quickly, however a certain amount of going back to verify times and phrases, and to determine exactly where a clip should start and end, was inevitable. We found that this process was much easier if two people shared the task (one taking start times and phrases, the other taking end times and phrases). Once an entire tape's worth of clips had been identified each useable clip was assigned a number.

The task of identifying clips required some judgement on the indexer's part. Sometimes it was necessary to allow repetitious material in order to preserve the overall delivery of the clip. Experts sometimes talk about several subjects in a story. Sometimes it is possible to separate the topics, sometimes it is necessary to let them run together. It was, in general, most helpful in later stages if each clip contained information on one subject or a story describing one experience, and clips more than a minute long tend to discourage users (users are shown the length of a clip, along with other information, before they decide to view the clip), though many good stories did run for two minutes or more.

Once usable clips were identified, edited versions of the interview were produced containing only the clips, each clip

separated by three seconds of blank tape. These clips were then indexed (they underwent content analysis).

7.3 Content Analysis

TaxOps was conceived of as a system where users would watch a clip that would presumably raise questions in their minds (which indexers would anticipate). Similarly, each clip would also answer questions (which indexers would enumerate). A network would then be constructed by searching for matching questions, weaving the library of clips into a hardwired network. It soon became clear, however, that the subject matter made it difficult for non-experts to link questions with confidence. Perhaps the most important problem was that the number of questions answered and raised in the space of one interview's worth of clips made it intractable to search the entire list of questions answered to find the best matches for each question raised. Without the addition of some automated process to help choose links it would be impossible to handle the task of linking several networks in a timely or efficient way.

7.3.1 Creating an Index

Because of the scale of the TaxOps domain, an index was derived by looking at the set of questions answered and raised that had been collected and finding the topical categories the questions seemed naturally to fall into. In addition, a few aspects of the index were "artificially" accentuated. For instance, hostile takeover was a subject that came up a number of times in the interviews, and this made it something for TaxOps to pay special attention to; so provision was made in the index to highlight anything that had to do with hostile takeovers. We do not believe that domain expertise is necessary to design or apply an index. We believe that we developed enough familiarity with the domain to accomplish this ourselves. It would be an interesting experiment to have the question posing and indexing done over again, but as separate tasks, to see how network topology and system usability change as a result.

The TaxOps index is neither deeply semantic nor deeply feature-based (though the TaxOps indexing method encompasses these approaches and tacitly also accomplishes some thematic indexing along the lines of "Ask Tom" (Schank et al., 1991)). It merely attempted to describe at a high level the topic of each question posed (i.e., "cash-flow problem", "you should bring us in

when..."). The index did not attempt to describe clips in great detail. In part this was because it is impossible to capture every possibility in a complex domain such as tax consulting. In addition, a large, complex index would be undesirably cumbersome for human indexers. The index was designed in a way that allowed a question to be identified as simultaneously a member of several distinct branches of the index tree. This helped to build a picture of the questions without having to develop extremely leafy branches with redundant leaves. In addition, domain constraints informed the structure of the index -- the index reflects only the tax opportunity domain. The emphasis is placed on the questions when choosing links, using the indices as preliminary clues to the content of the clip.

7.3.2 Personnel

Content analysis for the TaxOps video library was originally performed by Institute personnel who were neither the intended end users of the system nor experts in the domains with which the stories dealt. We found this to be unsatisfactory. A principle of indexing seems to be that highly specified domain knowledge intended for use by specialists in the same or similar domains cannot be adequately represented by novices in that domain. In other words, to classify and transmit expert knowledge and wisdom about a specialization of Arthur Andersen and Company's tax practice to an expert in a closely related field, it is necessary to have content analysis done by someone sufficiently knowledgeable in the field who is representative of the end user group. Ideally the person performing content analysis on a clip by an expert in Real Estate Consultation, for example, would be an expert in some field, within the larger domain of Arthur Andersen and Company's practice, other than Real Estate Consultation. This is because it is unlikely that experts in Real Estate Consultation will need to view clips dealing with their area of expertise, and because experts analyzing clips in their area of expertise might take some things for granted (particularly in posing questions raised) that an expert in a different field would need to have explained in more detail.

There is some leeway in this. In essence, it is important that the indexer be sufficiently knowledgeable to be able to recognize the content of clips at the same level as end users and anticipate the questions an end user might have, keeping in mind one's bias from specialization. This task was carried out well by a pair of senior managers who were good "generalists" in their knowledge of the

range of Arthur Andersen and Company's services and, of course, experts in their own field of specialization.

7.4 Synopses

It is unlikely that an indexer will be able to remember and process all the details of a complex clip after watching it once or twice. To continuously go back and view the video takes a long time. The number of times a video needs to be reviewed has, in our experience, been greatly reduced when indexers write out synopses as the first step in content analysis. Reproducing stories may aid memory and saves the time of watching the story over and over.

Synopses, which are narrative, are particularly important for narrative stories. They are of little importance for merely expository clips (the points made in the clip then become focal - see below). The synopsis retells a clip's story in skeletal form (usually one, two, or at most three sentences), giving a good idea of the content of the clip. When a user indicates interest in a narrative clip (usually because they have been shown a question the clip answers), TaxOps shows the user a synopsis of the clip. Based on seeing the synopsis the user will decide whether the clip is sufficiently interesting to watch. It is conventional to predicate synopses of narrative stories with the phrase "A story about". The following fictional examples illustrate the application of synopses:

Example 1: Narrative Clip

"We had a client who was having trouble dealing with problem Y. Many clients think they should deal with Y problems themselves, but you really need the expertise of Group X to deal with them properly. We had been performing some small services for this client, nothing major, but one day I happened to hear about this Y problem they had. I said to the Vice-President "Let us come in to have a look at your books; maybe we can spot the source of the problem." He agreed. Sure enough, as is often the case with Y problems, they were making the typical mistake, Z. We were able to help them correct this problem, and have been performing regular checks for Z ever since. The client has been so pleased with our service that this has led to additional and ongoing work for groups A, B, and C as well. You should know if your client has a Y problem. If they do, or if you think they might soon, you definitely need to call Group X."

A synopsis of this story might be the following:

A story about a client who was experiencing a Y problem. Group X was able to find and help correct the problem and has provided ongoing services since then, which have in turn led to opportunities for other groups.

Example 2: Expository Clip

"The personnel at group X are all experts in the area of Y problems. We can handle almost any Y-related issue. Group X can get the necessary resources to your client in any part of the country, and we believe we can add significant value for your client, no matter how large or small the Y problem. None of our competitors can bring such extensive resources to bear on a Y problem. So if you think your client might have a Y problem give us a call. We'll help you evaluate the opportunities and determine whether Group X can add value for your client."

A synopsis for this kind of clip will be much less expressive, as in the following:

A discussion of Group X's resources for dealing with Y problems.

From the examples above, which are fairly representative of the kind of content the TaxOps clips presently contain, it is clear that synopses are more appropriate for capturing the sense of narrative stories but are not very helpful for describing the contents of expository clips.

7.5 Points

Points represent the content of clips in expository form. When a clip is expository users are shown the points made in a clip to help them determine whether they want to view the clip.

A specificity problem similar to that encountered in posing questions (discussed below) occurs in formulating points. Points need to be informative and the sum of points for an expository clip need to represent the content of the clip well, but it is unnecessary to reproduce the entire content of the clip. Points should capture the gist of the clip. Typically between one and four points, of one

and occasionally two sentences in length, capture the essence of a clip.

The rule of thumb for point writing is to sum up in a couple of sentences what the expert is trying to communicate in the clip. Points can be thought of as being like notes taken at a lecture. Points for the fictitious example clips in the section above might be as follows:

Example 1 (narrative)

Points:

- 1. Clients often try to deal with Y problems themselves.*
- 2. Group X must be called when there is a risk of Y problems.*
- 3. Y problems are often caused by Z.*
- 4. Service of Y problems by Group X can lead to opportunities for other groups.*

Example 2 (expository)

Points:

- 1. Group X has resources and expertise to deal with any Y problems throughout the country.*
- 2. Y problems of any magnitude are good opportunities for group X to add value.*
- 3. Group X's expertise and resources for dealing with Y problems surpass those of any competitor.*
- 4. Group X will help the engagement team determine need for Y-related services.*

7.6 Posing Questions (Raised and Answered)

The TaxOps video network is composed of short clips (each less than four minutes long) connected by "question" links. The idea is that a student-teacher dialog is driven by questions the student asks. Answers provoke further questions, and this sequence continues as long as the answers can sustain the student's interest.

The TaxOps strategy for simulating conversational dialog involves viewing individual clips and posing questions about them. The questions are of two types: 1) questions answered by a clip, and 2) questions raised by a clip. Constructing a network of clips amounts to identifying the questions raised by one clip and then connecting that to other clips that answer those questions.

The question posing methodology for network construction is not without difficulty. First, the "question space" surrounding a video clip is large and, in the case of questions raised, possibly open-ended. Further, there are always individual differences about the questions "contained in" a video segment, with even the most straight-forward clip. Different people have differing knowledge, differing perspectives, differing personal interests, and varying abilities to pose relevant questions within a subject area. This means that, for this method to be most successful, very thoughtful choices must be made about the kinds of questions that are appropriate to the system's intended purpose, and care must be taken that the people posing the questions are in some way connected to the intended user group. For this reason, the question posing for TaxOps was done by tax managers.

The goal of the question posing methodology is to predict the questions that will be raised in a user's mind upon viewing a clip. This is inherently problematic. Another difficulty involves assessing the content of video clips, and their associated questions, in order to form meaningful links. In TaxOps, the average video clip raised between three and five questions, and also answered three to five questions. With a video library that includes approximately 500 video clips, the combinatorial potential for linking becomes quite large. In order to cope with this mass of information it is necessary to find a system for classifying questions. This is accomplished by indexing.

7.6.1 Questions and the Index

In keeping with the tradition of "ask" systems (Schank, 1991; Schank et al., 1991), TaxOps indexing features questions raised and answered for each clip. The questions that are presently used in TaxOps were written with an index in mind, and the Arthur Andersen and Company managers who wrote the questions were required to index their questions as they posed them. We now believe that this was a mistake. If the person posing the questions has an index in mind, before long the index will determine the questions posed. This

has several detrimental effects. The question poser will be discouraged from posing questions that do not fit within the index, and the questions he does pose will be little more than restatements of the index category that applies to the question. Our experience is similar to that of the Protos project:

"Formulation of an explanation for Protos is, of necessity, a two-step process. The teacher must conceive the explanation in his own terms and then must translate it into Protos' language. Performance of this knowledge engineering task proved to be difficult for the teacher. *He tended to skip the first step and to try to formulate explanations directly in the explanation language.*" (Bareiss, 1989, pg. 80, emphasis added)

Though TaxOps does not require the indexer to translate the precise meaning of his question into a language comprehensible to the program, we found determination by the index to be particularly problematic for questions raised. Questions answered draw their content from the expert's stories and so are less subject to external determination (though the problem persists here as well).

Those who pose questions should be allowed to pose them without immediate reference to an index. They may be encouraged to pursue certain lines or types of questioning (see below) but the questions should not be determined by some external structure since the goal is to record accurately the questions a user would feel a clip answers and to anticipate the questions a user would want answered next after seeing a clip, and this requires spontaneity on the part of the indexer.

7.6.2 Questions Answered

Each clip's contents are described in terms of the questions the clip answers. In other words, every useful piece of information or wisdom given by the featured expert can be seen as the answer to a question a user might ask. Each clip answers at least one question and can answer many questions. We found three questions to be the typical number needed to describe an average useful clip.

Question posing can be problematic. It is hard to know at exactly what degree of specificity a question should be posed. If a clip contains the statement "division X provides Y service" one could pose the question this statement answers in several ways. A non-specific question answered might be "what is a service that division

question answered that points to it. A question answered can apply to more than one point and a point can apply to more than one question answered.

Returning to the example clips from above, the questions answered might be the following:

Example 1.

Questions Answered:

1. *Should clients try to deal with Y problems without expert assistance?*
2. *How does Group X help clients overcome Y problems?*
3. *What often causes Y problems?*
4. *What opportunities to provide additional service can result from a successful Group X engagement?*

Example 2.

Questions Answered:

1. *In what parts of the country is Group X prepared to deal with Y problems?*
2. *How big does a Y problem have to be to make bringing in Group X worthwhile?*
3. *How does Group X compare with the competition in dealing with Y problems?*
4. *How can the engagement team determine whether Group X's Y-related services are needed?*

Some of the questions, like question two in the first example, are not directly answered by the corresponding points, but the points do indicate that some additional relevant information is contained in the clip. Other questions, like question two in the second example, are answered explicitly by the corresponding points.

7.6.3 Questions Raised

After a viewer watches a clip it is assumed that the clip will raise some questions in the viewer's mind. When an indexer poses questions raised he tries to anticipate these questions. Eventually

questions raised for a clip will be matched with similar questions answered from other clips and these links will form the TaxOps network.

There are problems of specificity that arise when posing questions raised. If a question is highly specific it may be that no adequate answer can be found in the network. The network cannot depend solely on such specific questions, though these questions may still be legitimate and can be posed. Sometimes an answer will be available (and the indexer can "cheat" a little if he knows from watching other clips that the answer is available). If the highly specific question is very relevant a lack of answers may indicate the need for additions to the video library. But for practical purposes the network cannot depend on these additions being made.

Highly general questions also can be problematic since there are likely to be too many clips available to answer the question. The rule of thumb in posing questions raised is for the indexer to imagine he is talking to the expert in the video clip and the expert has just given the contents of the clip in response to some question. The question poser should try to imagine what he would naturally ask the expert next in a real conversation. It is usually wise to include both general and specific questions raised for each clip.

Questions raised should usually cover a range of topics. If the clip dealt mainly with cash flow it is reasonable to pose a question that asks for more information about cash flow. It is necessary from a practical standpoint, however, to pose a question or two about something else. Questions raised are paths out of a clip. If there is only one path, or one type of path, out of a clip it may constrain users unduly, and if that path out is identical to the path in (as would be most likely in the hypothetical cash flow clip) the user would never have a chance to get off the subject of the clip. When a clip deals with one or two well-defined topics (such as how division X deals with cash flow problems) it is reasonable not only to ask for more information about cash flow problems, but to also ask what else division X can help with. Such a combination (with both fairly specific and general aspects) allows the user to continue a line of inquiry or to move on to something else.

Questions raised need to be posed in a somewhat disciplined fashion. One could potentially raise questions about any clip ad infinitum. Once again, the rule of thumb is to pose only those questions a user (for TaxOps, a highly knowledgeable business

professional investigating a real business opportunity) might ask as a follow-up to the information a clip imparts. We found that three or four questions raised were appropriate to most clips.

Occasionally indexers will encounter problems thinking of questions raised for some clips. This can occur because a clip might seem to be so complete in itself that nothing else needs to be said, (and it sometimes occurs due to numbness brought on by indexing too many clips at a stretch). It is important to keep in mind that a user may arrive at any clip via many paths. The clip may be a digression for the user, one of several lines of inquiry, or a component in a larger search. When all else fails there are default questions, some of which are nearly always bound to be appropriate. Examples of these are questions like "When (else) should you be called?", "What (else) do you do for clients?", and "What should I look for to identify service opportunities?". As discussed above, it is desirable to provide at least two different paths out of clip.

Some questions raised that might be applicable to the example clips discussed above might be the following:

Examples of Questions Raised:

1. *What are other problems that need expert assistance which clients often try to deal with themselves?*
2. *What are the signs of a risk of a Y problem?*
3. *What are other problems Group X specializes in solving?*

These questions facilitate links to other clips that deal with the same topic (question 2), different topics with similar themes (question 1), and to completely different topics (question 3). They are all sufficiently general to be likely to have good answers available in the system.

7.7 Indexing questions

Once content analysis (enumerating a synopsis, points, and questions) has been performed on a clip the clip's questions are indexed. The present index (see appendix D) has been applicable to all questions TaxOps indexers have posed. If "Y problems" correspond to Arthur Andersen and Company opportunity indicator 101, indices for some of the questions given in examples above are:

Questions Raised:

What are the signs of a risk of a Y problem?

Index: 2A2.101

What are other problems Group X specializes in solving?

Index: 1C3, 2A2, 2B

Questions Answered:

What opportunities to provide additional service can result from a successful Group X engagement?

Index: S1D3

How does Group X compare with the competition in dealing with Y problems?

Index: 1C3, 3A2

7.8 Rating Clips

TaxOps currently uses a very simple rating system. We had the managers who indexed the current library rate stories according to their "interestingness", accuracy, delivery, and completeness. The most important aspect of the rating system are the ratings for quality; "Great", "Average", and "Do Not Use".

The criteria for calling a clip great are that it should contain information useful or helpful to experts, delivered well (though the primary emphasis is on content). In practical terms, a "great" clip should be one which an end user would be very happy to see. This means that it should contain information that may be useful to experts in the general domain, but which is not common knowledge. The content of such a clip is likely to be sophisticated, and often involves opportunities to provide important services and collect large fees.

"Average" clips are clips which contain information that experts may not find exciting, but still might be useful. The majority of clips can be expected to fall into this category.

Clips marked "Do Not Use" are clips in which delivery is too badly flawed or information is not at all useful, usually because it is too basic to be informative to the expert users, occasionally because it is too specific or arcane an example to have sufficiently common applicability.

The greatest danger in rating clip quality is "rating inflation" - assigning the "Great" rating too often. The "Great" rating must be reserved for stories that are truly special or extremely important, otherwise it loses its value in determining the priority of links and loses its credibility with the user.

On the indexing forms used in the current version of TaxOps we incorporated "ratings" that indicated a clip contained inaccurate information. Because of the expert knowledge of the partners in the interviews this rating was not employed in practice except where details of a story had been confused.

The current indexing form allowed the managers who performed the indexing task to recommend that a clip be redone or that a clip needed a follow-up. Should partners who had participated in one interview be available for a second interview, these ratings will indicate where a good story needs to be delivered in a more polished and complete way so that it can become a useful part of the video library.

7.9 Additional Fields

Other features introduced to the indexing were opportunity indicator lists, service line lists, and a "money field". These features were assigned to clips (rather than to questions, points, or synopses).

The opportunity and service line lists used the same Arthur Andersen and Company documents employed in the index. At this time the function of these lists in TaxOps indexing is not well defined. We instructed the indexing personnel to simply make note of all the services and business situations to which a given clip might have relevance. These will include any indicators/service lines cited in the indexing for questions raised and answered by the clip, but can include many more as well. At present we use this information to help determine how closely related clips might be when determining whether a link is appropriate and to make available a body of clips related to a given opportunity or service line, even if the clip is not primarily or explicitly concerned with that opportunity or service line. The Arthur Andersen and Company managers would often be reminded of opportunities and service lines that a layperson would not have realized were related to clips.

The "money field" is simply a record of the amount of money, if any, explicitly mentioned in a clip. At present this is used as a default device to decide which of two otherwise computationally indistinguishable clips to offer the user, the assumption being that the more money involved, the more likely a business person is to find a story interesting.

8. Network Construction

The following is an example of a TaxOps indexing form that has been filled out. The speaker, Ron Fulks, has introduced himself and given a short description of his position in the firm. The questions raised and answered by this clip are simple; the services, numbered 16-21, are those offered by the State and Local tax practice (see appendix C).

clip: SALT-2
speaker: Fulks
start: 00:25 "My name is"
stop: 00:40 "...Los Angeles office"
rating: great
raised:
(1C 2A) What services does SALT offer?
(S1E1a7) How do I contact Ron Fulks?
answered:
(1E1a 4f) Who is the Western Regional Director of SALT?
(1E1a4) Who in the Western Region can I call with a SALT question?
points:
Ron Fulks is the Western Regional Director of SALT
srv. 16 17 18 19 20 21
oprntny.
money.
synopsis:
Introduction to the Western Regional Director of SALT and description of L.A. office staff.

In order to create video networks for TaxOps, these forms are translated to frames, links are formed between frames, and networks are formed from these links.

The sequence of steps in this procedure are described in the following sections.

8.1 Forms to Frames

The objective is to read the forms (clip descriptions) in an input textfile, and return frames containing the questions raised and

answered by those clips. A program reads each form from the input file, or NIL if no forms remain to be read. It ignores blank lines and lines that begin with semi-colons. Each form is assumed to end with the line "synopsis:" followed by one or more lines of text and either a blank line or the end of the file.

A form is returned as a list of strings. Each form can be broken into parts, where each part begins with a new keyword. Each part is placed in a separate list. Each part can be made into a frame slot. This generally entails turning the keyword for the part into the slot role, and the rest of the part into the slot filler.

A few final changes are necessary before the slots are ready to be placed into frames. The clip number and speaker name are combined to form a unique clip name. Some of the other slots are cleaned up (the 'raised' and 'answered' slots are handled separately). In addition to a question, each of the final frames contains all of the non-question information from its corresponding clip.

Each 'raised' frame (or r-frame) contains a single question. When a question raised is labeled with more than one index, each combination of question and index is treated as a separate question, and gets its own frame. The sample form above generates three 'raised' frames:

```
(raised
      (clip "FULKS-0002")
      (index 1-C)
      (question "What services does SALT offer?") ...)
```

```
(raised
      (clip "FULKS-0002")
      (index 2-A)
      (question "What services does SALT offer?") ...)
```

```
(raised
      (clip "FULKS-0002")
      (index 1-E-1-A-7-S)
      (question "How do I contact Ron Fulks?") ...)
```

Questions answered are treated similarly, except they are allowed to have multiple indices:

```
(answered  
  (clip "FULKS-0002")  
  (index (1-E-1-A 4-F))  
  (question "Who is the Western Regional Director of SALT?") ...)
```

```
(answered  
  (clip "FULKS-0002")  
  (index (1-E-1-A-4))  
  (question "Who in the Western Region can I call...") ...)
```

When `S' occurs at the front of an index in a form, indicating that the clip is a story, it is moved to the end of the index in the frames produced from the form. To make an r-frame or an a-frame slots are combined for the questions raised or answered with the generic slots that describe the clip.

8.2. Frames to Links

Once a set of input forms has been transformed into a set of frames, these frames can be examined to determine which pairs of questions raised and answered might result in links in the final network. A program constructs a list of possible links,

```
;;;  
((possible-link (raised ...) (answered ...))  
 (possible-link (raised ...) (answered ...)) ... )  
;;;
```

In each of these links, the index of the question raised is `matched' by at least one of the indices of the question answered. Two indices match when they are equal, or when the second is a specialization of the first. For example, 3A is matched by 3A, 3A1, 3A4k, and by (1A 3A1 4B2j); but not by 3, 3B, or 4.

Because the number of possible links can be enormous, it is possible to reduce the number of links generated by specifying a predicate -- only links satisfying this predicate are returned by the function (if no predicate is specified all possible links are returned). To speed things up, the a-frames are organized into a tree. Given the index of a question raised, we can examine only those questions answered whose indices are at or below the corresponding node in the tree. An r-frame and an a-frame match if their indices match,

but their clip names do not. The index of an r-frame can match any one of the indices of an a-frame.

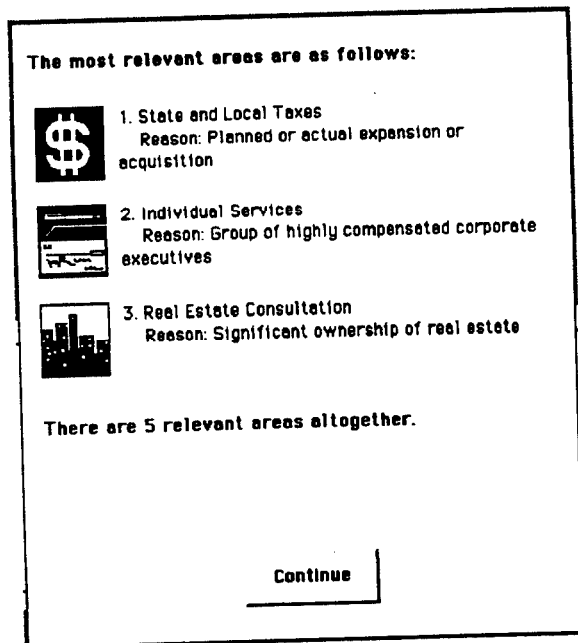


Figure 5: Service lines are ranked and the principal reason supporting each is listed.

8.3 Links to Networks

Given a list of links, the final step is to create a network description. Each link is a frame with at least two slots: 'raised' and 'answered'. Each of these slots is itself a frame with at least one slot: 'clip', the filler of which should be the name (a string) of a particular clip. For example, the list produced by the function:

```
#'frames->links
```

is suitable for input to the function:

```
#'links->network.
```

Dropping the unwanted elements from that list's result leaves you one step away from a network specification.

The first thing to do is to identify the useful clips. A clip is useful only if it raises and answers at least one question. A clip that raises no questions can't lead to other clips and one that answers no questions can't be reached from other clips. It follows that the useful links are those that contain only useful clips. This is iterated

until the set of useful clips remains unchanged, and the final set of links and clips is returned.

8.4 Cluster Analysis to Entry Points

The job-aid interface is more focussed than the browsing interface. The preliminary screen also lists service lines in priority order, but in this case the service lines are associated with particular opportunity indicators (Figure 5). Notice that the State and Local Tax (SALT) practice is rated first, for the Duet Cup Corporation, because of the "acquisition of facilities" feature. In the browsing interface (Figure 6), the Real Estate Consultation practice was rated most highly (its icon is completely darkened). The difference has to do with a notion of "critical mass". The SALT practice has several clips dealing with "acquisition of facilities" clustered together in the network, and these are collected together into a single coherent picture for the job-aid interface (Figure 7). The Real Estate Consultation practice, on the other hand, has a number of clips relevant to Duet Cup, but they are on disparate topics, and these topics are less highly rated opportunity indicators than "acquisition of facilities."

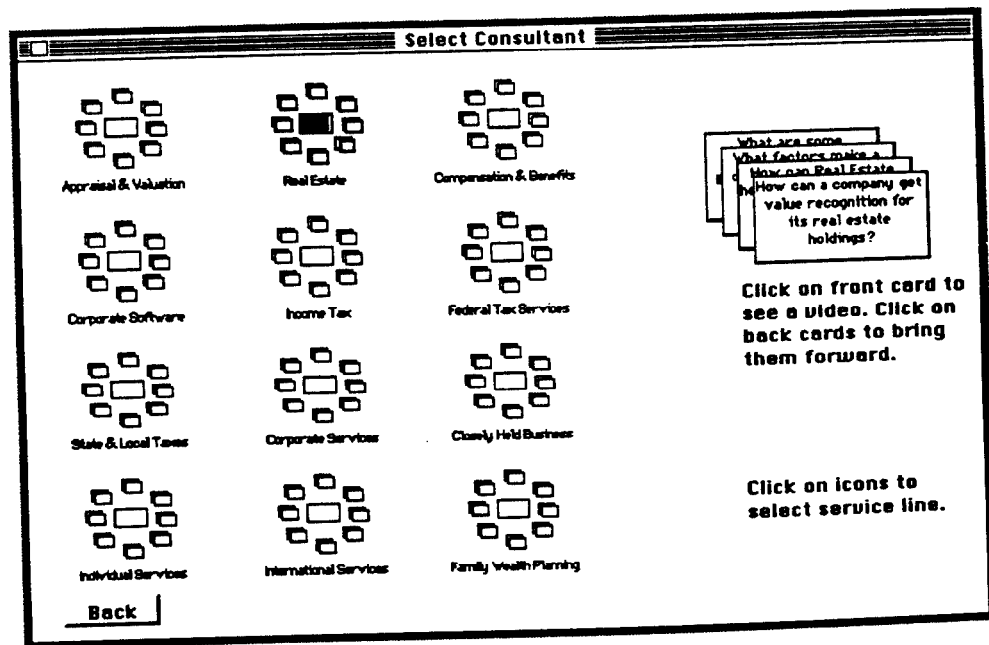


Figure 6: This is an overview of the service lines that will be covered in the training mode. The number of cards shaded gives an indication of which areas are the most relevant.

The entry points to the job-aid interface are clusters of clips relating to a single opportunity indicator. Rather than facilitating a free-form browsing interaction, the job-aid interface collects related material together in a more coherent way. For example, the best story about acquisition of facilities is connected to a specific button, as is the clip with questions to ask a client about acquisition, and the clip with more detail about acquisition. These buttons are collected together in a cross shape in the upper right corner of the job-aid display (Figure 7). Below the video screen on the job-aid display are a set of up to four follow-up questions relating to acquisition of facilities. These questions are also on buttons which are connected to clips that answer the questions.

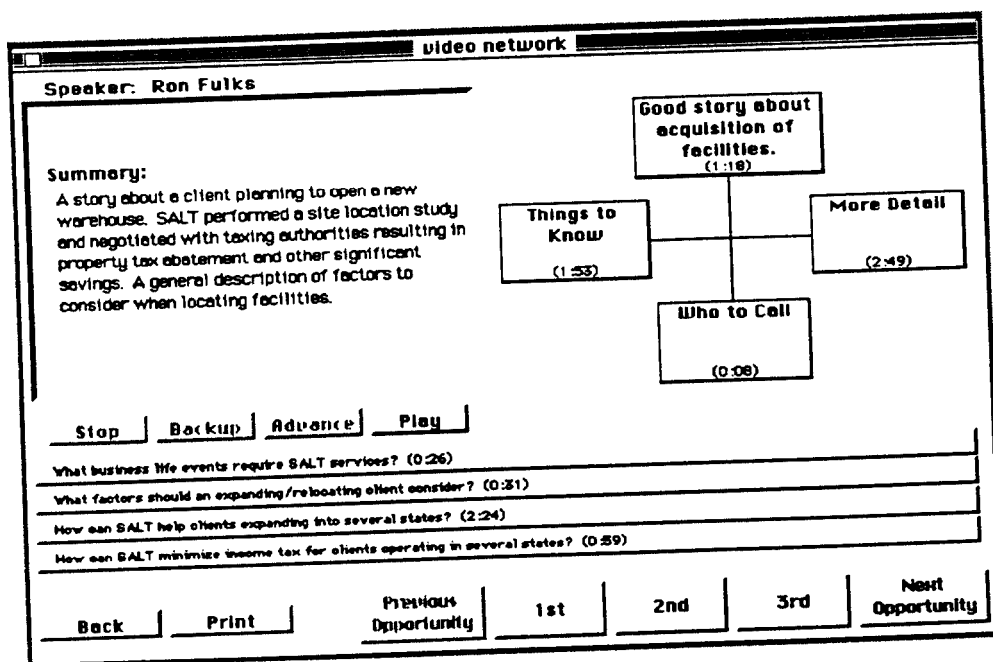


Figure 7: The job aid interface. The upper left corner of the screen is where the video clips are displayed. A summary of the clip is provided before the user actually views the clip.

The rationale behind this association is rooted in the foundations of case-based reasoning. If the current case and a pre-existing case are connected to the same indicators, and if that pre-existing case also has other connections, then it is reasonable to talk about the new case in terms of all these features. One example is a medical diagnosis in which the symptoms, according to reference literature, point to a particular disease, but personal experience indicates that these conditions are commonly associated

with another disease. In the Duet Cup example, TaxOps has found that there is "significant cash or cash equivalent buildup", but matching with the Ideal Paper Company indicates that "acquisition of facilities" is also relevant. This makes sense because acquisition is a productive method of handling a cash buildup.

9. Principles of Indexing

One of the principal methodological problems in developing TaxOps concerned questions of scale. The "raw" knowledge for the system came in the form of over fourteen hours worth of uncut videotape. These tapes contained hundreds of individual clips, varying in quality and content, and the first job was to review them all and choose the best. Unfortunately, there is no objective way to do this. For our purposes, we rated a clip "good" if it told a story, in a coherent way, and both raised and answered interesting questions; or, if the clip was expository rather than narrative, we looked for topical coherence, brevity, and interesting questions. Unfortunately, again, there is no objective way to really make these assessments up front. It was, in particular, impossible to judge the relative "questionality" (connectivity via questions) of the clips prior to actual content analysis, so we ended up choosing the clips that, in some sense, "looked" the best: i.e., those that were short, coherent and smoothly delivered.

The problem with assessing the "question connectivity" of a clip is essentially one of expertise. We found it quite difficult to pose interesting questions in the domain of tax accounting. More to the point, we were completely unequipped to pose questions that would interest tax professionals, and questions of interest to them were a crucial concern in designing the video network. Eventually, tax professionals were recruited to pose the questions, but not until we tried, and failed, to do it ourselves.

9.1 General Principles

A small set of principles and shortcuts have been revealed as a result of exploring the problem of knowledge acquisition for case-based consulting.

1. Get away from video as soon as possible. Questions should be posed on the basis of Synopses and Points. Viewing and reviewing clips takes too much time.

2. Questions should be posed without reference to an index. If the people posing questions have an index in mind when they are posing them, the index determines the questions.
3. Writing Synopses, Points, and Questions must be done by a member of the end-user group.
4. Indexers' spontaneous reactions to clips are good because they produce good questions and simulate the way in which users will raise questions.
5. Spontaneous reactions to clips can be problematic because they tend to produce questions not answered elsewhere in the network (although this is an excellent indicator of material that should be gathered in subsequent interviews).
6. Indexing questions requires cross-training. Either an indexer must be trained in the domain or an expert must be trained to index.
7. The more specialized the domain, the less call there is for "deep" reminders. The most relevant cases are the most specifically similar to those encountered in the real world by the end user.
8. In a very specific domain there is little or no value in cross-contextual reminders, even if the concept at play is quite general, like "Don't forget to follow up" or "Don't overlook the details". Experts would rather hear it from peers.

TaxOps succeeds on several levels. First, it captures a portion of a corporate memory: good stories about successes and failures that bear repeating because they are both entertaining and informative (and, of course, memorable). Second, it connects the stories of different areas of expertise, and thus forms links between different areas of thought (in this case, different tax practices, but the same notion of connectivity works for any complicated domain). Third, it reasons about real data and real cases. It makes rational associations between opportunities and services in a way that is visible to the user. Fourth, it lets users navigate a network of experts in which they can follow their own curiosity, get answers to their own questions, and interact with the

experts freely and without fear of appearing foolish. Lastly, it is engaging to use.

10. System Description

TaxOps currently runs on a MacIntosh. The system is written in Common Lisp. A total of twelve experts were interviewed. Seven of the interviews have thus far been committed to laser disk. The system contains approximately 500 individual video clips totalling nearly four hours.

10.1 Example Session

TaxOps is an intelligent performance support system that provides expert experience and advice to users when they are prepared to hear it. Using a combination of rules and case-based reasoning, TaxOps will analyze a company's situation and present the relevant opportunities through video clips of experts talking about their experiences. TaxOps is designed to simulate the look and feel of having a conversation with experts. TaxOps does not produce "the right answer" for a (potential) client. Instead, it presents the most relevant cases and lets the user interpret the cases to fit their current problem. TaxOps is a multi-media system with two modes of operation: "job aid" and "training". There are three shared modules for both of these interfaces.

10.1.1 Data Entry Module

The data entry module gathers financial and industry information about a company. The interface is made up of questions that will identify opportunity indicators. The questions are layered from nonspecific to very detailed. They are arranged in a tree structure. At the top level the user selects one of the branches of questions. Questions relate to the type of business the company is in, industry type, location of the business, financial information, etc. The first screen is a list of questions corresponding to all of the branches in the tree. (Figure 2, above) The user can select and answer any of the questions. Some questions may be left unanswered. The more detail the user gives the program, the more information the program will have to identify opportunities.

10.1.1.1. Help Facility

The tree has a replete HELP feature that will give specific information about where the requested information can be found. In one of the financial information questions, for example, users are asked to enter the total liabilities for the company under consideration. If users ask for HELP they learn that the desired information can be found in Schedule L, page 4 of the IRS form 1120 and they need to add three lines to get the total liabilities for the company (Figure 3, above). This was designed so an administrative person could perform the data gathering task. No advanced domain expertise is required.

10.1.1.2. Data Entry Aid

Another feature of the data entry module is the data entry aid. The data entry aid provides a guide that allows the user to systematically traverse the tree of questions. It will go through the questions sequentially, giving users the options of skipping a question or completely skipping the line of questioning in which they are engaged. It allows a novice to become familiar with all of the information the system can use. It also gives a systematic feel to the process of data entry.

10.1.2 Case-Based Reasoning Module

After the "snapshot" or profile of the company is created by analysis of the data entered in the form, a case-based reasoning module (discussed above) retrieves relevant opportunities for the current case situation in order to augment the profile. The case-based module uses a knowledge base of cases that are indexed by opportunity indicators (features that signal the need for service). These indicators are linked to video clips of experts sharing their experience about a particular opportunity. The cases are also linked to video clips in which experts give background information about opportunities and specific information about what questions to ask clients or what indicators to look for. The case-based reasoning module then searches the cases for the best match. There is a threshold that needs to be met before a case will be judged to be significantly similar to the company being analyzed. Once the matching case is selected, the opportunities that were relevant for the matched case but were not explicitly associated with the company being analyzed are factored into the case under consideration. Once the profile of the company is complete, the user has the option of entering one of the two modes of operation: "job aid" or "training" (Figure 4, above).

10.1.3 Job Aid Mode

The job aid mode organizes the opportunities so that the tax professional can see the best opportunities at a glance. The interface provides users with information specifically relevant to one opportunity indicator and one service line (Figure 7, above). There is a cluster of buttons in the upper right corner. One button is connected to a video clip of an expert relaying a story (that has received a "great" rating) about an experience he had that directly relates to the opportunity of interest. Another button is connected to a video clip of the expert describing things to know or questions to ask the client to get more information about that opportunity. A third button is connected to a video clip of the expert describing the opportunity in more detail. The fourth button is connected to a video clip of the expert introducing himself and saying how he can be contacted.

TaxOps lets users "meet" the experts before calling them. By interacting with TaxOps users can become familiar with the members and methods of other service lines. Once a user has identified a service line that might be valuable to the (potential) client, he can call the expert encountered in the TaxOps session. The user will already be up to speed on the basics of the services the expert can help provide, and they will have some common ground -- the expert's stories -- which can serve as the basis for talking about the case at hand.

10.1.4.1 Playing a Good Story

When the user clicks on a button a synopsis of the corresponding clip is displayed. The user can then decide if he wants to hear the story. The length of each clip is provided on the button to which it is attached. While viewing a clip the user can back up or advance the clip in thirty second time frames. Users can also stop the clip at any time. There is a meter that appears under the video that tracks the progress of the video clip as it plays.

10.1.4.2 Follow up Questions

Follow-up questions are displayed in the lower portion of the screen. These are questions that might be raised by the user after seeing the primary video clips for an opportunity. When these buttons are pressed key points of the attached clips will be displayed in the upper left corner of the screen. Again, the user has the choice to see that video clip or explore another question.

10.1.4.3 Next Opportunity

In the lower right corner there are buttons labeled "previous opportunity", "first", "second", "third", and "next opportunity". These buttons refer to the calculated priority of opportunities that were relevant for the company being analyzed. Selecting one of those buttons will take the user to the job aid interface for the corresponding opportunity.

10.1.4.4 Printout

There is a print button in the lower left corner. The print option will print out a summary of the information entered about the company, the relevant opportunities identified, and the synopses of all the video clips that were relevant for those opportunities.

10.1.5 Training Mode

The second mode of interaction is the "training mode," which is a less constrained, conversational browsing mode (Figure 6, above). All of the twelve service lines can be accessed from this interface (though only four are presently implemented). The service lines that have the shaded cards are the ones that have relevant video clips available in the system. The number of cards colored indicates the degree to which that service line is relevant to the case at hand. When a service line is selected a stack of cards (with questions) on the right side of the screen appears. These cards represent clips relevant to the case at hand, and they are the entry points to the network. Users can shuffle through the stack to choose an appealing place to start.

Once users have entered the training network, the questions for the service being investigated are presented in arrays of stacked cards (Figure 8). The center card is the one that may be viewed, the surrounding cards are linked to it. Users traverse the network by dragging cards with questions that interest them to the center where, after being shown the synopsis or points of the corresponding clips, they may choose to view them. When a card is dragged to the center the surrounding cards change to reflect the links out of the new focal card. The cards are grouped according to areas of interest to the tax professional: services, key indicators, business events, client contact, external factors, and when and who to call. There is also a stack of stories (which can include cards that also appear on other stacks). The stack of stories contains the experts' "war stories" about opportunities in that

service area. Tax professionals value the experience of the recognized experts and enjoy hearing those stories. The clips in each network have enough connectivity to make it possible to eventually reach any clip in the network from any starting point.

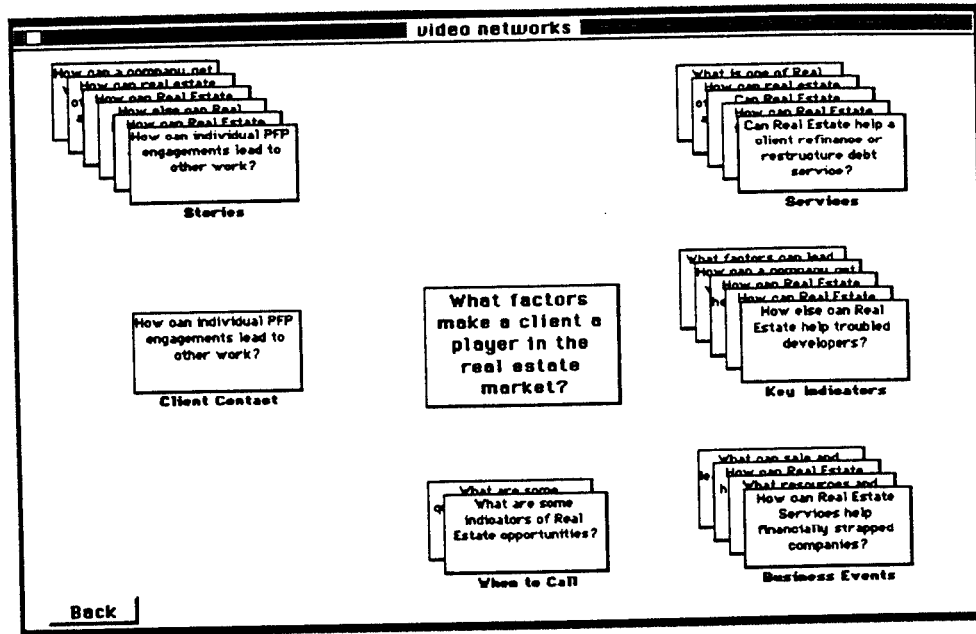


Figure 8: The center card is the focus of the screen. The surrounding cards are questions that may be raised after viewing the video clip that answers the question on the center card.

10.1.6 Application Summary

TaxOps is a performance support tool. The data entry module enables delegation of the data gathering task and facilitates organization of the information with little or no involvement on the part of the tax professional. The tax professional would normally do all of the number crunching and logical data analysis, TaxOps does that automatically. The tax professional would then need to determine what opportunities were relevant and find out more information for those areas that he was unfamiliar with. This process could usually take anywhere from two hours to two days. Now it takes TaxOps roughly between fifteen to twenty minutes. The tax professional can choose one of two modes to work in according to his objectives and his time constraints. The job aid mode prioritizes the information so that users can get right to the most immediately relevant stories. The training mode provides a

more casual learning environment where users can relax and explore the opportunities by "conversing" with the experts. Using either mode will allow tax professionals to explore issues in other service lines and increase their own personal case base, enabling them to better provide full service tax consulting for their clients.

10.2 Client Profile Outline

A useful by-product of a TaxOps session is the client profile outline. This is a report that summarizes the session and includes the technical information gathered from the data entry form, the opportunity indicators inferred by the system, and the summary screens for the video network entry points that TaxOps rated as relevant to the case of interest (see appendix A).

Having a printout of all of the information helps the tax professional in several ways. The printout can serve as a memory tool for the user while using TaxOps. The printout can be used as supporting documentation for a proposal based on the ideas discovered by using TaxOps. The printout also provides portability. Many times users will be out of town or away from the office, working with their clients. If they are curious about a particular client, or if they would like to approach a new potential client, they can call their secretary, giving only the company's name. The secretary can perform the data entry task, print out the company profile, and send it to the tax professional.

10.3 System Components

The standard Macintosh Allegro Common LISP (MACL) programming environment provides a rich variety of functions and objects for creating a user interface. For example, menus, dialog boxes, and buttons are all part of the standard environment. The TaxOps user interface required several extensions to the standard MACL programming environment. Much of the programming effort for TaxOps went into developing these extensions. This section gives a brief overview of these extensions, their functionality and how they were implemented. The information is specific to MACL and assumes the reader is familiar with programming MACL.

10.3.1 On Screen Video

On screen video was accomplished using the RasterOps video board. To control the board, several of the NOT IN ROM Macintosh Device Manager calls had to be implemented in LISP. A *video-view*

object class was built on top of the Device Manager calls to provide an easy-to-use programmer interface for controlling on screen video.

The Macintosh Device Driver calls also turned out to be useful for controlling the MoonRaker Video Board. The *video-view* class was extended to handle both RasterOps and MoonRaker boards allowing programs to be written without board specific code.

10.3.2 Outline Tree

The outline tree, used for entering information about a client, is a specialization of the MACL *sequence-dialog-item*. Individual cells were divided into fields so that they could have check boxes, fill in blanks, or pop-up menus associated with them. The click event handler was specialized to handle mouse clicks differently, depending on which field of a cell the mouse was clicked in.

10.3.3 Dialog Boxes

Color Pixel Pattern ('ppat') resources were used to provide the granite backgrounds in the dialog boxes. In previous projects this effect was achieved using large bitmap graphics for the background. Using ppat's requires less memory and increases drawing speed (defying the time-space tradeoff principle).

An alternative to MACL's modal-dialog function was written to allow for background event processing while presenting the user with a modal dialog. This was needed so that video could be played from a modal dialog box.

10.3.4 Video Networks (Ask Networks)

The card stack metaphor from the Ask Tom system was implemented as a MACL dialog item, *card-stack-dialog-item*. A dialog item consisting of a cluster of card stacks was also written, *ask-cluster-dialog-item*. These dialog items made it simple for programmers to use the card stack metaphor in their user interface.

10.4 Future Work and Tools

After implementing a working version of TaxOps several deficiencies became apparent. Most notably, TaxOps was not designed to facilitate changes. Several tools were envisioned to aid in the creation and modification of TaxOps. A few of the envisioned tools are described below.

10.4.1. The Indicator Designer

A significant portion of the knowledge that TaxOps uses to find appropriate services is encoded in Indicator Rules. These rules contain domain-specific information that help TaxOps infer characteristics from the current case. Here is an example of an Indicator Rule from TaxOps:

```
IF "net profit" is less than zero
  AND
    "owner equity" exceeds one-third of the "current assets"
  THEN
    70. "IRS or state tax penalty potential"
```

The Lisp code for this Indicator Rule is surprisingly complicated, involving the creation of two new MOPs and one calculation function. Each Indicator Rule for TaxOps was programmed by a member of the development team, occasionally with the aid of an expert in the tax consulting domain. After each Indicator Rule was developed it could only be modified with the aid of someone who knew the TaxOps system and Lisp programming. Ideally, the Indicator Rules should be designed and modified by the domain experts, who are often unfamiliar with computer programming. Future projects similar to TaxOps would greatly benefit from a Indicator Designer tool that could be used by non-programmers to develop and modify the Indicator Rules.

The envisioned Indicator Designer is a graphically based tool intended to greatly simplify the rule writing process. Domain experts would develop Indicator Rules using the familiar Macintosh environment, and would need minimal understanding of MOP memory. Each Indicator Rule would be created on screen as a tree of "rule cells," the elements of the finished rule (Figure 9). The user would be able to add to the Indicator Rule by dragging appropriate rule cells from a palette of various types of cells, including predicates, constants, and characteristics of cases. Cells could be hooked up to other cells by dragging a cell onto another cell, which would create a link on screen. Unwanted cells could be removed by dragging them into the trash. When the rule was completed, it could be saved to a database of Indicator Rules and compiled into executable Lisp code for use in the system.

The Indicator Designer would provide the entire functionality necessary to reproduce all Indicator Rules that were programmed in TaxOps. The Indicator Designer would, however, be domain-

independent, allowing it to serve as a useful tool in a variety of projects across a wide spectrum of applications.

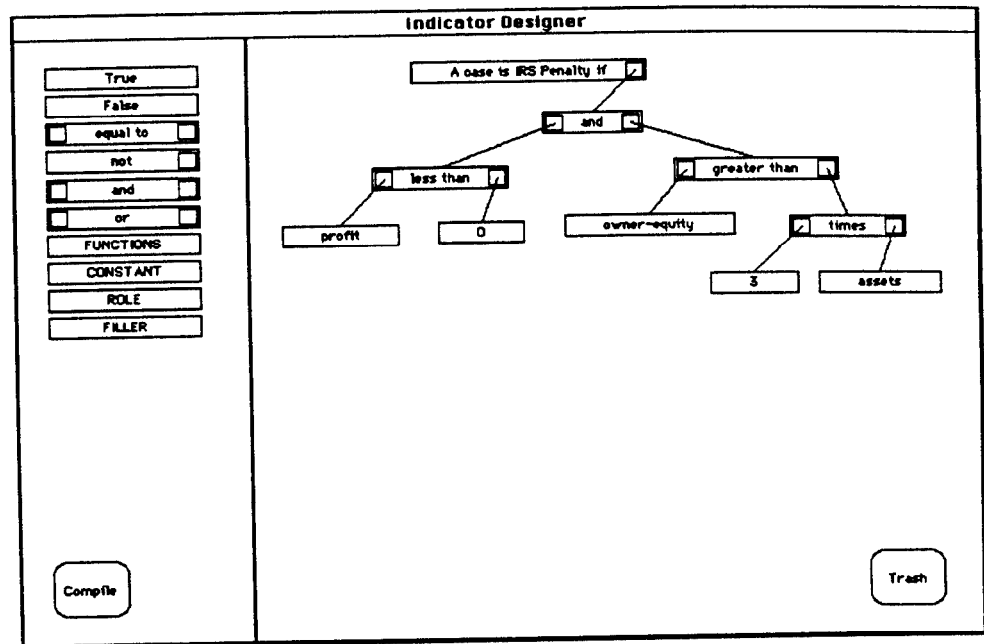


Figure 9: An early version of the Indicator Designer describing the rule cited above.

10.4.2 The Indicator Organizer

In TaxOps, after the indicators for a particular case are calculated, the best service opportunities are determined. Each indicator may add support for one or more service lines. The service line with the most support is selected as the best service opportunity for the case. When TaxOps was developed, the links between indicators and their corresponding service lines were imbedded in Lisp code created by the development team. As with the design of the Indicator Rules, creation and modification of indicator-service links could only be preformed by Lisp programmers familiar with TaxOps. Ideally, the creation and modification of service links would be preformed by a domain expert. The Indicator Organizer is the envisioned tool for non-programmers to create and modify indicator-service links.

The Indicator Organizer tool would allow the user to inspect the current indicator links of the system. Upon selecting a particular indicator, all of the current service lines associated with this indicator would be graphically displayed. The user would be able to delete links that were no longer valid and create new ones as needed.

The Indicator Organizer may also provide the means to change the importance of an indicator relative to the others. The Indicator Organizer tool could also facilitate the creation and management of representation of new services lines.

Like the Indicator Designer, the Indicator Organizer would not be domain-specific. In TaxOps, the indicators add support for various tax consulting services. In different domains, service lines may be replaced by, to name a few options, solution plans, further inferences, or result values.

10.4.3 Database Management

TaxOps keeps all of its data resident in LISP memory. At startup, TaxOps reads and parses a large number of text files to initially load memory. Changing the data means hand editing these text files. If a database were available for use by LISP, it could address several problems faced by TaxOps.

- If TaxOps were scaled up to contain more data, it may not be feasible keep it all in LISP memory. A database would allow it to be read from disk on demand.
- Text files do not allow for random access, this makes it impractical to read/edit a particular datum without reading/writing the entire file. A database would allow access to its individual records.

The issue of storing data is a serious one faced by most ILS projects. When a project moves from the prototype stage to a commercial application, the amount of data needed will grow beyond what can be kept in LISP memory. To date, no ILS project has addressed this issue. Some sort of LISP accessible database is needed. There are numerous difficult issues regarding the design and implementation of such a database, some of them specific to LISP. Currently there are no commercial products for the Macintosh that would handle our needs.

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Appendix A

Client Profile Outline for "Duet Cup Company"

HEADQUARTERS:

Location: Chicago

Office Code: 35

TYPE:

Corporation

INDUSTRY:

Paper and Allied Products

Recent Growth: Moderate Growth

Expected Growth: Modest Growth

SECONDARY INDUSTRIES:

Real Estate

FINANCIAL ATTRIBUTES:

Credit Rating: 5a1

Credit History: Clear

General Condition: Strong

Current Ratio: 4.90

The recent current ratio trend is: Increase

Income: \$382000000

The recent revenue trend is: Increase

Current Assets: \$111557000

The recent asset trend is: Increase

Current Liabilities: \$22763000

The recent liability trend is: Decrease

These calculated features of Duet Cup Company indicate potential client service opportunities:

1. Significant ownership of real estate

2. Significant cash or cash equivalent buildup
3. Stock ownership widely held
4. Group of highly compensated corporate executives
5. Multi-state operations in the U.S.
6. Capital intensive business

There is a very similar case: Ideal Paper Company

This case suggests these additional features:

1. Planned or actual relocation of facilities
2. Planned or actual expansion or acquisition

The most relevant areas are as follows:

1. State and Local Taxes

Reason: Planned or actual expansion or acquisition

2. Individual Services

Reason: Group of highly compensated corporate executives

3. Real Estate Consultation

Reason: Significant ownership of real estate

Summaries of video clips relevant to your opportunity:

Acquisition of facilities: SALT can help by mitigating state and local tax and related problems. SALT can assist with site location. SALT can negotiate with local taxing authorities to facilitate the relocation process. SALT can provide training materials to assist with compliance issues.

Good story about acquisition of facilities.

Summary: A story about a client planning to open a new warehouse. SALT performed a site location study and negotiated with taxing authorities resulting in property tax abatement and other significant savings. A general description of factors to consider when locating facilities.

More Detail

Points: Don't assume there are no SALT issues for clients doing business in just one state.

- Use tax nexus can be caused by out-of-state independent contractors.
- A state nexus study may uncover previously unknown state tax liabilities.
- SALT can be an entree for other services.

Who to Call

Points: Bill Curlee is head of the SALT practice firmwide.

Things to Know

Points: What states do you operate in?

- How much state tax are you paying?
- Are you doing business in a foreign country?
- What industry are you in?

What business life events require SALT services?

Points: SALT opportunities exist when a client add/deletes a product.

- SALT opportunities exist when a client moves in or out of a state.
- SALT opportunities exist when a client is subjected to a state audit.
- SALT opportunities exist when a client has a change in ownership structure.

What factors should an expanding/relocating client consider?

Points: Companies planning expansion should consider locating warehouses in no-income-tax states.

How can SALT help clients expanding into several states?

Summary: A story about how SALT helped a foreign client - operating in the US and expanding into new states - defend against an audit resulting in an ongoing cycle of opportunities for SALT to serve clients.

How can SALT minimize income tax for clients operating in several states?

Summary: A story about how SALT helped a client structure an expansion so that profits were kept in low tax states.

For what other services can SALT provide an entree?

Points: Don't assume there are no SALT issues for clients doing business in just one state.

- Use tax nexus can be caused by out-of-state independent contractors.
- A state nexus study may uncover previously unknown state tax liabilities.
- SALT can be an entree for other services.

Successful Executives: PFP can provide financial and estate planning for (groups of) successful executives. PFP can provide services to highly compensated executives or groups of executives. PFP can provide financial planning or estate planning to highly compensated or wealthy individuals.

Good story about successful executives.

Summary: A story about the spouse of a deceased executive who retained PFP because of a pre-existing relationship. This has led to ongoing work and referrals.

R

More Detail

Points: High-level executives rarely understand their investments or have adequate financial plans.

Who to Call

Points: Wally Head specializes in Financial Planning.

Things to Know

Points: Most executives have outdated estate plans.

- Estate plans need to be updated at least every three years.

What factors indicate a corporation needs PFP for its executives?

Points: Key indicators include executive compensation plans - valuable stock options - incentive or deferral compensation plans - and investment choices (profit sharing, etc).

Do complex compensation plans indicate a need for PFP at a corporation?

Points: Key indicators include complex or changing compensation plans - parachute payments - new executive contracts - defined benefit or compensation plans - stock options - and busy executives with a lot of cash.

How can individual PFP engagements lead to other work?

Summary: A story about a non-client chairman nearing retirement who retained PFP. This led to ongoing opportunities for PFP and other services.

Why do executives with independent financial advisors need PFP?

Points: Executives that retain independent financial advisors still need PFP.

- Executives usually don't have integrated investment - insurance - and estate plans.

How can PFP assist clients during downsizing and workforce reduction?

Points: PFP can be useful to clients that are downsizing.

- PFP can provide seminars - videos - and individual counselling.
- PFP can help employees who are leaving and employees who are remaining.
- Paternalistic companies will be concerned about employees who are leaving.

Why do executives need PFP services?

Points: High-level executives rarely understand their investments or have adequate financial plans.

Real Estate Holdings: The Real Estate group can maximize value and minimize costs. Clients should be aware that either owning or leasing property makes them a player in the Real Estate market. Real Estate provides facilities consultation and other valuable services to plan for current and future needs at the lowest cost.

Story about ownership of real estate.

Summary: A story about how Arthur Andersen and Company suggested a viable plan for shareholder's wealth maximization to an operating manager who vetoed it because it detracted from his compensation.

More Detail

Points: One should make sure that clients coordinate and communicate their real estate needs internally.

- Sometimes there are acquisitions and relocations done at different levels in the same organization that are not coordinated due to poor planning and management.

Who to Call

Points: Ivan Faggen is the worldwide director of Real Estate Services.

Things to Know

Points: How significant are the real estate holdings - either owned or leased?

- How are these properties managed and by whom?
- What is the total cost of operating those facilities?
- If clients cannot answer these questions they can use Real Estate services.
- Clients may be unaware that factors such as leaseholds make them players in the real estate market.

What are some indicators of Real Estate opportunities?

Points: Real Estate can help if real estate constitutes a large portion of a client's balance sheet.

- Real Estate can help if real estate expenses constitute an important part of a client's income statement.
- Certain management structures indicate a client might need Real Estate services.

What is one of Real Estate's highest priorities?

- SALT can be an entree for other services.

Multi-state operations: SALT has experts located all over the country who are familiar with regional tax issues. SALT can help a business avoid paying excess tax - sometimes businesses pay taxes in multiple places for a single transaction.

Good story about multi-state operations.

Summary: Stories about clients who had multi-state liabilities they would not have discovered without SALT services. Also a general discussion of SALT as an entree service.

More Detail

Points: Don't assume there are no SALT issues for clients doing business in just one state.

- Use tax nexus can be caused by out-of-state independent contractors.
- A state nexus study may uncover previously unknown state tax liabilities.
- SALT can be an entree for other services.

Who to Call

Points: Bill Curlee is head of the SALT practice firmwide.

Things to Know

Points: What states do you operate in?

- How much state tax are you paying?
- Are you doing business in a foreign country?
- What industry are you in?

What business life events require SALT services?

Points: SALT opportunities exist when a client add/deletes a product.

- SALT opportunities exist when a client moves in or out of a state.
- SALT opportunities exist when a client is subjected to a state audit.
- SALT opportunities exist when a client has a change in ownership structure.

What factors should an expanding/relocating client consider?

Points: Companies planning expansion should consider locating warehouses in no-income-tax states.

Are SALT services crucial to avoiding unexpected/unforeseen tax liabilities?

Points: In a down market Real Estate's highest priority is reviewing use of property.

- Real Estate can significantly reduce occupancy costs for almost all large businesses.

Relocating facilities: SALT can assist with site location and create significant tax savings. SALT can negotiate with local taxing authorities and win property tax abatements.

Good story about relocation of facilities.

Summary: A story about a client planning to open a new warehouse. SALT performed a site location study and negotiated with taxing authorities resulting in property tax abatement and other significant savings. A general description of factors to consider when locating facilities.

More Detail

Points: Don't assume there are no SALT issues for clients doing business in just one state.

- Use tax nexus can be caused by out-of-state independent contractors.
- A state nexus study may uncover previously unknown state tax liabilities.
- SALT can be an entree for other services.

Who to Call

Points: Bill Curlee is head of the SALT practice firmwide.

Things to Know

Points: What states do you operate in?

- How much state tax are you paying?
- Are you doing business in a foreign country?
- What industry are you in?

What factors should an expanding/relocating client consider?

Points: Companies planning expansion should consider locating warehouses in no-income-tax states.

For what other services can SALT provide an entree?

Points: Don't assume there are no SALT issues for clients doing business in just one state.

- Use tax nexus can be caused by out-of-state independent contractors.
- A state nexus study may uncover previously unknown state tax liabilities.

Summary: A story about a client that had overlooked state tax liability putting them in danger of bankruptcy. SALT was able to negotiate a reduction in liability that kept the client in business.

How can SALT help clients expanding into several states?

Summary: A story about how SALT helped a foreign client - operating in the US and expanding into new states - defend against an audit resulting in an ongoing cycle of opportunities for SALT to serve clients.

How can SALT minimize income tax for clients operating in several states?

Summary: A story about how SALT helped a client structure an expansion so that profits were kept in low tax states.

Appendix B

Opportunity Indicators

Industry Conditions

1. Capital intensive
2. Change in government regulation
3. Changing technology affecting the company's products
4. Changes in competition (increases, shift/mergers)
5. Highly competitive or low-growth industry, which puts pressure on costs
6. Hostile takeover overtures for the company or others in the industry
7. Inbound investments to the United States
8. Outbound investments

Nature/Condition of Business

9. Active in real estate acquisition/development/management
10. Changes in the business, products, market share
11. Expanding operations in Europe
12. Financially troubled company
13. Large expenses associated with international assignment of employees
14. Lenders/investors considering loans to/investments in new industry
15. Losses that provide no tax benefit
16. Major international operations, including in hyperinflationary countries
17. Multi-state operations in the United States
18. New business
19. Planned leveraged buyout or other restructuring
20. Planned or actual expansion or acquisition of facilities or product lines
21. Qualified buyer looking for targets that fit specific purchase criteria
22. Rapidly growing company
23. Real estate developer undertaking a new project
24. Remittances, sales or exchanges among members of an international group

25. Significant importing or exporting of goods (e.g., raw materials, subassemblies, finished products)

26. Tax-exempt organization

Management and Ownership

27. Aging management or no logical successors

28. Group of corporate executives

29. Corporate directors

30. Japanese ownership of U.S. companies

31. Large number of retiring executives/other employees

32. Large unfunded deferred compensation

33. Long-term stock growth -- desire to benefit employees

34. Management likely to stay with company after it is sold

35. New legal entity

36. New management team

37. Organizational changes such as centralization/decentralization

38. Reduction in work force (e.g., sale of business unit, consolidation, merger, etc., or normal attrition)

39. Stock ownership closely held

40. Stock ownership widely held

41. Threatened or actual change in control

Operating Expenses

42. High cost of processing insurance claims

43. Large employee population

44. Large/rising healthcare benefit expenses

Assets and Asset Management

45. Always short of cash due to rapid growth or other reasons

46. Aging or defective equipment

47. Analysis of distribution activities by Andersen Consulting

48. Bargain purchase of assets

49. Company owns or leases a bonded warehouse

50. Contemplated contraction of business units
51. Debt service problems
52. High level of funds tied up in inventory
53. Importing of raw materials or purchase from a supplier that imports goods
54. Informal/dated/undocumented intercompany pricing strategy
55. Major change in inventory mix or technology
56. Manufacturer with multiple LIFO pools
57. Need for additional financing for expansion of facilities, product lines or operations
58. Planned or actual acquisition, expansion or relocation of facilities
59. Plant with idle capacity or under-used distribution facility
60. Poor fixed asset control/management
61. Purchase or sale of assets or a business
62. Purchase/replace fixed asset accounting system
63. Significant assets available for divestiture
64. Significant cash or cash equivalent buildup
65. Significant costs for equipment maintenance and repair
66. Significant ownership of real estate

Tax Compliance/Administration

67. Existence of corporate Tax Department
68. High effective foreign tax rate
69. Inefficient estimated tax payment methodologies
70. IRS penalty potential/proposed
71. Large Schedule M adjustments
72. Missed deadlines
73. Numerous temporary book/tax differences
74. Payment of commodity, sales, value-added or other transaction-based foreign taxes
75. Payment of customs duties in any country
76. Planned adoption of SFAS 96

- 77. Poor records of historical timing differences
- 78. Revenue agent review/IRS inquiry
- 79. Significant carryback refunds
- 80. Significant NOL, ITC, FTC or AMT credit carryforwards
- 81. U.S. tax law conflict with tax treaty provisions
- Other
- 82. Accounting method/period change or adoption
- 83. Bank trust department
- 84. Divorce-past or pending
- 85. Elderly or deceased individual
- 86. Life insurance -- substantial coverage
- 87. Litigation support
- 88. Multiple family-owned entities
- 89. New Arthur Andersen client
- 90. Non-U.S. citizen spouse
- 91. Proposed new business venture
- 92. Significant charitable contribution
- 93. Wealthy family
- 94. Wealthy/highly compensated individual

Appendix C

Service Line List

Accounting Methods/Inventories

1. Existing Methods Reviews & Consultation
2. Inventory Reviews
3. Methods Changes

Appraisal and Valuation

4. Mergers, Acquisitions and Dispositions
5. Real Estate Appraisal Services
6. Transfers, Restructuring & Pricing
7. Claims & Disputes
8. Ad Valorem (Property) Taxes
9. General Appraisal Services

Capital Recovery

10. Capital Recovery Analysis & Tech. Support
11. Research & Development Activities

Contract Tax Management

12. Outsourcing Tax Department Activities

Corporate Software and Related Services

13. Customized Software
14. Tax Director Software Products
15. Software-related Pullthrough Services

State and Local Taxes

16. Income & Franchise Taxes
17. Sales, Use and Gross Receipts Taxes
18. Ad Valorem (Property) Taxes
19. Payroll Taxes
20. Net Worth & Capital Stock Taxes

21. Transfer Taxes

Individual Services

22. Individual Income Tax (IIT) Services

23. Corporate-Sponsored IIT Programs

24. Business Direction Review

25. Individual PFP Services

26. Corporate-Sponsored PFP Services

27. Expatriate/Inpatriate Tax Services

28. Retirement Planning Programs

Bank Trust Department Assistance

29. Trust Consultation

30. Return Preparation

31. Training Seminars

Exempt Organizations

32. UBI Review & Consultation

Real Estate Consultation

33. Facilities Consultation

34. Financing Assistance

35. Troubled Property Consultation

36. Feasibility Studies, Forecasts & Projections

37. Corporate Strategic Planning

Accounting for Income Tax

38. SFAS 96 Consultation & Implementation

Corporate AMT

39. Corporate AMT Consultation

Corporate Services

40. Financial Advisory Services

41. Buyer/Seller Services

42. Risk Assessment

43. Management Advisory Services

44. Corporate Advisory Services

45. Entity Structuring

46. Consolidations Consultations

International Services

47. International Trade/Customs Consultation

48. Cross-Border Planning

49. Japanese International Network

50. Intercompany Pricing Studies

51. Earnings & Profits Studies

52. Foreign Tax Credit Utilization

53. World Tax Reviews

54. International Financing

55. Europe 1992

Tax Reviews and other Studies

56. Tax Return Review & Assistance

57. Tax Department Reviews

58. Research & Development Credit Studies

Compensation and Benefits

59. Executive and Employee Compensation

60. Group Benefits

61. Qualified Plans

62. Life Insurance Products

63. Payroll Taxes

IRS Procedures

64. Expediting Tax Refunds

65. Estimated Tax Determinations

66. Penalty Assistance

67. IRS Audit/Adjustment Assistance

- 68. Information-Reporting Assistance
 - Office of Federal Tax Services
- 69. Rulings Assistance & Review
- 70. Monitor & Interpret Legislation
- 71. Client Representation
 - Closely Held Business Services
- 72. Tax Return Preparation
- 73. Basis Determination & Consultation
- 74. Allocations/Partnership Agreements
- 75. Debt Restructuring
- 76. Withdrawal Structuring
- 77. Entity Planning and Structuring
- 78. Ownership Succession Planning
- 79. Asset Transfers
- 80. Multistate Operations Consultations
- 81. S Corporation Taxes
- 82. Employee Compensation and Motivation
- 83. Personal Holding Company Awareness
 - Family Wealth Planning
- 84. Closely Held Business Services
- 85. Wealthy Family Services

Appendix D

TaxOps Index

1. Service overview

A. Goals

- 1. Talk about AA & Co.**

B. Fees

C. Services offered

- 1. Standard service**
- 2. Unusual/new service**
- 3. Special expertise**

D. Work with others

- 1. Coordinated work (AA & Co.)**

index with service line letter (ex. 1D1a)

Service Line letters (for reference)

- a. Appraisal and Valuation**
- b. Corporate Software & related services**
- c. State and Local Taxes**
- d. Individual Services**
- e. Real Estate Consultation**
- f. Accounting for Income Tax**
- g. Corporate Services**
- h. International Services**
- i. Compensation and Benefits**
- j. Office of Federal Tax Services**
- k. Closely Held Business Services**
- l. Family Wealth Planning**

- 2. Work with non-AA & Co.**

- 3. Cross-selling**

index with service line letter (as 1D1, above)

E. Resources

1. Personnel

a. Interviewee

1. Name
2. Title
3. Experience
4. Location
5. Personal info
6. Anecdotes
7. How to get in touch

b. Other personnel

1. How to get in touch

c. Extent of service delivery

1. Geographic
2. Other

F. Client profile

1. Typical client

- a. Corporate
- b. Non-corporate

2. Non-typical/new type of client

- a. Corporate
- b. Non-corporate

2. Need for service

A. Things to look for in a potential client

1. Questions to ask

- a. Ask the client directly
- b. Engagement team should find out

2. Key indicators (STATES)

index state with period followed by opportunity number (ex. 2A2.1)

Opportunity numbers (for reference)

1. Capital Intensive

43. Large Employee Population

93. Wealthy Family

a. Unusual/unexpected opportunity

index after opportunity number (ex. 2A2.1a)

B. Important business EVENTS from interviewee's perspective.

Index event with period, opportunity number (ex. 2B6)

6. Takeover

19. LBO/Reorg

20. Acquisitions/divest

31. Retirement

36. Change in management

45. cash-flow problems

50. Downsizing

a. Unusual/unexpected opportunities

index after opportunity number (ex. 2B6a)

C. When to call

1. Client should call

a. Ideally

b. Under duress

2. Engagement team should call

a. In general

b. Best time to call

c. Must call

d. No need to call

3. External factors

A. Competition

1. Who is the competition
2. Compare with the competition
 - a. Expertise
 - b. Resources
- B. Industry trends
 1. What is happening/will happen in the field
 2. How can one respond to changes
- C. Government/Regulatory body
 1. What is happening
 2. How can one respond
4. Interaction with clients
 - A. How does interviewee's line get clients
 1. Client initiates contact
 2. Office approaches client
 3. Other AA & Co. brings interviewee's office in
 - B. Engagement team's contact with client
 1. Introduce interviewee's service to client
 2. Ongoing contact with client
 - a. Things to keep in mind
 - b. Things you must know
 - c. Things interviewee's office would like to know
 - d. Information to give the client
 - C. Interviewee's office contact with client
 1. Original
 2. Ongoing

S. Stories

index as above with S preface

Appendix E

TaxOps Demonstration (videotape version 2)

Open on the demonstrator sitting at the terminal

He/She speaks (22 seconds):

TaxOps is a consulting program under development at Northwestern University's Institute for the Learning Sciences in cooperation with Andersen Consulting and the Arthur Andersen & Co. Tax Division.

TaxOps is intended to be a "friendly" and easy-to-use system for allowing a business professional to "follow a hunch" about a potential client, or to simply familiarize themselves with service lines within their own company.

Cut to the Data Entry screen, with "Duet Cup" already entered

Voice over (16 seconds):

In this demonstration, we imagine a tax professional has seen a short news item about the Duet Cup Company: perhaps Duet has announced the retirement of its founding chairman, or perhaps Duet is buying back its own stock. Whatever the case, curiosity about Duet Cup as a potential client opportunity has been raised.

Click on "Show Opportunities" (which displays the "opportunity indicator" screen)

Voice over (10 seconds):

Duet Cup is a manufacturer in the Paper and Allied Products industry. Various rules of inference are applied to the picture of the Duet Cup Company that has been developed from the data. These rules have access to the facts in the data, and to other facts about business and industry conditions that are captured in the TaxOps memory structures.

The opportunity indicators for Duet Cup appear, one by one (zoom to the top half of the screen)

Voice over (25 seconds):

Here we see that the Duet Cup Company has significant ownership of real estate. TaxOps knows this, as well as that Duet Cup has multi-state operations, from data entered into the form. TaxOps also knows that manufacturing firms are capital intensive, and that publicly traded corporations have widely held stock. Further, TaxOps infers that Duet Cup has highly compensated executives and significant cash buildup by an assessment of the financial size and strength of Duet Cup, based on financial figures taken from Dun and Bradstreet.

Pan down to the bottom half of the screen, where the case-based match has appeared

Voice over (35 seconds):

After calculating the key indicators for Duet Cup, TaxOps looks into memory for matching cases. Like doctors and lawyers, business professionals solve problems by reasoning from cases in their previous experience. TaxOps employs the same strategy, and has found a very similar case. The Ideal Demo Company has been judged sufficiently similar to Duet Cup, and two additional features have come into the picture. These features, relocation of facilities and expansion or acquisition, are known to be true of the Ideal Demo Company. It is reasonable to consider these opportunities, and their possible relevance to Duet Cup, since the two cases are very similar. Now we can look at the Best Opportunities.

Press the "Best Opportunities" button to show the "Summary Analysis" screen (zoom out to display the entire screen)

Voice over (22 seconds):

The three service lines judged most relevant to Duet Cup are listed here. The State and Local Tax practice is relevant because of the "expansion or acquisition" opportunity that was found by case-based matching. The Individual Services practice is relevant because Duet Cup has highly compensated executives. The Real Estate practice is relevant because Duet Cup owns substantial real estate holdings. Two more services, for a total of five, have been judged relevant as well.

Press the "Continue" button to show the "Job Aid" screen (zoom to the upper left quadrant)

Voice over (13 seconds):

In the upper left quadrant some text appears describing, in general terms, what the State and Local Tax (or SALT) practice can do for a client that is acquiring new facilities. This includes help with site location and tax compliance counselling.

Zoom back to display the upper half of the "Job Aid" screen

Voice over (18 seconds):

In the upper right quadrant there is a cluster of buttons. These buttons are connected to video clips concerning State and Local taxes and the acquisition of facilities. One of the buttons is connected to a video clip containing a story. Other buttons connect to video clips containing Things to Know (questions to ask a potential client) and More Detail about the acquisition of facilities.

Press the story button

Voice over (19 seconds):

Pressing the story button first displays some summary text. This allows the user to decide whether to actually watch the video clip (which, we can see by the numbers on the button, is almost 1-1/2 minutes long). This summary tells us the story is about a client opening a new warehouse, followed by a description of factors to consider in an acquisition. Let's hear it. Notice that the progress of the clip is tracked by the "thermometer" below the video screen.

Press the "play" button.

Ron Fulks says (80 seconds):

In the entire area of site location ... let me give you an example. We recently worked with ... if they located their warehouse outside the city limits of Lexington, Kentucky, they would save over \$550,000 a year in property taxes, more than enough to pay for the lease on the building ..."

Press the "More Detail" button

Voice Over (12 seconds)

After viewing this clip about site location, a user might be interested in "More Detail". Pressing this button gives a summary of the associated clip: that there are sometimes unexpected SALT opportunities, and that SALT can serve as an entree to other service lines

Press the "Play" button

Ron Fulks says (112 seconds)

You never know what's out there until you take a look... Only to find out later that they've been using 5000 independent contractors around the U.S. ... We had a client in Orange County ... We also started ... so State and Local Taxes is a tremendous entree into other tax related services...

Press the "stop" button

Voice over (15 seconds):

We can stop the clip at any point, and we can back up or advance. Notice the large numbered buttons in the lower right-hand corner. These correspond to the other service lines that TaxOps views as relevant to the Duet Cup Company.

Press the button marked "2nd"

Voice over (18 seconds):

This brings us to the Individual Services practice, where the opportunity indicator most relevant to Duet Cup is their successful and highly compensated executives. TaxOps inferred this feature based on the size and financial strength of Duet Cup. Notice the lines below the "stop" and "play" buttons. These contain questions related to issues concerning services that can be offered to successful executives.

Zoom in to the questions under the video window

Voice over (13 seconds):

The third question, "How can individual Personal Financial Planning engagements lead to other work?" seems particularly relevant for someone interested in cross-selling. As before, pressing the button shows a summary of the clip, and pressing "Play" shows the video.

Zoom out to display the entire "Job Aid" screen. Press Q3 and "Play"

Wally Head says (29 seconds)

At a large non-client, we were brought in because the chairman was a year from retirement, and was a financial disaster. Because the chairman wanted financial planning personally, he decided to put in a program for all of his top-level

executives. Over the next four years, we ended up working with about 12 top-level executives who were in the retirement years. We now have done more financial planning and some executive comp work at that non-audit client.

Voice over (7 seconds)

Given what we have just heard, the following question also seems relevant, "Why do executives with independent financial advisors need Personal Financial Planning?"

Press Q4 and "Play"

Wally Head says (39 seconds)

Top-level executives tend to have tax returns prepared for them...and we can add a lot of value in that.

Cut to the demonstrator, sitting at the terminal.

He/She speaks (5 seconds):

As a by-product of the session, TaxOps will print a "Client Profile Outline" like this one.

Demonstrator holds up the Duet Cup printout:

He/She speaks (18 seconds):

This form includes a summary of the data entered into the program in the fact-finding phase, as well as listing the opportunity indicators that TaxOps infers from analyzing the data and the similar cases. TaxOps also prints summaries of the video clips that are relevant to Duet Cup Company. This paperwork is useful for starting a file about the potential client, as well as serving as a memory aid to the user of the TaxOps system.

He/She speaks (16 seconds):

TaxOps is a system for quickly accessing video clips relevant to some particular business situation of interest. TaxOps is not an expert system for analyzing business conditions, rather, TaxOps allows the user to hear stories and receive advice from recognized experts in the Tax field, in a non-threatening and user-friendly environment. TaxOps is a consulting system that allows users at any level of expertise to explore creative solutions to interesting problems.

Cut to video display screen

Ron Fulks says (3 seconds):

You never know what's out there until you take a look.

Fade to black

Total (approximate) Running time: 528 seconds / 8 min. 48 sec.

Demo Continuation (long version)

Cut to the demonstrator, sitting at the terminal.

He/She speaks (8 seconds):

This ends the first segment of the demonstration. We will now show the other elements of the TaxOps system: data entry, report generation, and the "browsing" mode of viewing interactive video.

Cut to the TaxOps "splash screen"

Click on the "Start" button, moving to the blank "data-entry" screen

Voice over (14 seconds):

A session with TaxOps is composed of three separate components: a fact-gathering, or data-entry phase, an analysis phase, and an interactive video phase. Fact gathering is done by filling in the form displayed here. This can be done by any office worker, with the help of the "Data Entry Aid."

Click on the "Data Entry Aid" button, and enter "Duet Cup Company" into the first window. Fill in answers until the following voice over ends.

Voice over (20 seconds):

Questions on this form include very straight-forward things like the name of the business and its industry type. More detailed questions require financial data about the company: for example, current assets or net sales. The information that TaxOps asks for is commonly available, either in the form of published Annual Reports, or from the Dun and Bradstreet reporting service. This data can also be taken from recent tax returns. Future plans call for this data to be automatically gathered from pre-existing databases, rather than interactively.

Dissolve to the Data Entry screen, with "Duet Cup" already entered

Voice over (7 seconds):

Once the data about Duet Cup has been captured, which requires from 5 to 15 minutes, the facts and figures can be reviewed easily by browsing the form.

Double click on "Principal Industry" and then press the "Show Choices" button

Voice over (8 seconds):

Here we see the Duet Cup Company is a manufacturer in the Paper and Allied Products industry. After the data entry phase is completed, the analysis phase of TaxOps is entered by pressing the "Show Opportunities" button, which leads to the interactive video session demonstrated before.

Dissolve to the "Job-aid" screen

Voice over (6 seconds):

The TaxOps program contains some other interesting features. For example, we could press the "print" button.

Dissolve to the "Display Opportunities" screen for Duet Cup

Voice over (13 seconds):

As a by-product of the session, TaxOps will print a "Client Profile Outline" like the one displayed here. This form includes a summary of the data entered into the program at the fact-finding phase, as well as listing the opportunity indicators that TaxOps infers from analyzing the data and the similar cases.

Scroll the "Display Opportunities" screen, down one page

Voice over (10 seconds):

TaxOps will also print summaries of the video clips that are relevant to Duet Cup Company. This paperwork is useful for starting a file about the potential client, as well as serving as a memory aid to the user of the TaxOps system.

Dissolve to the "Opportunity Indicator" screen, with the Duet Cup opportunity indicators already listed.

Voice over (10 seconds):

At this point, TaxOps allows for a different style of interaction. Recall, last time on this screen we pressed the "Best Opportunities" button. This time, we press "Opportunity Network" instead.

Press "Opportunity Network" button which displays the "Network Icon" screen.

Voice over (16 seconds):

This screen displays a network icon for each of the service lines that TaxOps knows about. Notice that 4 of these figures are filled in, the others are blank. These 4 icons represent video networks for the 4 service lines that TaxOps has clips for. We can click one of these icons and see a set of questions, relevant to Duet Cup Company, answered by TaxOps.

Click on Real Estate, then click on State and Local Taxes. Zoom in to the stack of cards in the upper right quadrant

Voice over (8 seconds):

This stack of cards contains questions that are answered by video clips in the network. Clicking on the top card will take us into the network of clips, at the point where this particular clip is located.

Click on the 3rd card in the stack

Voice over (12 seconds):

Clicking on a hidden card brings it to the front. This card poses the question, "How can SALT (the State and Local Tax practice) minimize income tax for clients operating in several states?". Clicking on this card will get us the answer to that question.

Click on the 1st card in the stack

Voice over (15 seconds):

We are now in the video network, and again we are shown a summary of the clip we are about to see. This clip contains a story about how SALT helped a client structure an expansion. Since we know the Duet Cup Company might be expanding, this clip should be relevant.

Click on "Play".

Bill Curlee says (60 seconds):

We had a client recently that was looking at expanding their business by opening distribution centers in other parts of the country ... we recommended instead that ... the result was that we were able to ... where the parent company was operating.

Voice over (33 seconds):

This network view of the interactive portion of the TaxOps program is intended to be less focused and more browse-oriented than the "Job Aid" interface shown earlier. The idea is that one clip will answer certain questions, but will also raise other questions that can be answered by other clips. The kinds of questions that can be addressed are divided into the stacks you see here, surrounding the center card whose video clip we just watched. Questions are collected under headings like Services, Key Indicators, Business Events and so on. Notice the upper left hand stack is labelled "Stories", these are the cards for clips, under other headings, that happen to stories. At The Institute for the Learning Sciences, we believe that stories have a special status in the way people think and learn.

Click on the 4th card in the Stories stack

Voice over (15 seconds):

Having viewed the clip in the center, about minimizing taxes for multi-state clients, we can browse through the "Stories" stack looking for relevant clips. This card asks, "How can SALT help clients expanding into several states?". This seems relevant to Duet Cup, and it follows naturally from the clip we have just seen.

Drag the new front card on the "Stories" stack into the center of the screen and click on it once.

Voice over (7 seconds):

This clip contains a story about an expanding client, and how SALT helped them defend against an audit. Perhaps this can be watched some other time.

Click on "quit"

Voice over (4 seconds)

Now the user has the option of further browsing, in this video network.

Click on the "back" button

Voice over (4 seconds):

Or the user can go back, and choose another service line network.

Click on the "back" button

Voice over (5 seconds):

Or they can go back and explore the opportunities associated with a new or an existing client, and start all over again.

Press the "Get Existing Client" button, double click on ICN Pharmaceuticals in the dialog box

Voice over (2 seconds):

Or they can quit.

Fade to black (2 seconds)

Total (approximate) Running time: 803 seconds / 13 min. 23 sec.

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