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Elaws: Using Expert Systems to Deliver Complex Regulatory Information

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Background

The Department of Labor (DOL) is one of the largest regulatory agencies in the Federal Government, administering over 180 laws and statutes. The span of regulatory activity is extremely broad, involving a wide spectrum of workplace and workforce activities. At one end of the spectrum are the DOL's child labor regulations, dealing with such issues as the age and conditions under which an employer may hire young workers. At the other end are regulations governing health and welfare benefits to retired employees.

Minimum wage, overtime, workplace safety and health, pension security, the coverage of pre-existing health conditions, and family and medical leave are some of the other areas where DOL has been delegated responsibility for regulating the workplace. The implementing regulations that administer such laws literally fill thousands of pages in the Code of Federal Regulations (CFR).

To enforce these regulations, DOL employs several thousand inspectors, compliance officers and attorneys who respond to complaints, undertake inspections of worksites and, when appropriate, cite and litigate cases where violations have occurred. However, when measured against the number of workplaces in the U.S., it is impossible to reach all but a relatively minor number of these workplaces. Added to this is the increasing complexity of regulatory requirements such that for a large company, it would require a team of inspectors to adequately monitor or inspect their multiple facilities. For this reason, it has always been a primary tenet of the Department regulatory strategy to rely substantially on voluntary compliance by employers.

The Problem of Providing Compliance Assistance Information

In order to expect employers to voluntarily comply with DOL regulations, employers must be provided with information on what is required of them by these regulations. More importantly, it is critical that they understand what is required of them.

By law, the only information requirement until recently was that all new regulations must be published in the Federal Register. However, except the very largest of corporations, few companies subscribe to or follow the Federal Register.

To further add to the complexity of the problem, even if one were to read the Federal Register, most regulations are difficult to understand, as they are primarily written by lawyers for lawyers. Indeed legally, regulations are a direct extension of a statute defining in greater detail the requirements of the law, and hence they have historically been replete with legalistic terms and formats. Although a number of efforts have been made over the years to simplify regulatory writing, the language is rarely "plain English," tending more to meet the needs of legal sufficiency than of factual comprehension.

To address the need to provide employers with information that they can refer to in plain English, DOL regulatory agencies, over the years, have prepared a variety of compliance assistance materials. These have generally taken the form of pamphlets or fact sheets.

More recently, under the requirements of the Small Business Regulatory Enforcement Fairness Act (SBREFA) agencies are required to prepare comprehensive "Compliance Guides" that are intended to provide complete understanding of major regulations in simple to understand language. However, there are two major problems that make the preparation of useful compliance assistance materials extremely difficult.

First, there is a wide diversity in the demographics of firms. Of the approximately six and one half million firms with employees, a startling percentage fall into the "small business" category. Indeed, 99.7 percent of such business establishments have fewer than 250 employees. An even higher percentage would be found if the Small Business Administration’s official cutoff for "small business" of 500 or less were used.

A closer look at these small businesses show that there are very significant differences within this group itself. A "mom and pop" firm of say 3 to 5 individuals, for example, is very different from an establishment of 10 employees, or one of 30 to 50 employees or even 100 to 200 employees. Designing compliance assistance materials that meet the needs of each of these different size firms poses a major problem to providing effective and useful information.[1]

The second major problem in preparing compliance assistance materials--and even more problematic than the first--is that the information typically is too general to be of use. When firms need information, it is usually to address a specific situation or problem they are facing. Armed with only general information in the material prepared by DOL, they are not able to deal with the specific problem they are facing and must seek further clarification or help. To attempt to include such detailed information would only result in preparing huge documents that in themselves would not be useful.

The problem of tailoring appropriate compliance assistance information is exacerbated by the establishment size demographics noted above. Even if the compliance assistance materials were able to provide relatively specific information, addressing this to various sized firms would require a "matrix" of answers to a single question, since the size of the

establishment is often a critical factor in how one needs to address the problem.

Elaws: A Solution to Providing Comprehensive Compliance Assistance Information

The emergence of the Internet along with developments in Artificial Intelligence technology provided the Department of Labor with a unique opportunity to provide employers and employees with information on the duties and rights as proscribed by DOL regulations.

In 1995, the Department launched its Web site, which enabled it for the first time to mount a vast amount of information on its regulations. The information mounted included all the regulations as codified in the CFR, along with other useful information such as the preambles to these regulations and the available compliance assistance information. Some agencies also have posted information on legal cases and interpretive letters that seek to clarify further specific aspects of a regulation where questions of interpretation have arisen or where the regulations have not adequately addressed the requirements.

While it was very useful to mount all this information for the first time in one place, the task of ferreting out the specific information that was needed by a particular company or individual remained a daunting task. For many, especially the smaller employers, the effort to understand how a specific regulation applied to their situation remained as difficult as ever.

In response to this, DOL began to explore the feasibility of using "expert systems" as a method to guide an employer or employee through the maze of regulatory requirements. Starting with an experimental system that dealt with the Federal requirement of Veterans' Preference in the hiring of new employees, DOL launched a program to develop several interactive systems under the banner of Elaws: Employment Laws Assistance for Workers and Small Businesses.

Overview of Expert Systems

An expert system is a computer program that captures valuable knowledge and allows it to be disseminated to others. These systems emulate the interaction a user might have with a human expert to solve a problem. Expert systems are probably the most established form of artificial intelligence technology. Expert systems embed complex information into a computer model. The computer model can then be queried on a fact-specific situation and will give the user an answer to his or her specific question. Based on an individual's response to questions, the expert system provides the user with customized information.[2]

Each Elaws expert system or "advisor" provides information about a specific law or regulation. The advisors imitate the interaction that an employer or employee might have with a DOL regulatory expert. They ask questions, provide goal information and direct the users to the appropriate resolution based on their responses. The goal of Elaws is to provide the public with better, timely, and most importantly, *specific* information while simultaneously reducing the burden on DOL personnel of supplying compliance information.

Expert systems technology, which was introduced in the mid-1980's, is an important and successful application of artificial intelligence.[3] Until recently, expert systems were deployed

on personal computers and to a lesser extent on mainframe computers. In 1996, vendors (e.g. Exsys, 1996) started offering additional software to make expert systems run on servers accessible for client computers via the Web. This opened a range of possibilities for enhancing interfaces and mixing expert system, Web and database technologies.

An expert system performs reasoning using previously established rules for a well defined and narrow domain. An expert system combines a knowledge base of rules and domain-specific facts with information from clients and users about specific instances of problems in the knowledge domains of the expert system. The goal of an expert system is to provide the user or client with an interactive process similar to the experience of interacting with a human expert in the field.

When using an expert system, one is often struck by their simplicity. After being asked a few questions, the computer provides an answer that, in many cases, seems obvious. Providing such correct information in an easily accessible manner is the purpose of expert systems, but it should not suggest that the construction or operation of such systems is in and of itself "simple."

Let us take, for example, the question of whether a firm is covered by the Fair Labor Standards Act (FLSA) that requires it to pay at least the minimum wage and overtime if an employee exceeds working 40 hours in a week. The answer for the vast majority of firms is yes, they are covered. Appendix I is a presentation of the "module" that outlines the decision tree logic of coverage under FLSA. When represented in all its detail, embedding the knowledge of a sophisticated expert in this field, one is generally surprised at the amount of information that is "packaged" in these systems.

An important advantage of expert systems is the ease with which knowledge bases can be modified. This is a result of the architecture, which separates the knowledge base from the inference engine. As a result, changing the knowledge base does not require programming but can be done via word processing or an editor.

This feature makes knowledge engineering accessible to a wider variety of analysts, end users and experts. Ideally, the reasoning can be explained to help the user understand the questions being asked and the conclusions. Thus, the system can function more like human experts who explain the reasoning process behind their recommendations.

Rule Based Systems

Expert systems are especially good for closed-system applications for which inputs are literal and precise, leading to logical outputs. If this condition holds, then the inputs can be mapped to the outputs using "if-then" rules. By their very nature, government laws and regulations are excellent examples of rule-based closed systems. They typically proscribe specific sets of behavior given specific conditions (e.g., do not exceed a speed limit, stop at a red light).

In order to be truly useful, the expert systems must be consistent with real world practices. Another advantage of developing rule-based expert systems for Government laws and regulations is the availability of experts to explain how rules are actually interpreted (by the

courts, by Federal agencies, by the public).

Prototypes are especially useful in gaining the interest and attention of experts as the knowledge acquisition process is more productive and amicable. A variety of commercial development systems have become available over the last several years. These tools and associated techniques allow exploratory studies rapid prototyping for use in knowledge engineering.

Verification and Validation

A fundamental limitation of the expert system approach arises from the fact that experts do not always think in terms of rules. In these cases, it may be difficult to mimic the actual reasoning process of human experts, resulting in outputs that may be inconsistent with the responses that would be given by the human expert.

The computerized system is an attempt to produce performance that resembles human reasoning in some limited domain. The mechanism, however, may or may not resemble the actual biological or cognitive process. Thus, extensions of any expert system technique may not carry over into behavior that is similar to that of a human. Cognitive science, AI, and expert system research is still needed to produce a fundamental approach that models actual human reasoning.

In the meantime, a comprehensive technique based on a good understanding of human reasoning must be utilized. A practical approach is to use a systematic method to clarify the problem, elicit knowledge and procedures from the expert, organize the knowledge, and develop the expert system. After verification and validation of the computer-based expert the ongoing use of the system is monitored for future changes.

Examples of Current Elaws Advisors

As noted above, the Department has undertaken a systematic program of expert systems advisors for its regulations. The systems that have been developed can be found on DOL's Web site at <www.dol.gov> or can be directly accessed at the Elaws site, <www.dol.gov/elaws>**.**

Each Advisor is individually tailored to specific audiences, such as employees, employers, and policy officials. In addition, DOL's Advisor includes links to more detailed information that may be helpful to the user, such as sections of the regulations related to the topic being discussed. Links to Government publications and other organizations are also provided. To provide the reader with a better understanding of the content of these advisors, a summary of three such systems is given below.

The Family and Medical Leave Act (FMLA) Advisor <www.dol.gov/elaws/fmla.htm>

The Wage and Hour Division of the Employment Standards Administration developed the Advisor to answer a variety of commonly asked questions about the Family and Medical Leave Act (FMLA) including employee eligibility, valid reasons for leave, employee/employer

notification responsibilities, and employee rights/ benefits.

The Family and Medical Leave Act provides certain employees with up to 12 weeks of unpaid, job-protected leave per year. It also requires that group health benefits be maintained during the leave. The FMLA is designed to help employees balance their work and family responsibilities by taking reasonable unpaid leave for certain family and medical reasons. It also seeks to accommodate the legitimate interests of employers, and promotes equal employment opportunity for men and women.

USERRA Advisor <www.dol.gov/elaws/userra0.htm>

Veterans Employment and Training Service developed the Advisor to answer questions regarding employee eligibility, employee job entitlements, employer obligations, benefits, and remedies under the Uniformed Services Employment and Reemployment Rights Act (USERRA) of 1994. USERRA was signed into law on October 13, 1994. USERRA clarifies and strengthens the Veterans' Reemployment Rights (VRR) Statute. The Act itself can be found in the United States Code at Chapter 43, Part III, Title 38.

USERRA is intended to minimize the disadvantages to an individual that occur when that person needs to be absent from his or her civilian employment to serve in this country's uniformed services. USERRA makes major improvements in protecting service member rights and benefits by clarifying the law and improving enforcement mechanisms. It also provides employees with Department of Labor assistance in processing claims.

Specifically, USERRA expands the cumulative length of time that an individual may be absent from work for uniformed services duty and retain reemployment rights. The law is intended to encourage non-career uniformed service so that America can enjoy the protection of those services, staffed by qualified people, while maintaining a balance with the needs of private and public employers who also depend on these same individuals.

USERRA is administered by the United States Department of Labor, through the Veterans Employment and Training Service (VETS). VETS provides assistance to those persons experiencing service-connected problems with their civilian employment, and provides information about the Act to employers. VETS also assists veterans who have questions regarding Veterans' Preference.

For more information, please visit the Veterans' Preference Advisor. The USERRA Advisor answers questions about the rights and responsibilities for both the employee and employer. The system helps veterans to initiate claims if they feel their rights have been violated.

MSHA Form7000-2 Advisor <www.dol.gov/elaws/msha.htm>

This system allows electronic filing of the MSHA Form 7000-2, Quarterly Mine Employment and Coal Production Report. Each operator of a mine in which an individual worked during any day of a calendar quarter must complete and submit MSHA Form 7000-2 within 15 days after the end of each quarter, (i.e., April, July, October and January). In addition, each contractor performing work at a mine site for any one day of a quarter must file MSHA Form

7000-2.

This Advisor permits the forms to be completed and submitted to MSHA directly via the Internet. After all data is entered, the system asks the person to review the data to assure its accuracy. After they are satisfied with the data they can transmit it to MSHA. When MSHA has received the data, the person receives an e-mail confirmation.

Future Directions

The Department of Labor has approximately 20 systems operating and another 10 under development. DOL will continue to "fill-out" more and more of its regulations over the coming years. As more and more systems are created, we hope to develop meta-systems that build on the individual advisors.

Ultimately, it should be possible to develop a system that begins by asking the employer a number of questions about the firm's size, its SIC codes, the state in which it is located, whether it has Government contracts, etc., and the system will tell the employer which regulations appear to apply the his or her establishment. The system would then list the individual advisors that apply to the firm and the preferred order in which they should be executed. Upon executing the systems, the employer would then be provided with a complete and succinct listing of the specific requirements for which he or she is responsible.

As bandwidth expands and it is possible to deliver real-time video efficiently via the Web, it will also be possible to integrate visual aids into the advisors. For example, in some of the more technical regulations dealing with safety and health, it will be feasible to show the viewer visually how a respirator "fit test" is to be executed, or how a trenching operation should be accomplished. Similarly, required training as required by many regulations could easily be accomplished by packaging a series of downloadable training advisors that would accompany that particular regulation.

Maintaining the advisors and various assistance modules on the Web would allow for appropriate updates as needed and eliminate the problems associated with systems that use CD-ROM or floppy disks, where the user would need to know if the information is up-to-date. In short, the vision that such a fulsome architecture offers is a complete "knowledge management" approach to providing regulatory information to our clients--both employers and employees.

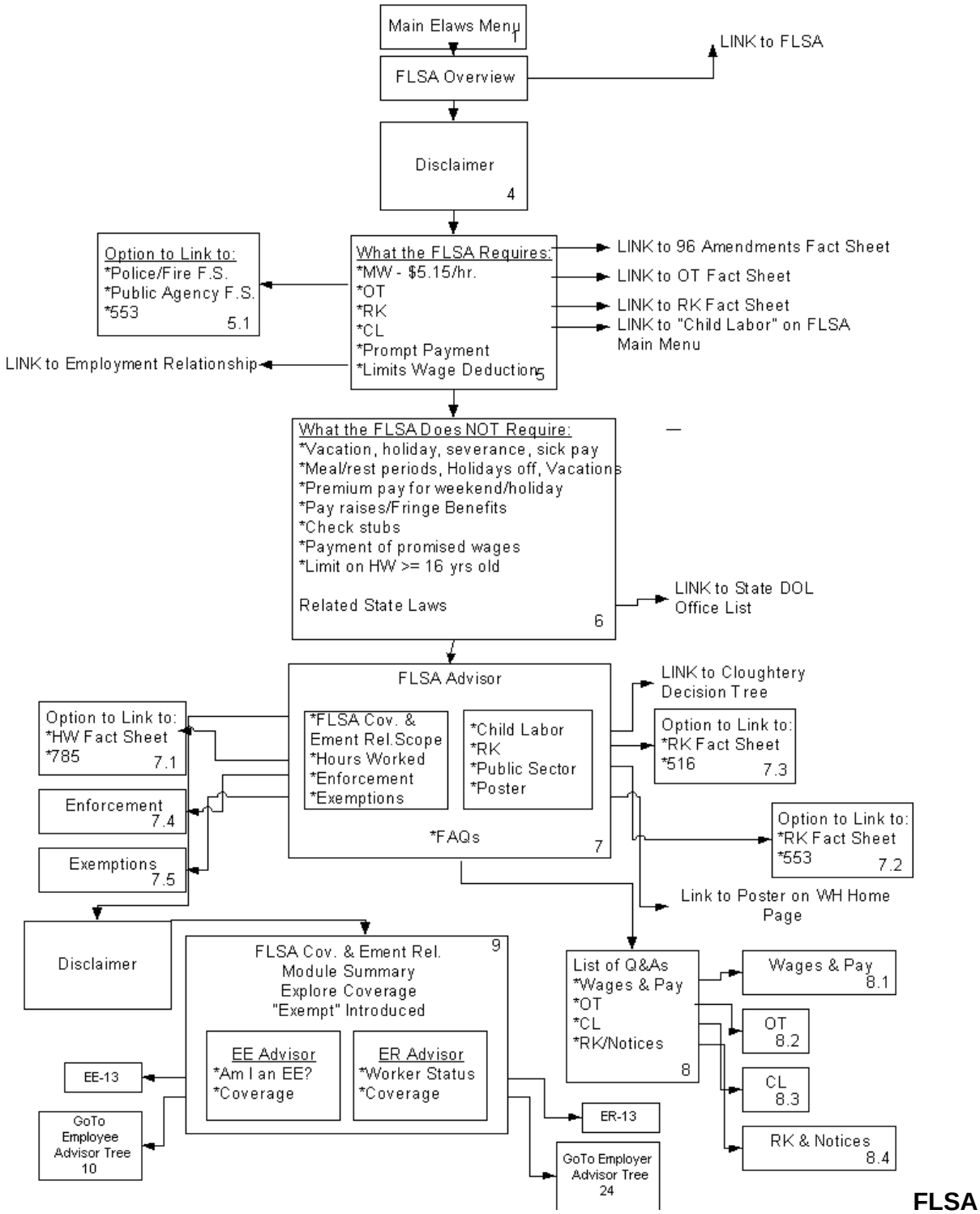
Notes

1. See Droitsch, R.G. The Dilemma of Regulating Small Business: The Need for a New Policy Framework, 33 Villanova Law Review, 6 (1988)

2. This section draws substantially on Mario DiStasio, Roland Droitsch and Larry Medsker, "Web-Based Expert Systems for Elaws," draft paper submitted for publication, 1999.

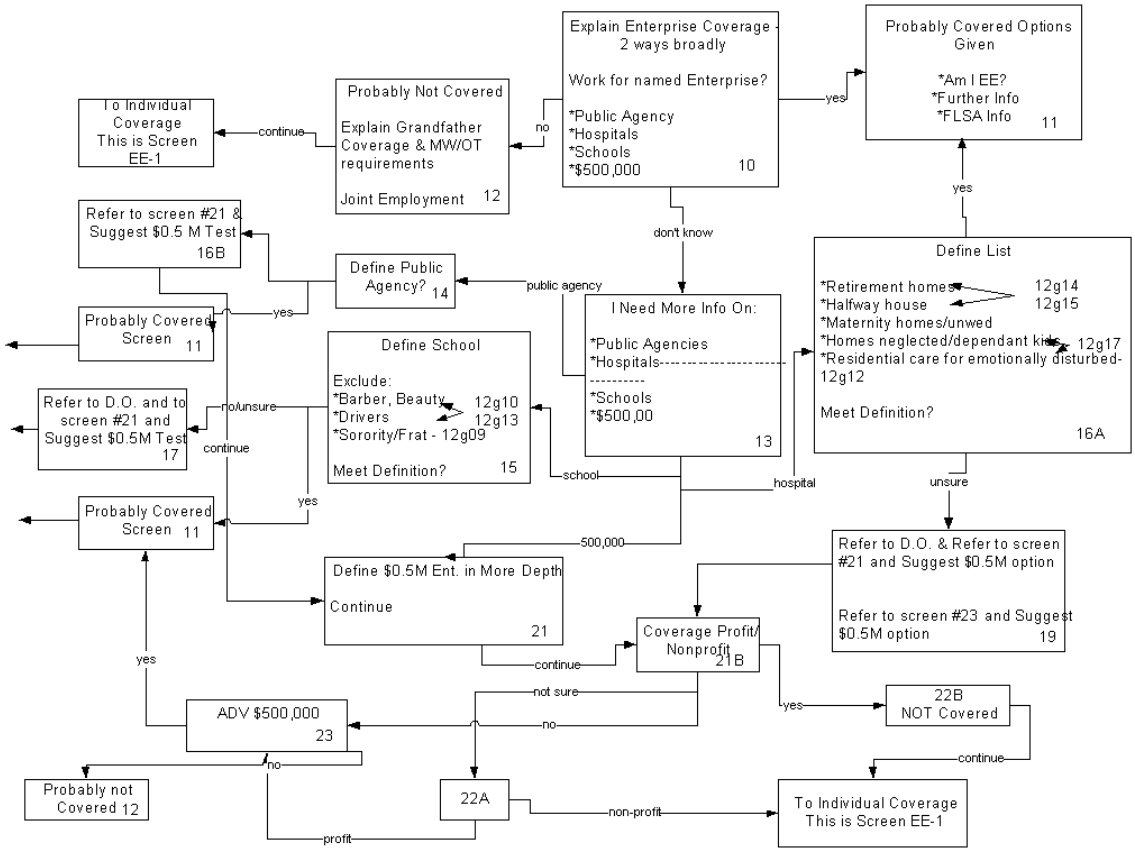
3. See L.R. Medsker and J. Liebowitz, Design and Development of Expert Systems and

Neural Networks, MacMillan, New York, 1994.

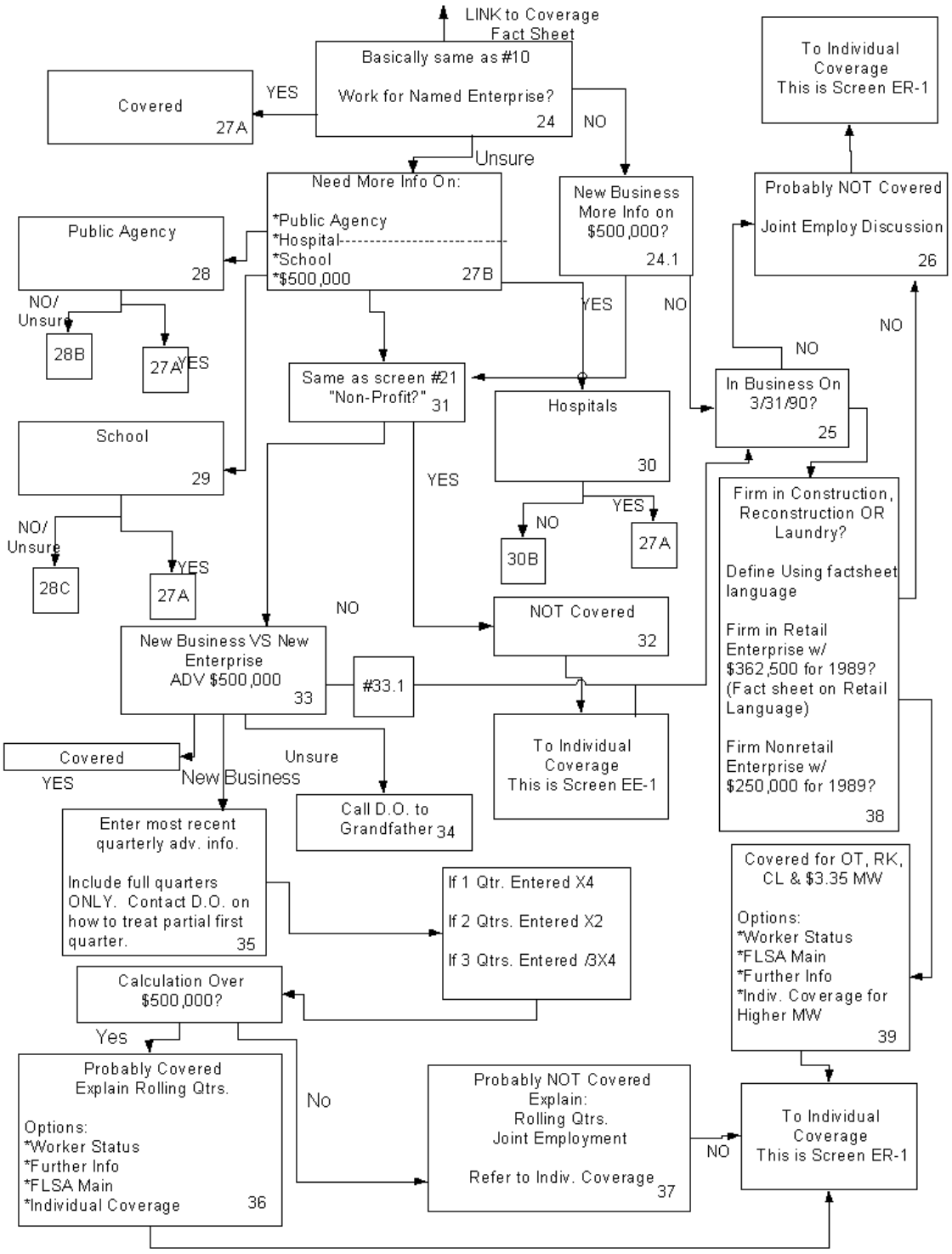


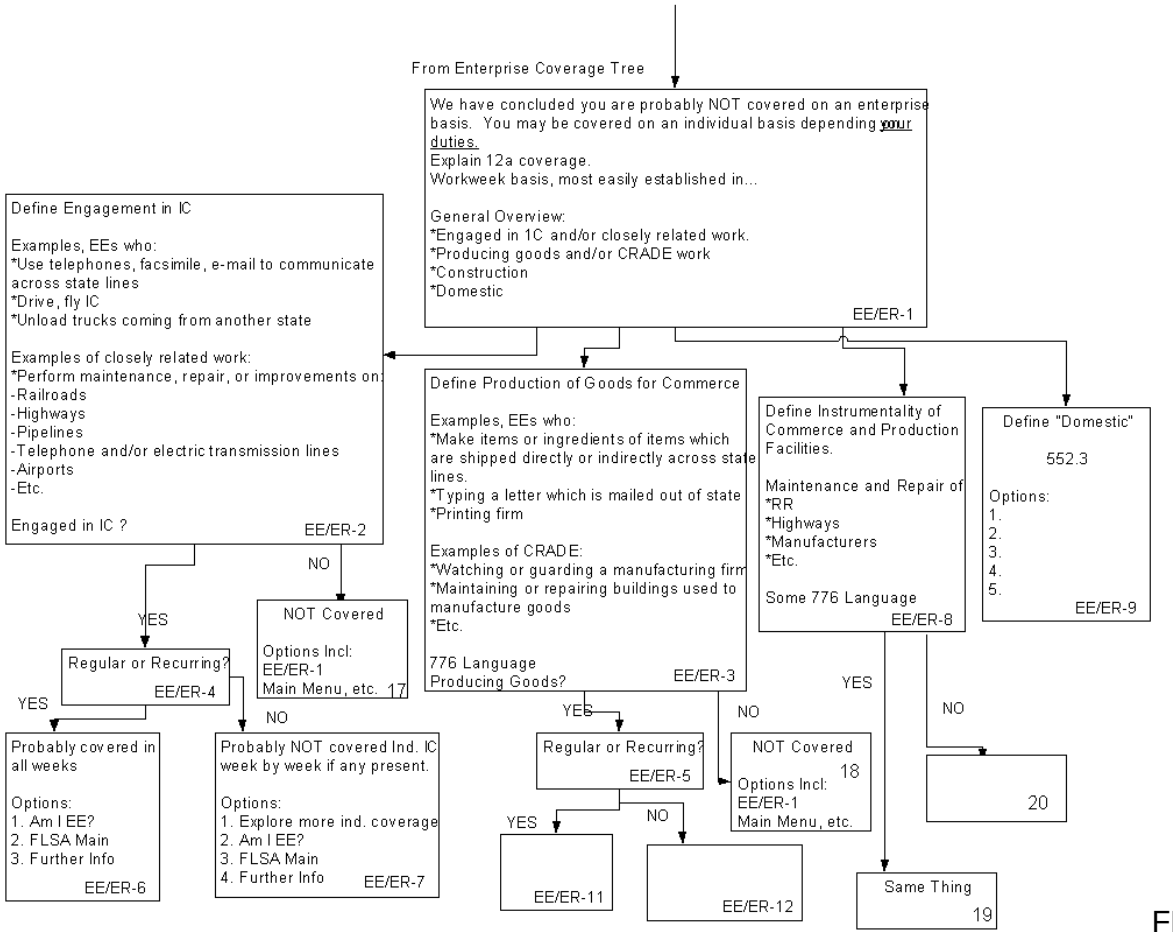
FLSA Coverage and Employment Status

FLSA Coverage and Employment Status



FLSA Coverage and Employment Status

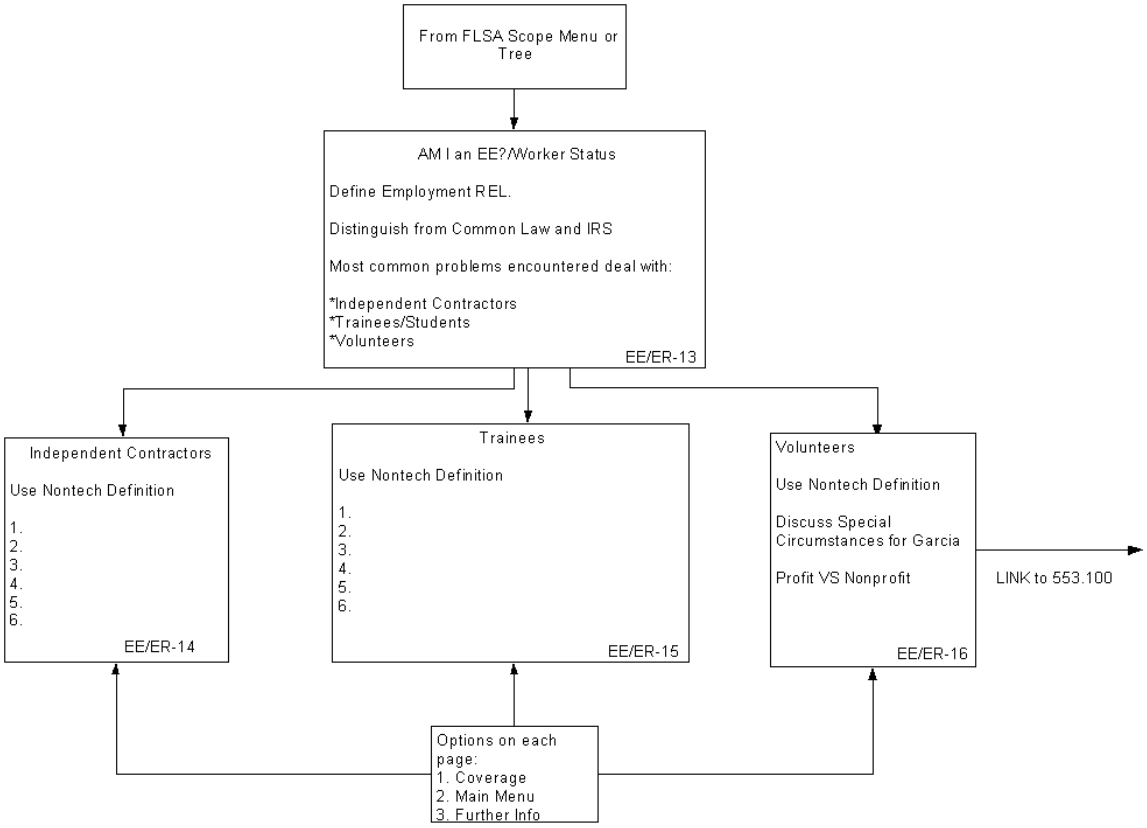

LINK to Coverage Fact Sheet
Basically same as #10
Work for Named Enterprise? 24
YES
Covered 27A
NO
Unsure
To Individual Coverage This is Screen ER-1
Need More Info On:
*Public Agency
*Hospital
*School
*$500,000 27B
New Business More Info on $500,000? 24.1
Probably NOT Covered
Joint Employ Discussion 26
Public Agency 28
NO/ Unsure
28B
27A
YES
Same as screen #21 "Non-Profit?" 31
YES
NO
NO
In Business On 3/31/90? 25
Hospitals 30
School 29
YES
NO/ Unsure
28C
27A
YES
NO
30B
27A
Firm in Construction, Reconstruction OR Laundry?
Define Using factsheet language
Firm in Retail Enterprise w/ $362,500 for 1989? (Fact sheet on Retail Language)
Firm Nonretail Enterprise w/ $250,000 for 1989? 38
NO
NOT Covered 32
New Business VS New Enterprise ADV $500,000 33
#33.1
Covered
YES
Unsure
New Business
To Individual Coverage This is Screen EE-1
Call D.O. to Grandfather 34
Enter most recent quarterly adv. info.
Include full quarters ONLY. Contact D.O. on how to treat partial first quarter. 35
If 1 Qtr. Entered X4
If 2 Qtrs. Entered X2
If 3 Qtrs. Entered /3X4
Covered for OT, RK, CL & $3.35 MW
Options:
*Worker Status
*FLSA Main
*Further Info
*Indiv. Coverage for Higher MW 39
Calculation Over $500,000?
Yes
No
Probably Covered
Explain Rolling Qtrs.
Options:
*Worker Status
*Further Info
*FLSA Main
*Individual Coverage 36
Probably NOT Covered
Explain:
Rolling Qtrs.
Joint Employment
Refer to Indiv. Coverage 37
NO
To Individual Coverage This is Screen ER-1



FLSA

Coverage and Employment Status

FLSA Coverage and Employment Status


From FLSA Scope Menu or Tree
AM I an EE?/Worker Status
Define Employment REL.
Distinguish from Common Law and IRS
Most common problems encountered deal with:
*Independent Contractors
*Trainees/Students
*Volunteers
EE/ER-13
Independent Contractors
Use Nontech Definition
1.
2.
3.
4.
5.
6.
EE/ER-14
Trainees
Use Nontech Definition
1.
2.
3.
4.
5.
6.
EE/ER-15
Volunteers
Use Nontech Definition
Discuss Special Circumstances for Garcia
Profit VS Nonprofit
EE/ER-16
LINK to 553.100
Options on each page:
1. Coverage
2. Main Menu
3. Further Info