

An Integrated Approach to Developing Human Services Web Portals

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Abstract

A major goal for Human Services Web Portals is to make as much expertise available as possible for clients and their caregivers. The expertise covers three main areas - diagnosing a client's problem, identifying available resources for solution, and finally, providing assistance to package these resources into a service plan that will serve as a solution for the client's problem. The main challenge in setting up a human services web portal lies in the nature of diversity and complexity in both the client set and the set of problems clients want to address. Therefore offering prepackaged solutions is not an option. We describe an integrated human services web portal design and provide a phased approach for implementation. Finally, we generalize our design for other domains in which external expertise is required as a component of service delivery.

1 Introduction

Web portals provide one-stop, on-line access for goods and services. In the commercial sector, a Web portal is like a shopping mall. The customers have a good idea of what kinds of goods they wish to purchase through common experiences or from marketing information pushed from convenient channels. Eligibility to purchase is simply determined as ability to pay with a valid credit card within its allowable credit limit. Transactions are point of sale, with later delivery of physical goods. The convenience of on-line shopping, with 24/7 access from home or work, combined with the power of hypertext links, search engines, and comparison shopping of shopbots (Smith & Brynjolfsson, 2001 and Smith, 2002) all contribute to increased efficiency (low friction) as the major benefit of Web portals.

A variety of public goods and services are provided by local governments, including education, public safety, infrastructure, and human services. Many of these services now have web-based components with the goal of providing one-stop portals for public services. Local government Web portals have received less attention in the e-government literature, but have some of the richest problems. In particular, human services are complex and can benefit much in efficiency and effectiveness of delivery through properly designed and integrated Web portals.

The design of web portals has received a lot of attention in the literature. Choo (2000) models a web portal in terms of a content space, a communication space and a collaboration or work space. Stowers (2003) identifies current practices for major components of federal e-government Web portals as online services, user help, service navigation, accessibility, legitimacy, and architecture. Gant & Gant (2003) do similar work for state e-governments. Detlor & Finn (2002) describe a comprehensive framework for the design of government web portals from three perspectives – that of the government, the citizen, and portal interface design.

Public sector Web portals, like their commercial sector counterparts, can also yield similar operational efficiencies for certain commodity types of public goods like drivers' or hunting licenses. But in addition to these operational efficiencies, well designed and integrated public sector web portals can provide major gains in effectiveness in identifying and implementing problem solving strategies related to the provision of human services via the web. In contrast to the current literature, we describe an integrated approach to web portal design, where the online and offline components form a seamless service infrastructure, centered on the client.

The next section reviews the human services provision problem with a focus on the unique features of the problem. Section 3 describes the general requirements of human services Web portals in the light of these unique features of the problem. Section 4 describes a phased-approach for human services Web portal design. We conclude in Section 5, discussing some generalizations and major lessons from our approach to web portal design for human services.

2 Distinguishing Features of the Human Services Delivery Problem

Human services provide a floor on endowments for those less fortunate, at risk, or disabled. Included are programs and services for substance abusers, the abused, unemployed, physically or mentally impaired, poor, elderly, and others. Counties, of which there are 3,043 in the United States, are the primary funders and providers of human services, although cities also fund and provide human services. Direct provision of human services to clients is generally outsourced to non-profit organizations. In Allegheny County, Pennsylvania (population 1.27 million) which contains the city of Pittsburgh, there are approximately 300 non-profit service providers for the elderly alone, very few of which have Web sites. Hence, there are many human services organizations across the country and

within any single county. A simple extrapolation based on population, estimates approximately 70,000 non-profit organizations for aging services alone in the United States. Each service provider needs representation on e-government Web sites.

There are unique and challenging features related to the provision of human services that differentiate them from other government services. First, clients of such services are heterogeneous. There are the direct users of human services, but often Web portal users are caregivers of those who will receive the direct services. Other clients are human services professionals employed by government, non-profits, or volunteer organizations that broker services for direct clients. Finally human resources managers in businesses are twice-removed clients, who welcome on-line services as a means to reduce absenteeism for employees who are caregivers. Most human services have caregivers and direct clients located in the same geographic area. A notable exception is for aging services, where adult children or surviving relatives are often in different cities or parts of the country. Trips by caregivers, in such cases, can be minimized or made more productive or shorter through information and services gained remotely from human services portals.

Second, on first encounter, many human services problems are outside the realm of common knowledge and experience of direct clients or caregivers. When an elderly parent is no longer independent, when a teenage child is found to be addicted to drugs, or when a child with disabilities is born, caregivers generally have few internal resources for dealing with these long-term problems. Unfamiliar and unknown external resources must be accessed. Third, like many public sector goods, there generally is no marketing budget for human services so that potential clients, even if they know what kind of service is needed, may be unaware that applicable services even exist in the public and not-for-profit sectors.

Fourth, eligibility determination requires collection and processing of much information from clients, financial institutions, health providers, government agencies, etc. For example, a county agency area for aging services requires a 25 page form for eligibility determination. Fifth, like private-sector patients of doctors, clients become cases that are managed over time with multiple transactions in multiple agencies, and records in files over life cycles and phases of care. This requires the design and management of dynamic care or service plans (Fernandes et al. 2001) that will address the clients' problems. Lastly, the actual delivery of services, while funded by governments, generally is outsourced to non-profit organizations. Non-profits are often small-scale and resource-poor, often having minimal management infrastructure and little by way of information technology resources.

Clearly, human services provision has daunting problems. Besides the many inefficiencies, many of these problems are ones of effectiveness, in learning that there are applicable treatments and services, and in designing services. Web portals, properly designed, have the potential to alleviate many human services delivery problems.

3 Web Portal Requirements

To be effective the portal design must be integrated with the overall service providing infrastructure that has a large off-line component. Indeed, we believe that Web portals will be critical for delivery of human services and be widely deployed to solve many of the hard problems of this area. Key to effectiveness is gaining access to *expertise and resources* for making decisions on services. We now describe how the unique features of human services determine Web portal requirements in terms of content management, search, and expertise and service plan management. Our approach to the problem integrates on-line or technology components with off-line features.

3.1 Content Management

Human services Web portal content should have decentralized input by the service provider organizations themselves to a centralized Web site. It is infeasible to build independent, custom Web sites for each service provider; they do not have the resources for such activities. Content should be databased, to allow decentralized Web form input and automation of content updates. A databased approach will also facilitate rendering content to a variety of display devices including PDAs for field workers. One desirable feature of decentralized, Web forms input is the ability to automatically send email messages based on dates requesting review and update of content, including links to specific Web pages for review via the forms.

A staff person at the portal site, should be a community outreach specialist. This person initially recruits service providers for placing their content on the portal. The staff person then helps input Web content for service providers and trains service providers on content gathering and Web form input and update. An important component for frequent input by service providers is a calendar function for special events and non-programmatic services; for example, a one-time dinner to be held at a church. The staff person needs computer expertise for tasks such as database input, reformatting digital images to reduce load times, and editing content for errors. The Allegheny County, Pennsylvania Area Agency on Aging has contracted with a non-profit organization that has

strong community connections, the Interfaith Community Caregivers, to manage its Web portal and who have in turn hired an outreach specialist as described above.

3.2 Search

Information and referral (I&R) specialists are integral employees of human services organizations. They use master lists of human service providers and programs, with key word search to recommend programs for clients, often from phone call centers but increasingly also from Web sites. The I&R field has a national taxonomy of codes for keywords describing services (INFO-LINE of Los Angeles, 2003). Besides service keywords, a second primary search criterion is geographic location. Many service providers are small scale, at the neighborhood level. Others are regional in terms of service area. Regardless, it is important to locate services proximate to clients' residences, and generally there are alternatives.

While many I&R systems are based on five-digit zip codes, zip code areas are often quite large with boundaries that make sense for delivering the mail, but not finding services. It is much more desirable to employ a geographic information system (GIS) for locating proximate services. A GIS allows the clients to enter his/her address and then search for service providers within specified distances (either straight line or street travel distances). Algorithms can automatically expand the search radius if alternatives are not found initially.

Standard Web page templates for service providers, with a standard look and navigation features, facilitate research by clients for comparing alternative service providers. Clients can select search criteria, including key words and geographic location, and be presented with a grid of alternatives with links to corresponding pages. On each page can be a link for continuing the same search (or starting a new search), to get back to the grid of alternatives. After searching the first site thoroughly, the client can then skip to specific key sections for comparison of subsequent alternatives. Individual service providers can distinguish themselves by the number of templates that they populate with data and the quality of the content. Some templates can be open ended; for example, like a virtual tour, that includes several stops. Also, a template can be included for special features of a site. Service providers that have individual, custom Web sites can have a link from the template home page of their site on the human Web site portal.

3.3 Expertise

There are at least five kinds of experts relevant for human services problem solving: legal, financial, housing, health, and psychological. There are increasing limitations on abilities for experts to provide health information because of the Health Insurance Portability and Accountability Act (HIPAA) although certain Web site designs may circumvent some of these. Financial experts must have sound knowledge on eligibility requirements and benefits from various public and private insurance and other programs. Housing expertise depends on knowledge of local housing markets for rentals, Section 8 subsidized housing programs, and units available in group quarters.

Sources for experts start with professionals on staff or retainer with local governments, of which there are many. Web access to these experts can be a productive and efficient use of these available resources. In addition are volunteers. Information about volunteers, such as in a "Meet the Experts" Web component, can be attractive for advertising experts' professional services, and thus serve for recruiting. Another form of expertise is from caregivers or clients who have been through the system. For infrequent problems, for example, certain rare diseases or disabilities, the Web can provide a critical mass by linking up individuals over multi-state areas.

Experts can provide several kinds of problem-solving information. One is knowledge on life cycles and phases, branching probabilities, expected lengths of states, potential remedies and treatments, probabilities of success, etc. for classes of problems. This educational component is most valuable in hypertext format, allowing quick scanning and drilling down for particular issues. In addition, experts can diagnose problems in the context of particular conditions of individuals. A critical part of diagnosis is follow-through referrals, often to local sources and opportunities. Thus experts are critical for informed action in terms of getting best services for problems at hand.

An important tradeoff in expert use on a Web portal is establishing legitimacy of expertise versus protecting experts from becoming entangled with or harassed by clients. It is desirable to insulate experts, to disconnect them from direct contact with clients in order to get buy from the experts to participate on a human services Web portal.

3.4 Service Plan Management

From our earlier discussion we can identify four operational components in addressing human services problems - a diagnosis of the client's problem (Client Problem Diagnostics), determining steps for a good solution

to the problem (Service Planning), identifying services across one or more agencies (Service Provision), and finally monitoring the service plan (Service Monitoring and Management). Assume availability of a mix of online (electronic) agents and off line (human) agents that correspond to the operational components and who work with clients. The relative mix of human and electronic agents depends on developments in hardware and application software technology. This component of the web portal requirement refines and addresses the client problem.

The Client Advocate Agent set devises a *service plan* consisting of feasible steps to meet entry rules and gain services across one or more agencies. The Service Facilitator Agent set belong to individual agencies providing human services. This agent is knowledgeable about the services provided by a particular agency. The Client Advocate Agent set communicates with Service Facilitator Agent set when devising service plans.

The Client Problem Diagnostic Agent set translates the client's problem statement into a more structured format in terms of a set of problem objectives. The Client Problem Diagnostic Agent communicates the set of problem objectives to the Client Advocate Agent. The Advocate Agent serves as an intermediary between the clients and the agencies providing services. The Advocate Agent maintains a database of services available (together with service characteristics). This database is populated and updated when Service Facilitator Agents register their services and corresponding requirements with the Advocate Agent.

In response to the query from the Diagnostic Agent, the Advocate Agent queries its database, communicates with the Service Facilitator Agents, and constructs and evaluates alternative service plans that will meet the set of problem objectives. The set of alternative service plans are communicated to the Client Diagnostic Agent. The Client Diagnostic Agent (with input from the client) selects a service plan which the Advocate Agent implements. The Advocate Agent also monitors the execution of the plan and reports on results.

The Service Facilitator Agent set has two important working principles that allow the Client Advocate Service Agent set place faith in it: 1) it must implement the policies and SOPs of the agency and 2) it must serve the client's best interests. In regard to these principles, it may be desirable to conduct periodic audits of Service Facilitator Agents, to ensure that they are faithful and not covering up agency wrongs or limitations. With faith established, the Client Advocate Service Agent can benefit from decentralization and be free of the details of service provision. The Client Advocate Service Agent merely passes needed inputs to the Service Facilitator Agent, and gets back results as needed for then next phase of the service plan.

4. A Phased Implementation Approach

It may not be possible to build all components of a human services Web portal at once, or even desirable at all. We envision a set of increasingly sophisticated components that can be built in phases, from basic to advanced. Each phase increases the amount of expertise available for clients. We suggest the following six phased-approach for a human services web portal

Phase 1: I&R Catalog

The minimum Web component for human resources is the I&R master list of government and non-profit service providers and programs, with retrieval by INFO-LINE taxonomy keywords and geographic locations. The corresponding database, which may consist of three or four related tables, is part of the information infrastructure of a county and should be carefully maintained and made publicly available in its entirety as well as through a Web portal.

An addition to common I&R database designs would be inclusion of performance and legitimacy data. Results of required inspections, renewal of certificates, and awards should be included. Also, it would be desirable to allow clients to record complaints and ratings of services, such as done on Amazon.com. Service providers that fall below acceptable standards may be given a grace period in which to comply, but then be marked on the Web site as out-of-compliance. If brought back into compliance, some "new and improved" notes for the service provider on the Web portal can be part of an incentive system.

The INFO-LINE taxonomy is hierarchical with services divided into increasingly detailed descriptions. A region or county needs to decide on the granularity desirable for its keywords, and this can occupy a committee with several months' work for a well-worked out design. Two items are desirable. One is a good graphical user interface to explore and study INFO-LINE. The second are some good designs and documentation for starting points in the design process. Also, it is desirable to have a national registry of service providers, although the organizational solution for such an endeavor needs investigation. An XML standard for I&R data may contribute to a solution.

Phase 2: Educational Articles Links

Many Web sites already have extensive collections of short articles for educating clients and caregivers on human services problems. Sometimes there are local conditions that warrant commissioning new articles, either

because of special competencies, needs, or services available. These articles should be reviewed and rated, with annotated links. Search by keyword or content are also desirable.

Phase 3: Decentralized Input and Revision of Advanced Content by Service Providers

I&R is restricted to directory and catalog information. Clients often need additional marketing information to make an informed decision or to be persuaded to use a service. Take the example of senior centers, which make up the gateway into the service network for the elderly population. Senior centers are for independent senior citizens, mostly providing social services such as congregate meals, games, lectures, tours, etc. Lectures and other services; however, introduce readiness and planning for stages of aging in which seniors become more dependent. One typical scenario for starting to use senior services is that a spouse dies, the old circle of friends and social activities for the survivor no longer work because they involve married couples, so the survivor has to build a new circle of friends and social activities. An adult child, living in a distant city, can help the already depressed elderly parent by searching for a good senior center nearby the parent and getting convincing marketing information. Web components that we have used for this purpose include “Meet the staff” in which there are photos, qualifications, and philosophies of the director and staff; “virtual tour” with photos and captions starting with the well-lit parking lot, beautiful entrance and handicap accessibility, social meeting rooms, activities, kitchen, etc.; “special features” for facilities and programs that distinguish the center like swimming pool and bocce court; “testimonials” showing pictures of clients with their statements about what they like at the center; “calendar” for events, and “menu” for noon-time congregate meals.

The conventional approach for such components is custom construction by a Web designer or a Web master. Clearly, non-profit service providers cannot afford such Web sites. Hence, we have built a system in which content input and revision is decentralized and by service providers themselves. The system employs simple Web forms for input of content in the areas described above plus the basic I&R data. The content is all databased and then rendered to Web site pages through programs and templates. Figure 1 is a screen shot of a grid from which content can be revised through forms and Figure 2 is a screen shot of the rendered Web site. Page composition is through a data element in which order of elements is determined and an on/off data element for elements. This Web site will be made public in January 2004.

Figure 1: Sample grid for revising content.

Delete This Row	Update This Row	Title/Name	Description	Priority	Turned On?	Photo
1	1	Joseph Yuros and Josephine Wise	Joe and I like Bingo. We play it every Friday. We have our own little library.	12	True	TestimonialPhoto1.gif
11	11	Emma Patrick	"You make a lot of friends here. We do crafts and exercise twice a week"	5	True	TestimonialPhoto11.gif

Buttons: Add New Testimonial, Update/Display Testimonial Photo

Figure 2: Program-Rendered Web Page

Bethel Park Resource Center

Testimonials

Joseph Yuros and Josephine Wise

Joe and I like Bingo. We play it every Friday. We have our own little library.

Emma Patrick

"You make a lot of friends here. We do crafts and exercise twice a week"

Navigation: Basic Information, Testimonials, Staff and Volunteers, Calendar of Events, Meal Menu, Virtual Tour, News

Search: Same Search | New Search

Phase 4: Structured Web Guides to Human Services

This component is motivated by a project completed in Allegheny County, Pennsylvania that produced *The Family Resource Guide* (Talerico, 1999). A group of 55 experts on children disabilities produced a 393 page hardcopy document that today would certainly be built and maintained as the Web component that we suggest here. The document links education and referral to local services – a very powerful integration of information that is normally obtained, piecemeal, through traditional channels of phone calls, office meetings, etc. The sections of *The Family Resource Guide* include:

- *First Steps for Families* – provides some hope and encouragement, and practical advice.
- *Developmental Supports and Services* – outlines the developmental stages of early childhood years and emphasizes early intervention given signs of developmental delays. It also provides data on corresponding service providers. This is a section of interest to all families with young children.
- *Medical Insurance and Benefits* – reviews all of the relevant insurance and benefits programs in depth, with corresponding contacts.
- *Medical Care* – reviews all options for care types and delivery modes, and how to find care providers.
- *Educational Services* – covers educational rights and special education alternatives, and includes corresponding service providers.
- *Family Support Services* – reviews support services (e.g., support groups, respite care, camps, psychological counselors, transportation, etc.), roles of social workers and advocates, sources of funding, and I&R data on providers.

Also included are numerous appendices such as glossary, important phone numbers and websites, approach for keeping medical records, etc.

Clearly, building Web guides, patterned after *The Family Resource Guide* would be a valuable component of Human Services Web sites. Several human services types merit their own guides; for example, substance abuse, employment training and daycare, and aging services. Content management opens up exciting additional possibilities for such guides; namely, to keep the community of experts engaged in Web content maintenance. Experts can be given Web form access to revise or extend previously submitted material. Valuable would be a “News from the Experts” section.

Phase 5: On-Line Access to Experts

Phases 1 through 3 promise to answer many needs of human services clients. Yet, there will remain need for one-on-one advice or information from experts. The “Ask an Expert” component from the state of Virginia’s SeniorNavigator.com Web site (<http://www.seniornavigator.com>) serves as a good example here. The steps and processes to use this service (with some steps inferred by us) include:

- The client must register with SeniorNavigator.com and include an email address.
- The client fills out a Web form with his/her question.
- The question and client ID are written to a database.
- A dispatcher, brings up a form with undispached questions and assigns questions to experts.
- The system automatically emails questions to experts. The email includes a URL to a Web form keyed to the question.
- The expert keys in an answer and submits the form. The answer and expert ID are entered into the database, triggering an email to the client.
- The dispatcher gets a report of questions with answers, plus an exception report of late questions with no answers.

This system has several benefits. First, the separation of client from expert is important for expert buy-in to participate, as mentioned earlier. Second, the databased set of questions and answers provides a high quality source of FAQs as a supplement to this phase. Of course, the major benefit is that clients get high quality access to individual expert advice at very low cost. The dispatcher plays an important role in interpreting questions and routing them to the most appropriate expert or experts.

A supplemental component is “Meet the Experts” in which biographical information, professionals accomplishments, and affiliations are included. Several of each kind of expert are needed, to help insulate experts from clients. Two benefits of this section are legitimacy of answers obtained and spin off marketing for experts’ for-pay services.

Phase 6: Providing Service Plan Management

The service plan generation and management component is the most challenging to implement. Currently the social workers serve as coordinators for identifying, implementing and monitoring service plans. The challenge here is twofold. First, there is the problem of identifying an appropriate plan made up of optimal service providers for the client's problem. Even when such a plan has been identified, there is the challenge of monitoring the plan and updating the plan when, for example, a selected service provider cannot deliver as expected. The complexity of this phase lends itself well to discussion on how service management may be made automated using intelligent software agents. There are several alternative ways in which the client advocate agent could be realized. We discuss two possible implantations for the client advocate agent as an example.

One would be to function like a sophisticated comparison shopping engine. Currently, comparison shopping engines are unintelligent (see www.dealtime.com for an example) and search through a fixed (usually 30 or so) set of vendor sites in response to a query (say for the price of a book). The retrieved offers are far too many – demanding a cognitive cost from the user to process them – and the retrievals take much longer (usually of the order of 40-50 seconds) than it takes to retrieve an offer from a single vendor (less than 4 seconds). Intelligent comparison search engines (Montgomery et. al, 2001) can use knowledge of prices at vendors and response times of their sites to decide on the optimal set off vendors to query for a price of a book. The offer set retrieved by these engines maximizes consumer utility. In a similar manner, a client advocate agent could conduct searches among the set of human services available to maximize utility to the citizen client.

While a utility maximizing approach provides a decision theoretic underpinning to agent design, new advances in computing architectures can also be adapted to the needs of our e-government context. In particular, we believe that the agents can be designed as a self organizing community of utility maximizing agents. These self-organizing communities will consist of intelligent computer agents that aid in relaying information and actively seeking out other community members that are similar to themselves. A network protocol called Gnutella (Oram, 2001; <http://www.readyportal.net/>) can be adapted for this purpose. A computer agent using Gnutella can monitor its local network topology and traffic.

Our proposal is to embed intelligent decision-making and learning capabilities in these agents to enable them to process information that they collect or may otherwise be able to obtain about the network. Using the learning capabilities, the agent can develop knowledge about the other computer agents in the network to which it is connected. Using the decision making capabilities, it can decide which other agents it should connect to and when faced with an information retrieval task, determine the agents it should query to maximize the utility to the citizen client of the response.

6. Conclusions: Lessons Learned

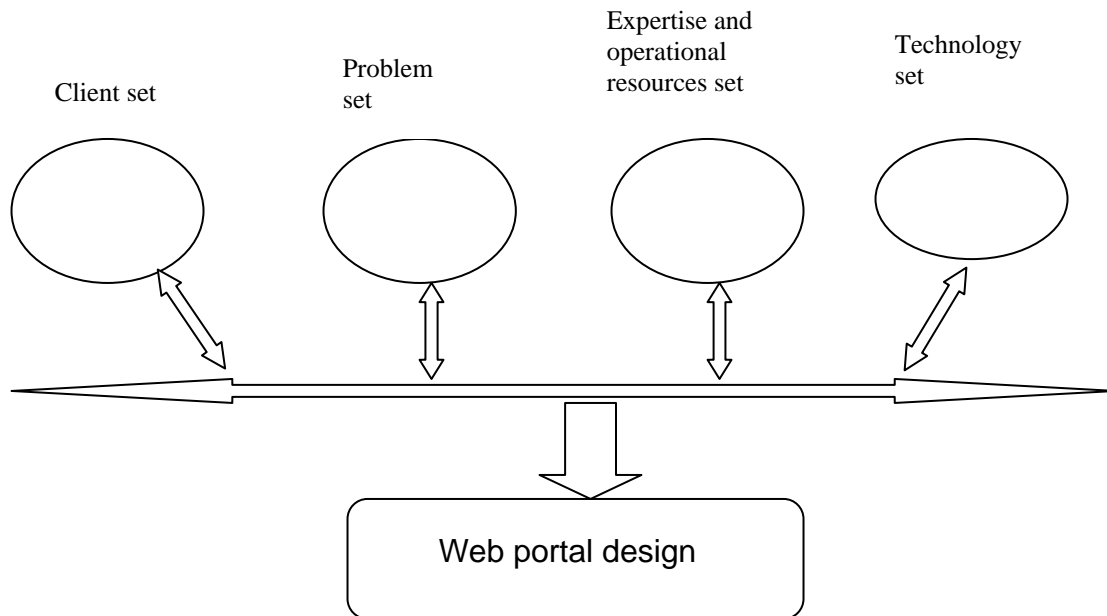
Human Services Web portals, as we have presented them, provide one example where expertise is a critical part of service delivery. Human services clients often need their complex problems diagnosed and solved by experts before appropriate and best services can be identified and delivered. There are many other domains which require expertise and can benefit from Web portal designs such as we have presented. One example is specialty health and medical services for geographically remote areas. A network of specialists can be built with Web portal access, content management, and mediation. Another example is the Government Accounting Office (GAO) which establishes best management practices for technologies. The community of experts and resources that they can provide to build best practices can be delivered through a Web portal of the kind that we have discussed.

A Web portal, by definition, provides one-stop access to information and services for a target set of clients. A human services-like Web portal furthermore establishes a set of experts that are integrated seamlessly in the portal for education and problem-solving purposes. Recruitment of experts and legitimizing expertise provided can both be aided by a showcasing “meet the experts” component. Content management approaches can keep a community of experts actively engaged in a Web portal over time, updating existing content, adding content and opportunities as they arise. Expert-built Web guides, as we have identified, place expertise and linked service providers in a easy-to-use hypertext format that can solve a majority of problems. Direct access to scarce expert time can be mediated through information technology and brokered through a central dispatcher (human or electronic agent-based). It is likely very efficient for clients and experts on retainer to have asynchronous interactions in the “ask an expert” component. Results of individual expert and client sessions can be captured and mined for problem-solving FAQs. An ideal is to automate some services that experts can provide using electronic agents, especially in determining eligibility and carrying out registration for services. Needed are standardization and systems such as used for Electronic Data Interchange.

There are five major building blocks in our portal design framework – a client set, a client problem set, a set of expertise and other operational resources, and a technology set (see Figure 3). The nature of these building

blocks and the way in which they interact with each other, impact the web portal design requirements. Members of the client set are the entities that benefit from the portal. The problem set specifies the problems that must be addressed by the portal design together with the accompanying policy, social, and economic constraints. The expertise and operational resource set consists of human experts and non technology resources such as service providing agencies. The technology set includes software and hardware components. When client and problem sets are complex, so that expertise must be included, as in Figure 1, then the technology set has new and critical roles in providing solutions.

Figure 3: Web portal design framework



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