Chapter XIII

Service-Research Partnerships: Research Projects that Help Bridge the Digital Divide

Jonathan Lazar
Towson University, USA

Anthony F. Norcio
University of Maryland Baltimore County, USA

The concept of service-research is described in this chapter. Service-research is the integration of community service with faculty research. It can benefit the researcher as well as community agencies. For organizations, such as non-profit agencies and schools, service-research can help provide free training, documentation, and help with systems development or management. For the researcher, service-research can provide inexpensive access to research subjects or data. This chapter discusses the data collection techniques that can be used with service-research, and how service-research can help bridge the digital divide, as well as the usability divide. Possible applications of service-research are presented, including user training, documentation, information systems management, systems design methodologies, and policy awareness. Two case studies of service-research are also discussed.

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INTRODUCTION

Teaching, research, and service— it is the trilogy of academic life. The service part of the trilogy usually refers to service to the academic community. One type of service in which faculty engage is service to the university, through curriculum committees, promotion and tenure committees, academic advising, faculty advisor of clubs, and similar responsibilities. Another type of service is to the respective research communities, through serving on conference planning committees, professional association leadership positions, reviewing papers, and journal editorships. One type of service that is less frequent is service to the local community. Faculty are often overwhelmed with their other responsibilities, and service to the local community may not be given a high priority by the university. Although faculty may have the desire to serve the community, it may be difficult to find the time.

If community service can be successfully integrated with faculty research, this combination can offer numerous advantages. This chapter discusses the concept of service-research, where community service and academic research are successfully integrated. In service-research, the process of academic research is structured in a way that it can make an immediate impact on the community. Although all research should eventually have a positive impact on the community through its findings, in service-research, the process of performing academic research provides an immediate, useful service to the local community. In this chapter, the theoretical foundations of service-research are presented. The problem of the digital divide is discussed as it relates to service-research, and appropriate areas for applying service-research are conceptualized. In addition, two case studies of service-research are presented. The goal is that this chapter will provide the background needed, to enable researchers to apply the concept of service-research to their own research initiatives, to help their communities.

GENERAL RESEARCH ISSUES

The goal of research, in general, is to increase knowledge. It is hoped that the research can also improve the human condition. The goal of research in information systems or human-computer interaction is to improve the human experience by increasing the understanding, use, management, functionality, and usability of information technology. In this modern and rapidly changing technological society, the effective use of technology directly impacts on the community’s ability to function well. Consequently, service-research partnerships provide enormous symbiotic opportunities for both the researchers and
the particular community. The data that are collected and analyzed during these studies become much more than just a set of numbers. These data become information that can be transformed into knowledge. At the same time, there is a secondary, more immediate benefit to the community. Community-based agencies can receive immediate services related to technology, as a part of the research process. The process and procedures for this relationship will be discussed later in the chapter. Through service-research partnerships, both the researcher and the community benefit.

Data Collection and Research Methods

The foundation of academic research is data collection. There are several data collection techniques that are commonly used for research on information systems and human-computer interaction (Preece et. al., 1994). While a detailed discussion of the different research methods is beyond the scope of this chapter, a short overview of each method might be useful. These different research traditions can all be applied when forming service-research partnerships.

- **Controlled Experiments.** With this technique, formal and rigorous experiments are designed and conducted, by developing specific research hypotheses. Subjects are appropriately selected and placed into groups where they may receive different treatments. Quantitative and qualitative data are collected, which may relate to the subjects’ performance, satisfaction and perception under these different controlled conditions.

- **Questionnaires.** Questionnaires (also called surveys) are a set of prepared, detailed questions that relate to the overall research questions. Subjects in the study are asked simply to complete the questionnaire form. There are many different types of questions, including open-ended questions, closed-ended questions, and Likert scales (Oppenheim, 1992). Furthermore, surveys can be distributed via paper, e-mail, or web pages.

- **Data Logging.** In data logging (also called interaction logging), the computer is programmed to record the different tasks and actions performed by the user, as well as the computer system responses. The data collected over time (and over different users) is then analyzed to look for patterns.

- **Focus Groups and Interviews.** In focus groups and interviews, a researcher (or researchers) asks questions of the participants. Interviews usually involve only one participant, whereas focus groups generally include more participants (Krueger, 1994). Focus groups and interviews tend to be less structured than questionnaires, allowing for more flexibility in data collection. For instance, when the subject makes an interesting
comment, the researcher can follow up on it.

- **Case Studies.** A case study is a detailed documentation of a specific organization, systems development project, partnership, or other situation or process. Case studies are valuable because they can present theoretical concepts through a real-world setting, allowing readers to see how theories can be implemented, as well as what challenges exist.

- **Observational Studies.** With this technique, unobtrusive observations are made in the natural settings of the subjects (Marshall and Rossman, 1995). This approach allows for a more realistic examination of the environment in which subjects use technology. However, with this approach, great care must be taken so that the observations do not change the environment, or the behavior or actions of the subjects.

**Subjects**

Whichever data collection technique is employed in the research, subjects are needed to participate in the study. Although theoretical frameworks are useful, much of the knowledge required to advance the fields of information systems and human-computer interaction must be based on data collection. In order to ensure that the results are statistically valid, large numbers of subjects should take part in research. No generalizations can be made about interface design with, for example, two subjects. However, if a strong pattern is observed in over 100 subjects, this is stronger evidence. The size of the subject population is a very important consideration in the validity of the research, especially if there are many different research treatments.

Acquiring access to subjects can be a challenge. And great care must be taken in choosing subjects so that the subjects accurately represent the user population of interest. For instance, it would be inappropriate to use high school students to represent the decision-making behaviors of business managers. It would also be inappropriate to use stockbrokers to represent users of hospital or airline information technology. If a representative population of subjects is not used, then results cannot be generalized to the user population. Furthermore, in many cases, subjects expect to be paid for their time, so the financial costs of performing research can increase. So, at the same time that there is a need for large numbers of subjects, there might be financial considerations that limit the number of subjects that can take part in the research. Service-research partnerships can help ameliorate the cost, because the subjects themselves are receiving a useful service, therefore, it is likely that it is not necessary to provide financial compensation, as the subjects are already receiving a non-financial compensation (the useful services). Both the researchers and the subjects benefit from the experience.
As in any type of research, with service-research partnerships, the rights of human subjects must be carefully protected. For most data collection efforts, subjects have a number of rights. The subjects have the right to know the purpose of the research, the right to know what will be asked of the subjects, the right to have all of their questions answered, and the right to leave the experiment at any time without any penalty. In addition, the data collected should not be identified by the name of the subject. Usually, before any data collection begins, the subjects must fill out a "Human Subjects Form" or a similar instrument, informing them of their rights, notifying them that the research has been approved by some oversight body (usually an institutional review board), and offering the subjects the option to leave at any time. While this might not be necessary for all information systems research, and in fact, information systems research tends not to be harmful in any way, shape, or form to humans, these are important considerations, which are just as relevant in service-research partnerships.

THE DIGITAL DIVIDE

There has been much talk recently about the "digital divide." The digital divide is a growing gap between those who have access to information technology and communication networks, and those who do not have access (U.S. Department of Commerce, 1999). In an information economy, there are many ramifications to not having access to computer networks such as the Internet. Not only do many jobs require familiarity and comfort with using computer technology, but job and resume postings are now largely Internet-based. Educational materials and news are also provided via computer networks, causing a disadvantage for someone who does not have access to those resources.

A number of different approaches have been developed for bridging the digital divide. For instance, community technology access centers provide access to technology in economically disadvantaged areas. Some schools provide access to their computer labs during the evening hours for local residents. Public libraries provide access to the Internet as part of their mission to provide knowledge to the entire community. Some community-based groups collect, refurbish, and donate computers to non-profit organizations. Other groups create volunteer efforts to assist in wiring schools and other community buildings. Many non-profit organizations in the community are connecting to the Internet but are barely able to afford the hardware, software, and Internet service provider costs. But having access to information technology is not equivalent to being able to use the technology effectively. There are a number
of additional factors that help determine successful use of technology. To ensure effective use of technology, there should be adequate user training. Understandable documentation is also necessary. Proper maintenance and management of the technology is necessary. Appropriate use policies and guidelines must be set up. Although university professors could help community groups in writing grants to purchase technology, academic research usually cannot help with the costs of acquiring computer hardware, software, networking equipment, and Internet service. However, academic research can be structured to assist with other technology expenses, such as user training, documentation, and management.

THE USABILITY DIVIDE

Along with the problems of access to information technology, there is a corresponding problem in ease of use for information technology. This could be called the “usability divide.” Many information systems and software applications are not easy to use. Software applications continue to become more complex, offering many more features than the users could ever need, and using terminology that the users cannot understand. User interfaces, while improving, are still a major headache for many users. Two important trends are the related areas of universal design and universal usability. Universal design is the process of designing products and infrastructures that can be used by the largest number of people. Universal usability is the process of designing information systems that are easy to use for a large number of people (Shneiderman, 2000). Universal usability means designing informational systems that are easy to use for diverse user populations (different levels of computer experience, different educational levels, different age levels, different disabilities, etc.) and under diverse technological settings (different platforms, different monitor sizes, different connection speeds, different physical locations, etc.) (Shneiderman, 2000). The concept of universal usability relates closely to the problem of the digital divide. If access to technology is provided for larger numbers of users, and if more and more people are being encouraged and required to use information technology, this information technology must be easy to use. How will a new user feel when they receive an error message such as: “A fatal exception OE has occurred at 017F: BFFAADOB. The current application will be terminated.”

As more users with little computer experience begin to use information technology, the usability of the information technology becomes even more important to ensure successful use of the technology. If the digital divide can be bridged, that means that more users from diverse populations will have access
to technology, but will they want to and be able to effectively use the technology once they have access? More research needs to be performed related to the usability of software applications, web sites, and information appliances. Service-research is a golden opportunity to help bridge the usability divide. As research is performed, the research has an immediate impact on the community, and helps to bridge the digital divide. The research may involve novice users (or other user populations), and will then help to bridge the usability divide by creating informational systems that are easier to use in the future. The research then has a double impact on the community.

THE BENEFITS OF SERVICE-RESEARCH

Universities are incredible collections of resources. The vast knowledge and experience of faculty, staff, students, and alumni are valuable resources. Universities also have capital resources such as buildings, classrooms, and computer equipment. When possible, these resources can be used, and should be used, to help the community. In the last decade, there has been an increasing focus on getting students and faculty involved with community service. For instance, during winter and spring break periods, some students and faculty work on building homes for those who are economically disadvantaged, through programs such as Habitat for Humanity. Students take part in weekly tutoring programs for children in the local neighborhood. Students are increasingly taking part in structured community service as a part of their course work (see Chapters 1-4 in this book). Faculty may run programs to assist local schools in network wiring, or in acquiring computer software and hardware. Service-research is an extension of this service trend, to meet the current needs of the community, relating to technology.

There are real needs in the community. Acquiring information technology is expensive, and managing that technology can also be expensive. If universities can help meet some of the community’s needs through research projects, this is an excellent benefit to the community. The community not only benefits from the expertise and/or services provided by the university, but the community ultimately benefits from the research, which is used to improve the experience of using information technology. And when a local community is stronger and more productive, that can only strengthen the university that resides in the community. A service-research partnership creates a synergy, which is mutually beneficial and may even provide some unexpected benefits. Faculty and staff of the university, when involved in the local community, can help offset some of the traditional “town and gown” tensions. Those living in the local community may have a more positive view of the university. The possibilities are endless.
POSSIBLE AREAS OF SERVICE-RESEARCH PARTNERSHIPS

There are many ways in which local communities can be involved with, and benefit from, academic research. The next section lists some possible application areas of service-research. These are by no means the only areas in which service-research is applicable. Researchers are encouraged to apply the concepts of service-research in creative and innovative ways.

- **User Training.** Although user training is an important aspect for the effective use of information systems, training is frequently omitted due to the lack of budgetary funds. Service-research can help fill the training gap. There are a myriad set of options to consider when planning and organizing technology training sessions. For instance, training sessions can have different physical settings (e.g., room layouts, air temperature, lighting, furniture), different presentational methods (e.g., procedural training versus exploratory training), or different combinations of instructors. Research should help to determine which approaches to training are most effective for specific training needs (different types of users, different types of software applications, etc.). The research area of training is a good match for service-research. Community members can agree to take part in a research experiment as subjects, and data is collected on the effectiveness (or some other aspect) of the training. At the same time, those community members receive training in software applications, usually free of charge (Lazar and Norcio, 2000). The training helps users to more effectively use specific software applications, or information systems as a whole. Both researchers and trainees benefit from the partnership.

- **Usability.** An important concern in the design of informational systems is the usability, or ease of use. Usability research with large numbers of people differs from usability testing on products. Usability research usually focuses on some inherent aspect of interfaces, and which presentation methods or input/output methods are most effective. Usability testing usually focuses on a smaller number of users, with the goal of finding and uncovering usability problems in a specific system. Many experiments are performed in the area of usability research. In return for taking part in an experiment on usability, there could be many possible benefits or services provided to the community. For instance, if the research is on how novice users interact with an interface, then it might be
appropriate to provide introductory training beforehand on using a system (which would be useful for novice users). This would be similar to the training through service-research described above. The difference is that with usability research, the multiple experimental conditions would not be focused on different training methods, but rather, all subjects would receive similar training, but receive different experimental interface treatments, and then data collection could relate to those different interfaces.

- **User Behavior.** Closely related to the area of usability is user behavior. What tasks do users perform most often? Which specific approaches do users take when performing a task? How do users perceive the technology, and do users feel satisfied? Which tasks are most frustrating? These are important research questions, and it is therefore necessary to study users and collect data. Data can be collected through session logging, and users can also fill out surveys. In return for allowing their computer actions to be logged, subjects can receive some sort of benefit. For instance, after researchers determine which tasks are most frustrating, the user might then receive suggestions or extra training on how better to respond to those tasks. Also, many organizations have “help desks” set up to respond to user questions and complaints. Help desks are perfect places to study user behavior as well as user perceptions of technology. In return, researchers could provide suggestions on how to improve the system, training, or documentation, so as to lessen the number of calls to the help desk. The researcher learns more about user behavior, while the user and/or community organization receives help in improving the experience with technology.

- **User Documentation.** Research in human-computer interaction may focus on different ways of presenting user documentation. For instance, user documentation can be a complete how-to guide for performing all tasks, or the documentation could present minimalist approaches, where only the simple, easy-to-understand steps are presented (Carroll, 1990). Researchers can learn more about the effectiveness of different approaches to user documentation by helping non-profit organizations develop appropriate user documentation. Data can then be collected on the effectiveness of these different approaches to user documentation. And if user training does not take place, the importance of good documentation increases.

- **The Effects of Computer Usage on Education.** A number of communities, schools, as well as the homes of teachers and students, have been provided with computers and Internet access, through the financial generosity of corporations or funding agencies. Researchers can study the
impacts of the technology on learning, and on the educational process and school management. The goal of the research is to learn more about the effects of technology, but the community immediately benefits, as they receive free computer equipment, software, and Internet service. This type of service-research occurs less frequently, because of the large amount of funding needed to begin such research.

- **Information Systems Management.** Whole books have been written about the topic of managing information technology, dealing with topics as diverse as project management, systems migration, acceptable use policies, and outsourcing (Martin et al., 1994). Community organizations often are in need of assistance with managing their information technology, and it would be helpful if researchers could assist community organizations with suggestions for managing their technology. At the same time, researchers can gain access to the community organizations to learn more about the problems and challenges of managing information technology in non-profit organizations. Case studies and examples of best practices can then be developed, which will possibly be able to help other organizations with effectively managing their information technology resources.

- **Policy Awareness.** For decision-makers, it is frequently important to determine current levels of compliance with certain national or international policies. For instance, the U.S. Government now requires that technology purchased by the federal government, as well as Federal web sites, be accessible for users with disabilities (Lazar, Kumin, and Wolsey, 2001). Similar requirements exist for web sites in Australia (Astbrink, 2001). Research could be undertaken to determine the current levels of accessibility, for technology both inside and outside of the government. At the same time, when organizations are asked to take part in the study, the researchers could use this opportunity to inform and educate respondents about the need for accessibility of information technology. Accessibility is not limited to government web sites; other research studies have looked at accessibility levels of popular e-commerce web sites (Sullivan and Matson, 2000). This would provide a public service, as it would help educate the community and community organizations to the needs of users with disabilities.

- **Design Processes.** Over time, the design processes for information systems have changed. New development lifecycles have been created that focus more on user involvement. For instance, participatory design, where users become a part of the design team, has been successfully used with educators (see the chapter by Carroll et al. in this book), senior citizens (Ellis and Kurniawan, 2000), and children (Druin, 1999).
information systems development projects never get fully implemented, because users were not sufficiently involved in the development (Hoffer, George, and Valacich, 1999). Researchers can assist community groups with their information systems development, by helping to determine what functionality and usability needs exist, offering suggestions on appropriate ways to integrate users into the development, and pointing out possible problems. At the same time, the researchers can learn more about the effectiveness of or problems in currently existing development models, or entirely new development models can be created and tested. Just as new systems development models have been created for websites (Lazar, 2001) and other distributed populations (Lazar, Hanst, Buckwalter, and Preece, 2000), appropriate development models will need to be created for handheld and wireless devices. This is a promising area for service-research.

CASE STUDIES

The following are examples of experimental research using the service-research paradigm. The next section describes a service-research project that was successfully completed, and a service-research project that is currently in progress.

Archdiocese of Baltimore

In 1998, the Archdiocese of Baltimore connected all of their parishes, schools, and offices to the Internet. With this large technology expense, the Archdiocese was not able to afford Internet training for their staff members. As part of a research experiment on different training methods for web browsing, free training was offered to employees of the Archdiocese of Baltimore (Lazar and Norcio, 2000). The information technology office at the Archdiocese advertised the experiment to employees, and the researchers coordinated registration. At the end of the research experiment, more than 250 people had taken part in the experiment, and therefore, had received Internet training at no cost. The researchers gained access to a large subject pool of novice users, and were able to learn more about how different training methods for web browsing affected performance and satisfaction (Lazar and Norcio, 2000).

Howard County Office on Aging

We have currently formed a service-research partnership with the Howard County Office on Aging. This is an office that serves the needs of senior citizens in Howard County, Maryland, which is located between Baltimore and
Washington, DC. Staff members in the office are interested in receiving training on the effective use of Web browsers, however, training funds are not available in the office budget. The current plan is to provide training, and in return, the staff members will take part in a research experiment. The purpose of the research experiment is to learn about novice user perceptions of error on the web. The planned methodology for the experiment is available in Lazar and Norcio (2001).

SUMMARY

Scholarly research in information systems has a positive impact on the community; however, the impact might sometimes be realized long after the completion of the research. There are many technology needs in the community that go unfulfilled due to lack of funds. Through a concept called service-research, some research experiments can be structured so that they provide an immediate benefit to the community. By forming a service-research partnership, researchers can get access to large numbers of subjects, while at the same time helping the local community to meet their technology needs. Service-research can be applied in many different research areas, such as training, documentation, usability, management, and policy.

REFERENCES


