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# Undergraduate Programs in Information Science: A Survey of Requirements and Goals

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# Undergraduate Programs in Information Science: A Survey of Requirements and Goals

Colin Koteles and Caroline Haythornthwaite

Numerous new undergraduate programs have appeared in the past few years that focus on theories and practices of information science and information technology. As the global reliance on networked, digital information continues to grow, we can expect such programs to be enduring and common features of college and university undergraduate curricula. As educators and administrators consider establishing their own information studies (IS) programs, many are asking what is an IS program, and how do you create one? We surveyed online information related to existing undergraduate IS programs in the United States and Canada. Using quantitative and qualitative data about these programs, we identify in this paper common characteristics that point to a unified identity for this emerging curriculum. At the same time, we find programs shape their own identity, creating their own niches within the programs as a whole. These findings help provide an objective starting point when attempting to define and create an undergraduate program.

## Introduction

Over the past few years, undergraduate programs that teach the theories and practices of information science and information technology have been established at universities and colleges throughout the United States and Canada. These majors and minors, variously titled "Information Science," "Information Studies," "Information Technology Studies," "Internet Studies," and "Informatics," have been created at almost half of the Association for Library and Information Science Education (ALISE)-affiliated institutions and at many non-ALISE-affiliated universities. As the global reliance on networked, digital information continues to grow, these programs will logically become common features of college and university undergraduate curricula. These nascent programs are grappling

with what it means to teach information science, as we refer to it here, and to come to terms with bringing this knowledge to undergraduates. As universities and colleges begin to pursue the development of IS programs, educators and administrators are trying to determine just exactly what *is* an IS program and how to establish an IS program.

As program coordinator and advisor for one of these programs (the Information Technology Studies program at the Graduate School of Library and Information Science, University of Illinois), we have been actively involved as participants in this endeavor. We spend time defining requirements for the program, explaining to faculty and students what our IS program is about, and determining course offerings. It is important in defining and planning to also understand how other schools are approaching this subject and these tasks. Thus, we set out to examine what is offered by other ALISE- and non-ALISE-affiliated schools and what their approaches are for undergraduate IS

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programs, as well as finding out what is happening in the "Internet Studies" program that are gaining media attention.

Using online data, we gathered and classified data on 21 ALISE-affiliated programs, and 11 non-ALISE-affiliated programs, making our summaries of these programs available online (see <http://www.lis.uiuc.edu/gslis/programs/itsminor/its-research.html>). In this paper we examine existing IS undergraduate major and minor degree programs to examine the scope and requirements of the programs, as well as to understand the overall character and direction of these programs, and similarities and differences across curricula. We believe this data is useful for others with similar programs and for those starting such programs. We conclude with some observations for defining such programs.

#### Data Collection

The first task in collecting data on IS programs was to identify existing programs in the United States and Canada. This was a difficult task because many of these programs are new and there is no consistent title for the

programs. Therefore, we could not use a standardized set of terms for online searching. We also could not look at an existing database of undergraduate IS programs since none existed. However, we were able to consult the list of ALISE-affiliated schools and links to these schools' home pages compiled on the ALISE web site (<http://www.alise.org/nondiscuss/schools.html>). A school-by-school examination of this list led to the identification of all ALISE-affiliated undergraduate IS programs. Although many of the 56 schools on this list only offered graduate programs, at the time of writing, we have located *21 IS programs at ALISE-affiliated schools*: 16 undergraduate majors, 3 undergraduate minors, and 2 certificate programs.<sup>1</sup>

A more difficult task was to identify programs at non-ALISE-affiliated schools. To identify these schools, we used search engines such as Google and the experimental VisIT search engine (<http://www.visit.uiuc.edu/>) using keywords from the names of the identified ALISE-affiliated programs, e.g.: "information science," "information studies," "informatics," "information technology studies," and "information systems," as well as "internet studies." Searches were

**Table 1**  
Number of Schools in Study

	Majors:	Minors:	Other:	Total:
ALISE:	16	3	2	21
NON-ALISE:	6	2	3	11
Combined:	22	5	5	32

- 4 schools that offer majors also offer minors

- the "Other" category includes programs that offer certificates and cognate certificates

also limited to the ".edu" domain to eliminate commercial technology schools even though this limited us to U.S. institutions. The Association of Internet Researchers listserv (an international list, see [www.aoir.org](http://www.aoir.org)), personal contacts, and national media were also useful for identifying Internet studies programs. Through this process we identified 11 IS programs at non-ALISE-affiliated institutions: 6 undergraduate majors, 2 undergraduate minors, and 3 certificate programs.

This non-ALISE set is smaller and more diverse than the set of ALISE-affiliated programs. For example, the University of Denver program has a focus on the design of digital media; the Brigham Young program is closer to a traditional engineering program; and the Brandeis University program is a more socially-oriented Internet studies program. Although we believe we did not identify every non-ALISE IS program, and the definition of "IS program" we used for these schools was broadened to include programs that would not be considered traditional IS programs, we believe this set is still useful for comparison with what is happening in ALISE schools.

Once identified and located, the online information available about each program was compiled and studied. Because these programs generally provide a great deal of online information about themselves, there was a substantial amount of data with which to develop quantitative and qualitative conclusions about each program and the programs as a whole.

Descriptive data were collected on the department that offers the program, the title of the program, and the type of undergraduate degree or certificate that completion of the program entitles. To build a quantitative analysis of these curricula, we attempted to locate within each program's website numbers and statistics relating to twelve specific categories:

- Total number of IS hours required to complete the degree or certificate
- Total number of required hours within the total hours
- Total number of elective hours within the total hours
- Whether the program had a required overview course
- Whether the program had a required capstone course
- Total number of courses available within the program
- Number of courses available each semester
- Whether internships were available, and if available, whether they were required
- Year and term of the program's inception
- Stated enrollment
- Non-IS interdisciplinary courses included within the program

These numbers were most useful for determining concrete criteria regarding the level of implementation required to establish an undergraduate IS major or minor.

Programs also generally publish detailed and informative mission statements, media releases, or other forms of rhetoric on their websites that we used to develop qualitative conclusions related to the programs. These statements outline the purpose of the program, the intended outcomes for graduates of the program, and what particular niche they expect their graduates to fill in organizations and society. For this reason, they were useful for assessing the overall goals and nature of each program.

The data we gathered from each program's website can be found on the website located at: <http://www.lis.uiuc.edu/gslis/programs/itsminor/its-research.html>. For each program, an entry was created that includes a table containing quantitative data, followed by any rhetoric published by the program that could offer subjective, qualitative insight. Any additional notes or useful links pertinent to the program were also added, as well as comments on aspects of the program revealed by looking in more detail at the course offerings and web pages of each program. Links to each program's home page are also included for each entry. The site is roughly divided into ALISE-affiliated programs and non-ALISE programs. Brief information regarding four university centers

or Internet studies is also included at the end of the site.

First, we discuss the descriptive statistics about the programs, and then proceed to examine the mission statements.

### Descriptive Statistics about the Programs

#### Average Total Number of Hours:

Interestingly, most of the data collected point to a relatively uniform set of requirements necessary to establish an IS program, whether it be a major or a minor. The average total number of required IS hours needed to complete an *undergraduate major at ALISE schools* is 40 hours. The total number of required IS hours of 8 of the 15 majors are within five hours of this average (see table 2). Therefore, the average of 40 would seem to be a somewhat accurate gauge of the amount of work that programs require of students. The minimum required number is 24 at the University of North Texas and the maximum is 68 at the University of Washington. The three ALISE-affiliated *undergraduate minors* average 18 total required IS hours. Each minor was within three hours of the average, which showed again that this average would be a useful number for evaluating or creating an IS minor.

The *non-ALISE programs* generally require more hours than their ALISE counterparts. The average number of required hours of IS or IS-approved course work is 47 for majors and 19 for minors (see table 2). However, in the case of major programs, only two of the six programs are within five hours of the average.

#### Required and Elective Hours

There was more diversity among the programs in how many of the total number of IS hours are required IS requirements and how many are electives. For ALISE majors, the average number of hours completed in requirements is 28 and the average number of additional elective hours is 13.5. However, only six of the programs were within five hours of the average, making it hard to make broad statements about how many of the total required hours should be set for students and how many are chosen by students. Of the total IS hours required by the minors, an average of 10.5 were required and 7.5 were electives. As this was a much smaller set, all of the minors were within two of the overall average of specifically required coursework (see table 2).

The averages for non-ALISE-affiliated schools are 23.5 hours for required courses and 17.5 hours for elective courses among

**Table 2**  
Average Hours Required

	ALISE Schools:		Non-ALISE Schools	
	Majors:	Minors:	Majors:	Minors:
Required IS Hours:	28	7.5	23.5	9
Elective IS Hours:	13.5	10.5	17.5	10
<b>Total Required IS Hours:</b>	<b>40</b>	<b>18</b>	<b>47</b>	<b>19</b>

- 3 hours represents 1 class

- all numbers rounded to the nearest 0.5

- 2 of the ALISE major programs that report total number of hours required do not provide information regarding how many of the total are specifically required and how many are elective—therefore, their numbers are reflected in "Total Required IS Hours," but not in "Required" or "Elective" IS hours

majors; with 9 required and 10 elective hours for minors (see table 2). However, there was a great deal of variability among hours required by these programs.

#### Total Number of Courses Offered Overall, and Per Semester

Other important criteria when establishing or evaluating an IS program is how many total courses to offer by the program and how many courses need to be available each semester. Among ALISE-affiliated major programs, 27 courses are offered on average by each program, ranging from 16 to two programs that offer 50 courses in total (see table 3). Although there is variation between the programs in the total of courses they offer, the distribution is concentrated in the 20-30 range. Therefore, the average of 27 courses appears to be a good target for establishing a major program.

The average number of courses offered per semester is 14, ranging from 5 to 25 per semester across programs. Again, programs vary widely in the number offered, and the number offered per semester may be dictated by the size of the program.

ALISE minors offer an average of 14 total courses, with a range from 9 to 20. Only one program had available information on the number of courses per semester and that is seven.

Non-ALISE majors generally had more total courses available (32.5) and fewer

available per semester (9) than the ALISE programs, while Non-ALISE minors had fewer total courses available (10) (see table 3).

#### Interdisciplinary Courses

Given the importance of interdisciplinarity in LIS and in IS, as well as many new endeavors that combine with computer technology, we considered the amount and types of interdisciplinary courses that are included in these programs. Interdisciplinary courses are those that are taught by faculty from other colleges or departments within the program's university or college. These courses are not IS or library and information science (LIS) courses, yet they are still officially part of the program and can be specifically required or elective options. The interdisciplinary courses that are an integral part of various IS programs can give a great deal of insight to the goals and nature of these programs.

Among the ALISE programs (majors and minors), the most frequently integrated cross-disciplinary courses are in computer science (8 of the 21 programs), psychology (8 programs), communications, (7), business administration (7), and art and design (5) (see table 6). These interdisciplinary courses illustrate the multidimensional character of IS and IS education. Because IS now lives almost entirely in the digital realm, IS programs can integrate computer science courses to teach

**Table 3**  
Average Number of Courses Available:

	ALISE Programs		Non-ALISE Programs	
	Majors:	Minors:	Majors:	Minors:
Total Classes Offered:	27	14	32.5	10
Classes Offered Per Semester:	14	7	9	N/A

- numbers rounded to the nearest 0.5  
- numbers based only on schools that provided this information online

students to effectively use computers, their applications, and networking hardware to use, build, and evaluate information systems. Psychology courses educate students in the cognitive processes humans use to seek, evaluate, and create information, as well as principles of human-computer interaction for systems and Internet site design. Furthermore, much of IS relies on communicating between information users, information creators, and user communities making communications course work highly relevant. The same can be said for business administration courses; understanding the theories and practices of business organizations prepares IS students to deal with some of the largest creators and consumers of electronic information, and educates them about their future workplaces. Finally, as electronic information depends more and more on multi-media presentations of information, understanding and mastering design principles enhance an IS student's ability to create and evaluate electronic information.

The use of this multi-disciplinary approach is a unique and exciting aspect of

the IS programs in this study. IS can fill an empty niche between the social sciences and computer science. It is becoming apparent that knowledge of only computer science without a foundation of knowledge of how humans actually seek out and use information, or vice-versa, is limiting. A limitation specifically recognized by IS program designers (see below in the evaluation of the mission statements). IS programs can use this interdisciplinary approach to create a revolutionary discipline that produces graduates who understand not only technology, but also the people who use technology.

#### Internships

The importance of real-world application of skills taught by these programs is also reflected in the number of programs offering and requiring internships. Of the ALISE-affiliated programs, twelve of the major programs offer internship opportunities and five require them (see table 4). Among the non-ALISE major programs, four offer internships with three requiring them (see table 4). Within the minors, only one program offers

**Table 4**  
Number of Programs Offering and Requiring Internships:

	ALISE Programs		Non-ALISE Programs	
	Majors:	Minors:	Majors:	Minors:
Programs Offering Internships:	12	1	4	2
Programs Requiring Internships:	5	0	3	1

**Table 5**  
Number of Programs Requiring Overview and Capstone Courses:

	ALISE Programs		Non-ALISE Programs	
	Majors:	Minors:	Majors:	Minors:
Programs Requiring Overview:	13	2	6	2
Programs Requiring Capstone:	5	2	4	1

**Table 6**  
Interdisciplinary Courses Included Within Programs:

ALISE Programs	N	Non-ALISE Programs	N
Computer Science, Psychology Communications, Business Administration	8		
Art/Design	7	Computer Science	5
Linguistics	5	Economics	4
Philosophy, Mathematics	4	Art/Design, English	3
Biology, Chemistry, Economics, English, Journalism, MIS, Sociology, Statistics	3	Psychology, Sociology, Statistics	2
Advertising, Anthropology, Archiving, Education, Geography, Music, Political Science, Religious Studies, Writing	2	Agricultural Resources, Anthropology, Architecture, Biology, Business	
	1	Administration, Communications, Geography, History, Law, MIS, Music, Philosophy, Writing	1

- some programs approve interdisciplinary courses on a case-by-case basis  
 - some IS courses reflect interdisciplinary theories and applications  
 - LIS, Library Science, Information Systems, etc., are not considered interdisciplinary

internships, and two of the non-ALISE minors offer internships (one requires it). Because IS is a conglomeration of numerous constantly evolving specialties, actually completing an internship may be the best way to teach this specialized knowledge. Drexel University "emphasizes career management through experiential learning as an integral part of the education process." Emphasizing internships is another way that IS programs can prepare students to be leaders in the world of networked electronic information.

#### Year of Inception

Many of these programs, while unified in many ways, are still in an early stage of development and may further develop along divergent paths. The majority of these programs were founded in 1998 or later (exceptions are the University of Pittsburgh program founded in 1979, and the Drexel University program founded in 1994, although revised in 2000). Thus, in general, these curricula are still in their infancy, even when compared to newer

disciplines such as computer science. At this point, there is not even a standard title for these programs. Within the 21 ALISE programs, there are 15 different program names (see table 7). The most common is "information studies," yet this is only common across three schools.<sup>2</sup> Ten of the 11 non-ALISE programs have different titles (two share "information technology studies"). This diversity may be a reflection of the nascent nature of these programs, or it may be a result of each school attempting to develop its own exclusive approach toward education in this multi-faceted field, adjusting to external demands for content and name. Each program could also be attempting to be a trendsetter in this new field in the hopes that other programs will follow their lead in the naming and design of future programs.

#### Summary

These numbers show interesting aspects of the state of undergraduate IS programs. In many ways they show uniformity in that there is some consistency in the number of

**Table 7**  
Program Titles

ALISE Programs:	N	Non-ALISE Programs	N
Information Studies	3	Information Technology Studies	2
Information Science	2	Internet Studies	1
Information Systems	2	Information Technology	1
Informatics	2	Information Sciences and Technology	1
Library and Information Science	2	Electronics and Information Technology	1
Information Resource Studies	1	Computer-Mediated Communications	1
Information Technology Studies	1	Digital Media Studies	1
Information Transfer	1	Integrated Science and Technology	1
Information Management and Technology	1	Science, Technology and Society	1
Information Architecture and Knowledge Management	1	Communications with concentration in Web Design and Analysis	1
Information Resources	1		
Digital Information Management	1		
Information Technology and Informatics	1		
Media, Information and Technoculture	1		
Untitled	1		

hours required for different degrees, the number of classes that are available, the types of interdisciplinary courses offered, and the importance of internships. However, we must remember that these are very young programs that do not even have a uniform identifier. Thus, there is still much room for refinement and evolution within existing programs and future programs to establish a firm identity for the programs as a whole. On the other hand, we may find that the changing environment fosters programs that never become homogenized and continue to develop along unique and divergent paths.

### Evaluating the Mission Statements

Turning now to the mission statements available for the programs, we can explore what the program implementers envisage for their programs. We find much in common across the programs, particularly across the ALISE-affiliated schools.

In reading through the mission statements, two aspects of the descriptions are most striking. First and foremost is a

breathlessness associated with a rush to deal with change brought on by new technologies. There is frequent reference to the newness associated with the programs and technologies, demands for the new information technology (IT) workforce, and changes to the way people think, work, learn, play, and live (Long Island University; Brandeis).<sup>3</sup> We are described as living in a "rapidly changing social, technological and organizational environment" (Syracuse), in which the "global information explosion" (Long Island) and "rapid and cheap communication" afforded by the Internet "has fostered a truly global economic system and transformed societies throughout the world" (Brandeis).

Following this breathlessness is a second, more sober and thoughtful response on how to prepare students to be part of the construction of the coming reality. Although few non-ALISE programs have been examined in detail, there appears to be a marked difference between how ALISE-affiliated programs stress preparation to be active participants in the IT workforce, whereas

non-ALISE-affiliated programs (in non-computer science (CS) or engineering disciplines) tend to stress analysis and understanding of the changes. ALISE schools are setting out to create the IT workforce rather than preparing observers of its impact. While some restrict their focus to information use and users, most also consider the design, implementation, management, and impact of IT.

#### **Growth and Change**

Newness, growth, and change are noted for the workplace, and the place of IT<sup>4</sup> in organizations. Newness stemming from "rapid evolution of the information society, facilitated by the emergence and explosion of digital information and electronic networks" (Kent State) and the "new knowledge economy" (Emporia State) drives growth in the "information industry" (State University of New York (SUNY)-Albany) and "information-related disciplines" (Kent State). This results in a growing demand for workers "skilled in the development of information systems and the management of information" (Drexel), in this "increasingly information-rich and information-based global society" (University of Oklahoma), and a growing demand for workers with the kind of education provided in these programs (Emporia).

The new demands require a new set of skills because of the "new sets of relationships" (University of Alabama) put in place by IT. "New roles in information-intensive organizations" (Kent State University) emerge, requiring a "new breed of information professional" (University of Wisconsin-Milwaukee) who "possesses considerable communication skills and must be able to learn new ideas quickly and adapt to ever-changing conditions" (University of Pittsburgh). A breathless field calls for a breathless information professional.

#### **Technical and Human**

The goals of these programs differ from what might be characterized as a CS or engineering approach in stressing the need "to integrate new technologies within the

workplace with an eye to social and human implications" (Indiana University), and to create and promote technologies that are "responsive to people's needs and values" (University of Washington), including both information systems and services (University of Alabama).

This emphasis on the technical combined with the human<sup>5</sup> is evident in almost all ALISE-affiliated programs, and is in keeping with the LIS emphasis on users and user information needs. Programs specifically mention combinations that go beyond strictly technical considerations, addressing "technical, psychological & social aspects of information technology" (Indiana); "computer technologies, human cognition, and scientific principles" (Pittsburgh); "the people, the information, and the information technology" (University of Washington); "humanistic, cognitive, and management aspects" (SUNY-Albany). They emphasize "facilitating the link between people, whether individuals or groups, and the information necessary to their success" (University of Oklahoma).

#### **Integration and Inter- or Multi-disciplinary Focus**

In keeping with inquiry into the combination of the technical and human, most programs stress the need for integration of knowledge from across multiple disciplines. There is a perceived need for a "broader focus than programs that emphasize computer programming and higher mathematics" (SUNY-Albany), and it is felt that the IS programs can provide this. Almost all minor programs refer to the way in which the program will complement the student's major, and some major programs include study in a "cognate area" that will complement what is learned in the major. A few programs (more often the non-ALISE based programs) also mention interdisciplinary faculty participation.

#### **Nimble and Flexible, but Rigorous**

In both the programs themselves, and the skills and knowledge that graduates are to possess, there is an effort to create a balance

between theoretical and practical knowledge, between preparation for change and learning of established practice. Kent State phrases this well in referring to their own program:

This degree program is designed to be nimble and flexible, but rigorous: nimble and flexible through the program's continually keeping abreast of current and emerging information skills, technologies and education, yet rigorous so that graduates are equipped to assume important positions in an organization.

So, too, Rutgers emphasizes combining "theories drawn from the humanities and social sciences with practical computer-based competencies."

Balance is essential in satisfying the need for programs that both go beyond the technical and yet are not satisfied at only being critical. IS programs strive to balance the technical and the social and to do so requires continuous adaptation, learning, and flexibility on the part of instructors and students.

#### Graduates

As noted above, graduates face a world of rapid change, and are expected to be able to continue learning and adapting in their future work roles. Thus, they also face a changing list of job titles and responsibilities. Perhaps this explains why programs are more likely to list sectors for jobs (or consider "universal" or "all" application areas to be relevant) than to list specific job titles. Some of the jobs and sectors that the ALISE-affiliated schools suggest as places we will find their graduates in the future include holding titles such as: knowledge manager; information specialist; knowledge navigator; systems analyst; system designer; database developer; database manager; interactive system designer; information retrieval specialist; customer service representative for database vendors; and information analyst for database publishers and other related fields. And they will be found in these arenas and sectors: data warehousing;

e-commerce; information technology management; consulting, Internet, or financial institutions; business; public service; the professions; banking; health care; libraries; judicial systems; communication industry; education; agriculture; private industry; government agencies; information centers; bibliographic utilities and networks; information industry; specialized publishing firms; and abstracting and indexing services

#### Summary

The mission statements show a changing world and an important need unfilled by other programs to bridge the human and the technical. The ALISE IS programs stress preparation of active, participating graduates who combine skills from many arenas and thus can work in many arenas.

#### Observations

We offer a few observations based on the survey of programs that we believe may help those establishing an IS program that fits with the IS programs being offered by ALISE schools.

1. Programs tend to have a unified core group of courses, combined with more specialized courses reflecting the identity of the program. For example, Drexel leans very much toward the technical end of the spectrum, while the University of North Texas is closer to a traditional LIS program. However, most programs do tend to teach both a core set of proficiencies (both theoretical and technical) and focus on their divergent emphasis.
2. Filling the niche between the "human" and the "technical" is an essential characteristic and need satisfied by these programs. "Students have expressed an interest in a program that has a broader focus than programs that emphasize computer programming and higher mathematics." (SUNY-Albany). This particular bridging appears to be how ALISE IS programs are creating a strong and appealing identity.

3. Maintaining and managing a multi-disciplinary approach is achieved by many programs. The diversity in settings and applications calls for the need to cross disciplines, applying IS knowledge to the arts, humanities, and sciences.
4. Foundations of LIS can serve as a key underpinning to programs, including knowledge about understanding issues about user communities, information quality, access, information organization and classification, etc.
5. Integrating real-world experience in such things as real-world tasks or internships further bridge the gap between the technical and human. They also bring the student to the real world and achieve a crossover from the theoretical to the practical.

There are many new programs still in development, and as stated, these new programs still have room to develop. This is a challenging time for ALISE schools, and for the human-technical endeavor. We look forward to seeing more programs in the future, and seeing how the field progresses.

#### **References and Notes**

1. We know that this number is growing rapidly; with several schools that we know are in the process of creating IS undergraduate

programs. See the web pages for more recent updates to the list.

2. We also note the change in our own school's name from "Information Studies" to "Information Technology Studies" within eighteen months of the inception of the program. Other programs may be experiencing similar changes.
3. E.g., "The global information explosion has changed the way people think, work, and play" (Long Island University). "The Internet provides powerful tools to change how we work, how we play, how we learn, how we live" (Brandeis).
4. Although the Internet has received much press attention, very little is said in mission statements about the Internet or the Web in ALISE-affiliated programs. We conjecture that this is in keeping with the LIS field's more general approach to information, with the Internet being only one technology associated with information and thus not to be singled out as the focus for programs.
5. The way in which human aspects are mentioned in these mission statements suggests attention to the level of individual psychology and to societal level impacts. There is little that suggests attention to group level impacts. Consideration of organizations is implied, but mentioned more frequently as a place where changes are occurring and as places for work rather than as objects of study.