Preliminary Validation of a Text Summarization Algorithm

S. Szpakowicz [a], K. Barker [a], T. Copeck [a], J.-F. Delannoy [b], S. Matwin [a]

[a] Department of Computer Science, University of Ottawa

[b] RES International

Abstract

We describe an experiment whose purpose has been a manual simulation of an algorithm at the heart of a text summarization project proposed in 1996 to NSERC. We present the algorithm, based on shallow linguistic clues and on a simple machine learning method of keyphrase identification. We discuss the various heuristics applied by the experimenters, and the summaries they constructed. The experiment has shown a noteworthy overlap of summaries produced from different heuristics. This lends credence to our claim that automated summarization based on keyphrases can give usable results even without advanced natural language processing techniques.

1. The text summarization project

The Knowledge Acquisition and Machine Learning (KAML) group at the Department of Computer Science, University of Ottawa, has applied for an NSERC strategic grant for work on text summarization. The complete proposal is available on the World-Wide Web* .

The heart of the proposal is an algorithm that makes use of a number of linguistic and machine learning resources developed by the KAML group or its research partners. A validation of the algorithm (part manual, part mechanized) has been undertaken in order to assess the viability of the whole approach. The purpose of this report is a detailed presentation of the algorithm, the experiment and the result.

An essential part of the algorithm is a keyword/keyphrase extraction method, developed by P. Turney from NRC. The text we chose for the validation exercise+ has been put through Turney's program. The keyphrases extracted have been listed at the beginning of Appendix I, which also contains the text itself.

2. The summarization algorithm

The algorithm has been presented in the proposal for NSERC in a narrative fashion. Its essential points covered in this experiment can be formulated as follows:

0. Parse the text and extract noun phrases, or skim the text for noun phrases. In this experiment, noun phrases have been aligned with their sentences to facilitate further processing.
1. Identify noun phrases that are keyphrases from P. Turney's list or have a keyphrases as a constituent. Mark the sentences that contain those noun phrases. (Sentences could also be

---

* http://www.csi.uottawa.ca/~szpak/proposals/text-summ-1996_ToC.html

\+ Suzanne K. Murrmann, "The Americans with Disabilities Act: Perspectives on Reasonable Accommodation". *J International Academy of Hospitality Research*, Issue 5, Sep. 8, 1992. [http://borg.lib.vt.edu/ejournals/JIAHR/92-09-08.jiahr.html] identified directly, without going through noun phrases.) These sentences are candidates for inclusion in a summary.

2. Identify pronouns in the candidate sentences and try to apply the pronoun resolution algorithm from the DIPETT parser. If a new noun phrase appears as a result of pronoun resolution, repeat Step 1 for it. (Pronoun resolution could also be carried out before Step 1.)
3. Select some of the sentences marked in steps 1-2. (This involved applying heuristics. Some heuristics in the experiment were common to all experimenters, others have been chosen individually. Every experimenter was free to invent selection criteria so long as they were or appeared mechanizable.)
4. Concatenate the sentences in the order of appearance in the text to get a level 2 summary—see point 4.2.3 of the proposal.
5. Evaluate the resulting summary for recall and precision—see point 4.2.5 of the proposal.

Most of Step 0 has been performed before the experiment began. The text has been parsed by the DIPETT parser, which found 153 units. 137 of these units are sentences or phrases that ought to be considered in the experiment. The complete text, divided into units, appears in Appendix I.

There was some variability in the execution of Step 1, depending on how keywords and keyphrases have been identified in the text. Some of the experimenters used simple tools for keyphrase identification, others performed Step 1 by hand. There also were differences in the use of the author's abstract, keyword list and section titles. All this has been presented in some detail in Section 3 of this report.

Step 2 was only carried out by two of the experimenters, but the number of pronouns in the text is low enough to make this discrepancy irrelevant.

Step 3, the central element of the experiment, is described in detail in Section 3.

Step 5 has been performed by two assessors. The raw results appear in Section 4, and a brief evaluation in Section 5.

3. Individual heuristics—experimenters' reports

Five experimenters ran experiments that produced ten summaries. We have labelled these summaries A, B, C, D, E, F, G, H, J, K. In this Section we present notes prepared by the experimenters and tabulate the raw results. The complete summaries appear in Appendix II.

There was only one common selection criterion: a sentence cannot go into a summary unless it contains at least one keyphrase extracted from the text by Turney's program, as dictated by Step 1. There also was a common suggestion, heeded in a slightly various way by each experimenter, to give more weight to sentences with more keyphrases.

Summaries A, B

The general attitude was to keep the process as simple and as potentially mechanizable as possible, and to stick to surface clues: semantically coloured choices are acceptable insofar as they can be eventually translated with good probability into surface phenomena.

Step 1 was done manually. Locating Turney's words or pairs of words by string matching is not sufficient. Keyphrases were looked for in the noun phrases, not in the sentences. The singular-plural distinction among keyphrases (such as *employee*-*employees*) has been preserved. The abstract and the section titles have not been considered.

Step 1 gave the keyphrase count. All sentences with zero or one keyphrase were discarded. Not considering single keyphrases is a debatable decision: if the extraction method improves and produces longer keyphrases, even one might be worth considering.

Next, keyphrase density has been calculated: it is the ratio S = K/L of the number K of keyphrases (not the number of words in them) to the length L of the sentence in words. Counting constituents might be more accurate, but would be less easily mechanizable. Keyphrases were identified wherever possible, for example, two keyphrases were found in *employees with disabilities*.

For the resulting 14 units, mostly sentences, the cut-off point of 5% density has been arbitrarily selected. This reduced the selection to 9 units. One of these high scorers, a noun phrase, was discarded—sentence fragments are not advisable in a narrative summary. (Simple editing was done on 3 units. They were preceded by a short noun phrase, removed in the summary.) All in all, there were 8 sentences, not pruned in any other way. This is Summary A.

This summary feels too long for comfort. Since one can easily parametrize the process, the cut-off point was moved up to 10%. This gave summary B.

Summaries C, D

In Step 0, the list of noun phrases was not used.

In Step 2, for each sentence or independent noun phrase a count (call it WK) was taken of the exact occurrences of words in all keywords in that unit. For example, *reasonable accommodation* would count as 2. The length of the sentence in words (call it L) was calculated too. The sentences were those in which the ratio S = WK/L was no less than 10%. This threshold was chosen arbitrarily. The informal rationale was to have a 5% length abstract.

One occurrence of the pronoun *it* has also been resolved.

This resulted in Summary C.

Next, it was decided that sentences past the third one were not very promising. The first three sentences gave Summary D.

Summaries E, F, G

In each experiment, a different density measure was applied to sentences produced in Step 1 by locating keyphrases in complete sentences rather than noun phrases. A string matching tool developed in Unix was used on the text without the abstract. Embedded occurrences, such as *employees* only within *disabled employees*, were discarded.

In the first two experiments, the number WK of keywords in a sentence and the length L of the sentence were considered. In both cases, the density measure was repeatedly adjusted until the arbitrarily imposed summary length of 10 has been achieved.

Summary E was produced for the density measure S = WK/L that favours shorter sentences.

Summary F resulted from applying the density measure S = WK*L: the premise here is that a long sentence with N keywords contains more information than a short sentence with N keywords. This premise assumes that there may be words other than the supplied keywords that contribute to the saliency of a sentence (effectively requiring less confidence in the completeness of the supplied keyword list).

The third experiment, which produced Summary G, was unusual in that the list of keyphrases has been expanded to include:

- single-word heads from multi-word keyphrases;
- roots of inflected keywords, found in the Collins dictionary;
- single-word modifiers from multi-word keyphrases;
- WordNet synonyms of keywords.

The extended list is as follows:

individual, accommodation, disability, reasonable, disabled, alteration, adjustment, qualifying, limiting, change, person, someone, mortal, human, soul, disablement, handicap, impairment.

The measure, which did not account for the sentence length, was

$$S = WK + .9H + .8M + .7W$$

where H was the number of roots of inflected keywords, M the number of noun modifiers and W the number of WordNet synonyms.

Summary H

The set of preselected sentences consisted of the sentences containing at least one of the keywords. Excluded were the author's abstract and section titles. For these, a personal judgment was made on eligibility for inclusion in the abstract. A four-tier rating (rejected, or 1 to 3 stars).

Criteria for acceptance included the following:

- information is core or marginal;
- facts are given about the world rather than the reported study;
- the sentence is conclusive, wrapping up the points;
- the sentence gives background;
- the sentence stresses relevance of domain and approach;
- the sentence gives justification.

There was one 3-star and eight 2-star sentences, and 30 others received 1 star. The numbers are the unit numbers from Appendix I.

- 3 stars: 19.
- 2 stars: 37, 38, 52, 77, 115, 128, 132, 134.
- 1 star: 7, 8, 18, 21, 22, 42, 45, 46, 47, 49, 51, 54, 60, 61, 62, 63, 64, 83, 87, 96, 102, 112, 113, 129, 131, 133, 135, 139, 146, 152.

Summary H consists of the 3-star and 2-star sentences.

Summaries J, K

In Step 1, the abstract was included.

In Step 2 the ranking produced by post-processing of DIPETT's output was used. Turney's keyphrases include words and phrases repeated in a more qualified form: employee, employees, disabled employees. The ranking was filtered to remove matches involving parts of a two-word keyphrase (for example, *disabled employees* was kept, but *employees* removed). In this revision of the ranking, repetitions of a keyword in a sentence were ignored. Also ignored were alternative phrasings of a keyphrase (for example, *individuals with disabilities* versus *disabled individuals*). Sentences containing at least three keywords after filtering were retained in the summary, which followed sentence order in the text.

The ranking that arose from this procedure—it gave Summary J—has been summed up in Table 1. Next, a shorter four-sentence summary of sentences containing three or more unique keyphrases was produced. This is Summary K.

unit #	matches raw	unique	
25	4	3	←
38	4	3	←
115	4	2	
138	4	3	←
3	3	3	←
14	3	1	
17	3	2	
37	3	1	
72	3	2	
74	3	1	
79	3	2	

Table 1. Details of the production of summary J

4. Raw results

There were 137 units—not all of them complete sentences—that could have been selected for a summary. The experimenters chose altogether 32 units, 21 of them more than once. Table 2 shows these units. We leave till the Section 5 observations motivated by Table 2, and an assessment of the quality of each summary.

5. Discussion and conclusions

Convergence

Table 3 contains the rows from Table 2 that show text units assigned to at least three summaries by at least two experimenters. The cutoff point has been chosen arbitrarily. No serious conclusions can be drawn from this simple pruning exercise. Table 3 suggests, however, that despite the variety of selection heuristics there is a notable convergence in the experimenters' opinion on units appropriate for a summary. This is even more interesting if we note that two of five experimenters and three of ten summaries have been produced by semantic reflection rather than by methods relying on surface clues.

Recall and precision results

Point 4.2.5 of the proposal for NSERC offers the following method of evaluating the quality of a summary:

[...] Assume there are N crucial concepts covered by a manually prepared abstract that an evaluator considers perfect; recall would be the percentage of concepts captured by an automatically produced summary, while precision would be the percentage of relevant concepts in this summary. (In particular, the whole text has 100% recall, but very low precision.) [...]

We prepared a list of relevant concepts that should appear in an informative, professional (though not necessarily perfect...) summary of the sample text. The list is shown in Appendix III. It is encouraging that only 6 of 19 relevant concepts (32%) do not show up in units indexed on keyphrases acquired automatically and without any linguistic reflection.

	Experiment										
#	A	B	C	D	E	F	G	H	J	K	TOTAL
3									+	+	2
5					+						1
14						+			+		2
15						+					1
16			+	+							2
17									+		1
18			+	+							2
19	+		+	+	+		+	+			6
20			+		+						2
21						+	+				2
22					+						1
25			+		+				+	+	4
31					+						1
37						+	+	+	+		4
38	+	+	+			+	+	+	+	+	8
42						+	+				2
45							+				1
52			+					+			2
54			+								1
61			+								1
63			+								1
72	+	+							+		3
74	+				+	+	+		+		5
77	+	+			+			+			4
79	+								+		2
82					+	+	+				3
87	+		+		+	+	+				5
115							+	+	+		3
128								+			1
132	+	+						+			3
134								+			1
138						+			+	+	3

Table 2. A tally of summaries

#	A	B	C	D	E	F	G	H	J	K	TOTAL
19	+		+	+	+		+	+			6
25			+		+				+	+	4
37						+	+	+	+		4
38	+	+	+			+	+	+	+	+	8
72	+	+							+		3
74	+				+	+	+		+		5
77	+	+			+			+			4
87	+		+		+	+	+				5
115							+	+	+		3
132	+	+						+			3
138						+			+	+	3

Table 3. The most often selected summaries

The Appendix also contains instructions for identifying concepts in summaries, and a table. A row in the table represents a unit that has been included in at least one summary, a list of relevant concepts in each of those units, and the number of other concepts. The latter have been selected manually, following the same instructions. These are concepts considered likely as indexing terms—as are the 19 relevant concepts—that have not been found as characteristic of the text.

In Table 4 we present the recall and precision data for all ten summaries, as well as for two more set of units: those assigned by at least two experimenters to three or more and four or more summaries.

Summary/ unit set	Length in units	Relevant concepts	Others concepts	Recall in %	Precision in %
A	8	10	16	52.6	38.5
B	4	4	7	21.1	36.4
C	11	10	14	52.6	41.7
D	3	5	2	26.3	71.4
E	10	9	11	47.4	45.0
F	10	9	33	47.4	21.4
G	10	11	24	57.9	31.4
H	9	11	15	57.9	42.3
J	11	11	28	57.9	28.2
K	4	4	10	21.1	28.6
in 3+	11	12	21	63.2	36.4
in 4+	7	9	13	47.4	40.9

Table 4. Recall and precision in the summaries

Discussion

The data in Table 4 do not exhibit many clear trends. It is evident, however, that the precision of shorter summaries (3-4 units) is too low. The possibly spurious high recall of one of them may be the effect observed elsewhere: units at the beginning of a text are likely to make a good summary.

Neither recall nor precision of two "popular" sets of units (in 3+ and in 4+) is outstanding; even if "in 3+" has the highest recall, its precision is low. This suggests—weakly—that an intersection of heuristics, so to speak, may work less well than any single, presumably more consistent selection method. Obviously, more work on good heuristics lied all ahead.

Let us now restrict our attention to the longer summaries with acceptable recall: A, C, E, F, G, H, J. We notice that mechanistic selection from the given set of keyphrases (A, C, E, F) fares less well than selection from the extended set (G) and summary construction that included semantic reflection (H, J), though the difference in recall may not be significant.

We may note that recall could have been better had we done more pronoun resolution, and generally reference resolution. Another noteworthy point is that only one method of manual selection of relevant concepts has been applied. Other methods will have to be formulated and tested. In particular, it may be better to avoid partially overlapping concepts, such as 2/3 or 4/6/18/19—see Appendix III.

Precision results are disappointing. The heuristic that prefers longer units over shorter ones (summary F versus E) does not improve recall, but hurts precision. In general, the precision data should be treated with caution, since the selection of "other" concepts has not been reconfirmed carefully enough.

Finally, it should be said that recall and precision as defined in the NSERC proposal may not be the most adequate measure of a summary's quality. Other measures will have to be attempted.

Appendix I. The text for summarization

Keyphrases extracted by P. Turney's program

modification
individuals
reasonable accommodations
reasonable accommodation
disabled employees
disabled individuals
employee
employer
employees
disabilities

The text divided into units by the DIPETT parser

[1] ABSTRACT.
[2] Using the present federal guidelines delineating organizational requirements under the Americans with Disabilities Act (ADA), this study examines the influence of work experience, personal attitudes, and employment law knowledge on perceptions of reasonable accommodation.
[3] Findings indicate that attitudes toward individuals with disabilities are most highly associated with perceptions of the essentialness of different categories of reasonable accommodation.
[4] Suggestions for future research are discussed.
[5] KEY WORDS : Americans with Disabilities Act (ADA), Reasonable Accommodation, hospitality industry.
[6] INTRODUCTION.
[7] On July 26, 1990 President George Bush signed into law the most far reaching law to date that bars discrimination against the disabled, the Americans with Disabilities Act (ADA).
[8] The act will affect 4.5 million private sector employers, state and local governments and private businesses, and 43 million Americans with disabilities.
[9] The need for this legislation is evident.
[10] Sixty-seven percent of disabled Americans are unemployed.
[11] As a result, the federal government currently spends approximately $170 billion dollars on programs and benefits for the disabled.
[12] According to a 1986 Lewis-Harris poll, eighty-two percent of all disabled people would give up their government benefits in favor of full time employment.
[13] Furthermore, the disabled are the nation's largest minority group.
[14] Since the first discussions of this legislation in Congress, and the final passage of the law, major contributions have been made to the body of literature concerning the ADA, particularly in the areas of how the Act will be interpreted by the courts, how it may affect different types of businesses, and how best to approach the inclusion of disabled employees into the workplace.
[15] However, because the Act does not actually take effect until July 1992, research has yet to be published on employer perceptions of the effects it may have on their businesses and how they approach its requirements, particularly in the area of reasonable accommodation.
[16] Hospitality has been an industry that has taken a high level of interest in the drafting of the ADA and for obvious reasons.
[17] Not only will the law significantly affect its responsibilities to present and potential employees covered under Title I of the law, it will also require tremendous modifications to its facilities and operations within the (public) accommodations portion of the Act.
[18] It is, therefore, a logical sector in which to assess perceptions about reasonable accommodation, and the variables that influence an employer's inclination to engage in such activities.

[19] The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers ' beliefs about reasonable accommodation.

[20] THE ADA AND REASONABLE ACCOMMODATION.

[21] Under Section 102 (5) (A) of the ADA an employer discriminates if it fails to make reasonable accommodations to an applicant or employee with known physical or mental limitations who is otherwise qualified for a position, unless the employer can demonstrate that the accommodation would impose an undue hardship on the employer's business.

[22] There exists no actual definition of "reasonable accommodation" under the ADA.

[23] Those writing about the ADA and federal guidelines interpreting it generally rely on the regulations and case law stemming from the Rehabilitation Act of 1973 when formulating examples of "reasonable accommodation" under the ADA.

[24] Included are : 1.

[25] Making existing facilities used by employees readily accessible to and usable by individuals with disabilities.

[26] 2.

[27] Adopting part-time or modified work schedules.

[28] 3.

[29] Reassignment to vacant positions.

[30] 4.

[31] Acquisition or modification of equipment and devices.

[32] 5.

[33] Adjustment or modification of examinations, training materials or policies.

[34] 6.

[35] Provision of qualified readers, interpreters, or similar accommodations.

[36] While this list includes the generally accepted and conspicuous examples of reasonable accommodation, congressional discussions note that the employer may not fulfill its duty to accommodation simply by providing the resources or activities appearing on such a list.

[37] To be reasonable, the accommodation must provide a meaningful equal employment opportunity, i.e. an opportunity to attain the same level of performance as is available to non-disabled employees having similar skills and abilities, and in a manner that is effective for the disabled employee.

[38] Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

[39] RESEARCH QUESTIONS AND HYPOTHESES.

[40] As mentioned earlier, the literature to date has been extensive in terms of presenting to interested management and legal audiences the content of the ADA and its expected requirements for reasonable accommodations.

[41] Little has been published concerning the perceptions of managers who will be involved in the implementation of the ADA requirements.

[42] Since managers will play a pivotal role within each organization in determining how to satisfy the requirement of reasonable accommodation, this research examined managers ' perceptions of the essential components of reasonable accommodation, and investigated influences on these perceptions.

[43] To first identify an operational definition of reasonable accommodation, a review of the relevant literature was conducted.

[44] This literature included articles published in legal reviews discussing the ADA's potential interpretation based on similarly situated cases under the Rehabilitation Act, general management articles directed toward its application in a work setting, federal guidelines issued to interpret the law, and summaries prepared by legal organizations, again directed to managers.

[45] Though interpretations differ slightly from source to source, it appears that reasonable accommodation falls under three distinct categories : (1) Facility Modification, (2) Equipment and Devices, and (3) Human Resource Management Functions.

[46] The study's first hypothesis therefore proposes that ; H1 : Managers will have three distinct conceptualizations of "reasonable accommodation" ; 1.

[47] Accommodations related to changes and alterations of their facilities that influence employee access in the workplace.

[48] 2.

[49] Accommodations related to the provision of equipment and devices necessary for an employee to function adequately in the job.

[50] 3.

[51] Accommodations related to the human resource management function that influence employee job performance.

[52] Twenty-two specific questionnaire items were developed to assess perceptions of what constitutes "reasonable accommodation" for these three dimensions.

[53] These items are described below in the methods section of this paper.

[54] In addition to assessing managers ' perceptions of what constitutes reasonable accommodation, we examined factors that may influence these perceptions.

[55] For instance, having a negative view of the disabled may predispose managers to disregard the needs of the disabled.

[56] This idea is supported by the research of Wolfensberger who found that the real causes of continuing discrimination against people with disabilities are the negative images held of them and the devalued social roles society allows them to fill.

[57] Ending such discrimination will require a change in those roles, including those in the workplace.

[58] Based on Wolfensberger's work, we propose that acceptance of the need for reasonable accommodation will be influenced by attitudes concerning the employability of the disabled, general work experience in the hospitality industry, and previous work experience with disabled persons since such experience may influence perceptions of the feasibility of accommodation.

[59] Previous research has also shown that managers ' perceptions of their rights to engage in certain human resource activities, i.e. hiring and retention, of individuals with AIDS are strongly associated with their knowledge of employment law as well as general attitudes toward such individuals.

[60] The study therefore proposes that perceptions of reasonable accommodation may also be influenced by the manager's knowledge of personnel management policies, practices, and employment law relevant to discrimination and accommodation.

[61] The following hypotheses were proposed : H2 : The essential nature of accommodation will be positively related to employment attitudes toward disabled individuals.

[62] H3 : The essential nature of accommodation will be positively related to length of experience in the industry.

[63] H4 : The essential nature of accommodation will be positively related to experience in working with and managing disabled employees.

[64] H5 : The essential nature of accommodation will be positively related to an individual's current knowledge of employment law.

[65] METHODOLOGY.

[66] Sample Data was collected through surveys administered to undergraduate and graduate students enrolled in a hospitality program at a major regional university.

[67] Students within this program are required, as part of the curriculum, to work a minimum of 600 hours in hospitality positions.

[68] The sample was limited to those individuals who reported management experience, i.e. positions in management in either food-service or lodging, of at least six months or longer within the past five years.

[69] This resulted in a sample size for this study of 209 persons.

[70] Survey Questions.

[71] Background information - Respondents were asked for a variety of information including race, age, gender and year in school.

[72] Work Experience - Two different measures of work experience were used for the study : industry work experience, and experience working with or supervising employees with disabilities.

[73] Industry work experience was measured through total years of experience in hospitality.

[74] Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

[75] Data was collected using a yes-no response scheme for the three disability categories under both supervisory and co-worker experiences.

[76] A total disability score was then calculated based on responses, with final scores ranging between 0, indicating no experience to 6, indicating experience in all six areas.

[77] Knowledge - Knowledge was hypothesized to influence individuals views on reasonable accommodation.

[78] Employment law knowledge was assessed using a 10-item, 5-point Likert scale on employment practices governed by federal laws including Title 7 of the Civil Rights Act, the Age Discrimination in Employment Act, the Immigration Reform and Control Act, and the Fair Labor Standards Act.

[79] Accompanying this scale were items on employment practices traditionally seen as part of management rights such as the right of the employer to determine the work to be performed by employees.

[80] This measure was developed for previous research on AIDS and shown to have an internal reliability alpha of 0.77.

[81] Employment Attitudes toward the Disabled - To measure employment attitudes toward the disabled, a fifteen items scale was developed based on earlier work in the area of AIDS.

[82] Items were structured to measure beliefs about whether employers should have the right to engage in negative employment actions against individuals with disabilities or respond positively toward applicants or employees with such disabilities within the context of customer preference.

[83] Three items specifically related to physical handicaps, four to mental handicaps, and three to disabilities related to serious illnesses.

[84] The remaining five items pertained to HIV/AIDS.

[85] A Cronbach alpha of 0.82 was calculated for the scale.

[86] Responses to the items were collected on a 5-point Likert scale ranging from strongly agree to strongly disagree.

[87] Reasonable Accommodation - To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

[88] This list was reviewed by several experts in the area of the ADA and further reduced to 19 items.

[89] Four items were eliminated because of their perceived overlap with others.

[90] Data on each item was collected using a 5-point Likert scale on which respondents were asked to indicate whether the accommodation was viewed as being 1 - essential to 5 - unreasonable.

[91] RESULTS.

[92] Data collected on the 19 items were factor analyzed using an orthogonal factor rotation, VARIMAX procedure.

[93] A final factor number of three was specified in the procedure for verifying the initial assumptions for reasonable accommodations.

[94] Table 1 presents the results of the analysis.

[95] As expected, items specifically related to the provision of equipment and devices necessary for an employee to function adequately in the job including braille devices, electronic visual aids, mechanical page turners, and adaptive hardware loaded on Factor 1.

[96] Factor 2 included those items related to changes and alterations of the firm's facilities that may influence employee access in the workplace.

[97] Included in this group were alterations to work stations and areas such as widening aisles, ramps, and the modification of elevator panels.

[98] Items loading highly on the third and final factor related specifically to human resource policies, practices, and activities that influence employee job performance.

[99] Items pertaining to job restructuring, work scheduling, reassignment, and changes and/or accommodations associated with employment policies appeared on this factor.

[100] The grouping of items correspond to the initial guidelines interpreting the ADA, confirming the study's first hypothesis.

[101] Table 2 presents a ranking of the study's extracted dimensions of reasonable accommodation based on their essential nature as seen by the respondents.

[102] Though no apriori hypotheses were made about what types of reasonable accommodations would be viewed as most essential within this group, one might predict that the more costly the accommodation was viewed by a individual, the more unnecessary it would be.

[103] The premise has its underlying rationale from the method which the courts have interpreted the concept of undue hardship under the Rehabilitation Act, and how that concept is carried over into the ADA.

[104] One reason the researchers did not formulate this hypothesis was because of the sample group used in the study.

[105] While all individuals within the group have had management experience, the length of time in the industry is probably not sufficient to expose them to this law.

[106] Moreover, full time, experienced managers in the industry may not have an adequate knowledge base since, except for large hospitality organizations holding federal contracts, few others are covered by this particular piece of legislation.

[107] Even so, since profit margins are historically very narrow in the industry, cost should still be seen as a significant factor in determining reasonableness.

[108] The results of the factor analysis show however, that while accommodation related to the human resource management function is seen as significantly more essential when compared to other types of accommodations, respondents viewed more costly facility modifications as more essential than the provision of equipment and devices.

[109] A second determinant to accommodation could be ease of accommodation.

[110] It could be hypothesized that the ease which accommodations are fulfilled might dictate their necessity.

[111] Again, however, this does not appear to be the case.

[112] While activities such as work scheduling and reassignment, and instituting HRM policy changes are more easily attained than redesigning and modifying work facilities, it would appear that the latter task is far more difficult than the provision of equipment and devices to handicapped employees.

[113] The placing of facility modification over equipment and devices may be due to the relative familiarity that individuals have with accommodations.

[114] Clearly access ramps are far more common than such items as electronic visuals aids.

[115] Moreover, modifications to the structure of an establishment could be viewed as an accommodation more useful to a wider range of both disabled and non-disabled employees in the industry and, therefore, more reasonable.

[116] To investigate the influence of work experience, knowledge and employment attitudes toward disabled workers on accommodations, Pearson Product Moment correlation tests were performed for each independent variable.

[117] The results, shown in Table 3, suggest that while some of the variables of interest in the study may be influential in formulating a manager's belief concerning what is an essential accommodation, others are not.

[118] The data show no relationship between total work experience and accommodations, and a very weak but significant relationship between experience in working with and supervising disabled employees, and accommodation in human resource management functions.

[119] Therefore, hypothesis three was not confirmed, and hypothesis four was only partially confirmed.

[120] This suggests several conclusions.

[121] One might be that because of their experiences, presuming that they were positive, they feel that handicapped individuals can reasonably function without special equipment and other changes in the organization.

[122] If this is the case, then the meaning of "essential" and "necessary" within the context of the study has been inappropriately defined.

[123] A counter argument is that these experiences have been negative in nature, and have in fact negatively biased their answers.

[124] Unfortunately, this information was not collected.

[125] The absence of a relationship between experience and accommodation, however, is more likely caused by the sample itself.

[126] Though all students included in the sample group indicated management experience, the average for the group was low ($M = 1.2$), as was their average level of experience with actually working with disabled individuals.

[127] Therefore, though the findings of the study suggest that experience is not related to accommodation, additional research should be done on hospitality managers with and without such experience to verify the relationship between these two variables.

[128] When data from the response group on their relevant knowledge of employment law was compared with beliefs concerning accommodation, those indicating correct knowledge of regulations as they relate to employment activities were more likely to view accommodation related to equipment and special devices, Human Resource Management functions, and facility modification as more necessary than individuals demonstrating poorer knowledge of employment law.

[129] Though all appear to be weak, facility modification demonstrated the strongest relationship with knowledge.

[130] The findings, therefore, support hypothesis five.

[131] Beliefs concerning individuals with handicaps have the strongest relationship to accommodation of the variables investigated in the study.

[132] In general, those individuals expressing more positive views about individuals with mental physical, and serious illness disabilities viewed accommodations as more essential than those with more negative views.

[133] These attitudes appear to be most strongly related to the essentialness of facility modification, followed by human resource management functions and equipment and devices.

[134] Individuals possessing positive attitudes toward the disabled are likely to view the installation of ramps in work areas, and the modification of work areas and stations as essential activities for organizations.

[135] As discussed earlier, this may not be due to the relative cost of such improvements, but possibly to the familiarity that individuals have at present with them.

[136] The findings, therefore, support hypothesis two.

[137] CONCLUSIONS.

[138] In describing the Projects with Industry (PWI) partnership involving the International Association of Machinists and Aerospace Workers and corporate managements, Guy Stubblefield, the executive director of IAM CARES points out that a key to integrating disabled individuals into the workforce is employers looking beyond disabilities.

[139] This study suggests that the beliefs and attitudes that managers hold about the disabled, both those with obvious and not so obvious disabilities, affect their ability to do so.

[140] Such views, however, appear to be moderated by work experience with the disabled.

[141] But in reality, management may not be able to sit back and wait for work experience to acclimate their managers to the disabled, since managers ' beliefs may in fact constitute a barrier to their acquisition of such experience.

[142] In the past, such unwillingness resulted in the loss of otherwise qualified and productive employees.

[143] As of 1992, such unwillingness will ultimately result in legal action under the ADA.

[144] Therefore, corporations should take care in monitoring the activities of supervisors and managers who will play a crucial role, particularly in the area of human resource management, in the accommodations they make or refuse to make for disabled applicants and employees.

[145] It should be noted that this study is exploratory in nature and limited by its sample, hospitality students from one regional university.

[146] It is imperative that further research be done to more fully understand the nature of reasonable accommodation and the factors influencing its essentialness for hospitality managers.

[147] Such a study conducted with experienced hospitality managers is necessary in understanding the relationship between previous interactions with disabled employees and their affects on attitudes.

[148] Traditional motivation theory states that attitudes concerning a group are the primary motivator of behavior toward that group.

[149] Given this, one must question the affect of regulation of behavior through laws such as the ADA without a change in managers ' attitudes about the disabled.

[150] Changing such attitudes may be accomplished through increased "regulated" exposure to the disabled in the work setting.

[151] However, since attitudes are formed by the beliefs an individual holds about a group, the study suggests that managers learn more about the law that governs accommodation of the disabled.

[152] Knowledge about the law, the disabled, and how they can be accommodated should accelerate the process of reasonable accommodation in organizations.

[153] Further research in the area is needed to clarify these relationships.

Appendix II. The ten summaries

Summary A

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers' beliefs about reasonable accommodation.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Two different measures of work experience were used for the study: industry work experience, and experience working with or supervising employees with disabilities.

Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

Knowledge was hypothesized to influence individuals views on reasonable accommodation.

Accompanying this scale were items on employment practices traditionally seen as part of management rights such as the right of the employer to determine the work to be performed by employees.

To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

In general, those individuals expressing more positive views about individuals with mental physical, and serious illness disabilities viewed accommodations as more essential than those with more negative views.

Summary B

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Two different measures of work experience were used for the study: industry work experience, and experience working with or supervising employees with disabilities.

Knowledge was hypothesized to influence individuals views on reasonable accommodation.

In general, those individuals expressing more positive views about individuals with mental physical, and serious illness disabilities viewed accommodations as more essential than those with more negative views.

Summary C

Hospitality has been an industry that has taken a high level of interest in the drafting of the ADA and for obvious reasons.

It is, therefore, a logical sector in which to assess perceptions about reasonable accommodation, and the variables that influence an employer's inclination to engage in such activities.

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers ' beliefs about reasonable accommodation.

THE ADA AND REASONABLE ACCOMMODATION.

Making existing facilities used by employees readily accessible to and usable by individuals with disabilities.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Twenty-two specific questionnaire items were developed to assess perceptions of what constitutes "reasonable accommodation" for these three dimensions.

In addition to assessing managers ' perceptions of what constitutes reasonable accommodation, we examined factors that may influence these perceptions.

The following hypotheses were proposed : H2 : The essential nature of accommodation will be positively related to employment attitudes toward disabled individuals.

H4 : The essential nature of accommodation will be positively related to experience in working with and managing disabled employees.

Reasonable Accommodation - To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

Summary D

Hospitality has been an industry that has taken a high level of interest in the drafting of the ADA and for obvious reasons.

It is, therefore, a logical sector in which to assess perceptions about reasonable accommodation, and the variables that influence an employer's inclination to engage in such activities.

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers ' beliefs about reasonable accommodation.

Summary E

KEY WORDS: Americans with Disabilities Act (ADA), Reasonable Accommodation, hospitality industry.

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers' beliefs about reasonable accommodation.

THE ADA AND REASONABLE ACCOMMODATION.

There exists no actual definition of "reasonable accommodation" under the ADA.

Making existing facilities used by employees readily accessible to and usable by individuals with disabilities.

4. Acquisition or modification of equipment and devices.

Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

Knowledge - Knowledge was hypothesized to influence individuals views on reasonable accommodation.

Items were structured to measure beliefs about whether employers should have the right to engage in negative employment actions against individuals with disabilities or respond positively toward applicants or employees with such disabilities within the context of customer preference.

Reasonable Accommodation - To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

Summary F

Since the first discussions of this legislation in Congress, and the final passage of the law, major contributions have been made to the body of literature concerning the ADA, particularly in the areas of how the Act will be interpreted by the courts, how it may affect different types of businesses, and how best to approach the inclusion of disabled employees into the workplace.

However, because the Act does not actually take effect until July 1992, research has yet to be published on employer perceptions of the effects it may have on their businesses and how they approach its requirements, particularly in the area of reasonable accommodation.

Under Section 102(5)(A) of the ADA an employer discriminates if it fails to make reasonable accommodations to an applicant or employee with known physical or mental limitations who is otherwise qualified for a position, unless the employer can demonstrate that the accommodation would impose an undue hardship on the employer's business.

To be reasonable, the accommodation must provide a meaningful equal employment opportunity, i.e. an opportunity to attain the same level of performance as is available to non-disabled employees having similar skills and abilities, and in a manner that is effective for the disabled employee.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Since managers will play a pivotal role within each organization in determining how to satisfy the requirement of reasonable accommodation, this research examined managers' perceptions of the essential components of reasonable accommodation, and investigated influences on these perceptions.

Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

Items were structured to measure beliefs about whether employers should have the right to engage in negative employment actions against individuals with disabilities or respond positively toward applicants or employees with such disabilities within the context of customer preference.

Reasonable Accommodation - To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

In describing the Projects with Industry (PWI) partnership involving the International Association of Machinists and Aerospace Workers and corporate managements, Guy Stubblefield, the executive director of IAM CARES points out that a key to integrating disabled individuals into the workforce is employers looking beyond disabilities.

Summary G

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers' beliefs about reasonable accommodation.

Under Section 102(5)(A) of the ADA an employer discriminates if it fails to make reasonable accommodations to an applicant or employee with known physical or mental limitations who is otherwise qualified for a position, unless the employer can demonstrate that the accommodation would impose an undue hardship on the employer's business.

To be reasonable, the accommodation must provide a meaningful equal employment opportunity, i.e. an opportunity to attain the same level of performance as is available to non-disabled employees having similar skills and abilities, and in a manner that is effective for the disabled employee.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Since managers will play a pivotal role within each organization in determining how to satisfy the requirement of reasonable accommodation, this research examined managers' perceptions of the essential components of reasonable accommodation, and investigated influences on these perceptions.

Though interpretations differ slightly from source to source, it appears that reasonable accommodation falls under three distinct categories: (1) Facility Modification, (2) Equipment and Devices, and (3) Human Resource Management Functions.

Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

Items were structured to measure beliefs about whether employers should have the right to engage in negative employment actions against individuals with disabilities or respond positively toward applicants or employees with such disabilities within the context of customer preference.

Reasonable Accommodation - To operationalize the essential components of reasonable accommodations under the ADA, 22 items representing management activities constituting reasonable accommodation were constructed using the current literature on the ADA, preliminary federal guidelines in the area, and prior court cases under the Rehabilitation Act of 1976.

Moreover, modifications to the structure of an establishment could be viewed as an accommodation more useful to a wider range of both disabled and non-disabled employees in the industry and, therefore, more reasonable.

Summary H

The purpose of this study was to investigate the important essential components of reasonable accommodations for managers in the hospitality industry, and the factors that influence managers' beliefs about reasonable accommodation.

To be reasonable, the accommodation must provide a meaningful equal employment opportunity, i.e. an opportunity to attain the same level of performance as is available to non-disabled employees having similar skills and abilities, and in a manner that is effective for the disabled employee.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Twenty-two specific questionnaire items were developed to assess perceptions of what constitutes "reasonable accommodation" for these three dimensions.

Knowledge - Knowledge was hypothesized to influence individuals views on reasonable accommodation.

Moreover, modifications to the structure of an establishment could be viewed as an accommodation more useful to a wider range of both disabled and non-disabled employees in the industry and, therefore, more reasonable.

When data from the response group on their relevant knowledge of employment law was compared with beliefs concerning accommodation, those indicating correct knowledge of regulations as they relate to employment activities were more likely to view accommodation related to equipment and special devices, Human Resource Management functions, and facility modification as more necessary than individuals demonstrating poorer knowledge of employment law.

In general, those individuals expressing more positive views about individuals with mental physical, and serious illness disabilities viewed accommodations as more essential than those with more negative views.

Individuals possessing positive attitudes toward the disabled are likely to view the installation of ramps in work areas, and the modification of work areas and stations as essential activities for organizations.

Summary J

Findings indicate that attitudes toward individuals with disabilities are most highly associated with perceptions of the essentialness of different categories of reasonable accommodation.

Since the first discussions of this legislation in Congress, and the final passage of the law, major contributions have been made to the body of literature concerning the ADA, particularly in the areas of how the Act will be interpreted by the courts, how it may affect different types of businesses, and how best to approach the inclusion of disabled employees into the workplace.

Not only will the law significantly affect its responsibilities to present and potential employees covered under Title I of the law, it will also require tremendous modifications to its facilities and operations within the (public) accommodations portion of the Act.

Making existing facilities used by employees readily accessible to and usable by individuals with disabilities.

To be reasonable, the accommodation must provide a meaningful equal employment opportunity, i.e. an opportunity to attain the same level of performance as is available to non-disabled employees having similar skills and abilities, and in a manner that is effective for the disabled employee.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

Work Experience - Two different measures of work experience were used for the study : industry work experience, and experience working with or supervising employees with disabilities.

Respondents were also asked to report whether they had had such experiences with 1) physical disabled employees, 2) mentally disabled employees, and 3) employees with serious illnesses such as cancer or epilepsy.

Accompanying this scale were items on employment practices traditionally seen as part of management rights such as the right of the employer to determine the work to be performed by employees.

Moreover, modifications to the structure of an establishment could be viewed as an accommodation more useful to a wider range of both disabled and non-disabled employees in the industry and, therefore, more reasonable.

In describing the Projects with Industry (PWI) partnership involving the International Association of Machinists and Aerospace Workers and corporate managements, Guy Stubblefield, the executive director of IAM CARES points out that a key to integrating disabled individuals into the workforce is employers looking beyond disabilities.

Summary K

Findings indicate that attitudes toward individuals with disabilities are most highly associated with perceptions of the essentialness of different categories of reasonable accommodation.

Making existing facilities used by employees readily accessible to and usable by individuals with disabilities.

Though it is suggested that appropriate methods to accommodate disabled individuals be made by both the employer and the applicant/employee, ultimately it is within the purview of the employer to implement accommodation using expense and ease as criteria as long as equal employment opportunity is provided.

In describing the Projects with Industry (PWI) partnership involving the International Association of Machinists and Aerospace Workers and corporate managements, Guy Stubblefield, the executive director of IAM CARES points out that a key to integrating disabled individuals into the workforce is employers looking beyond disabilities.

Appendix III. Manually prepared concepts

Relevant concepts

1. Americans with Disabilities Act / ADA / the Act
2. reasonable accommodation
3. perceptions of / views on / beliefs about reasonable accommodation
4. person / individual / employee with disability {also the disabled / disabled individual / disabled person}
5. work experience
6. employer of a disabled person
7. hospitality industry / program / positions
8. hospitality manager
9. equal employment opportunity
10. attitude (toward disabled) / perceptions of a manager
11. employee access
12. employee function
13. employee job performance
14. facility / workplace modification
15. human resource management
16. essential (nature of) accommodation
17. employment law
18. work with / supervision of disabled
19. physical / mental / illness-related disability

Instructions for identifying concepts in summaries

A. Do not count "parts" of a concept. For example, do not count *reasonable accommodation* in *views on reasonable accommodation*.

B. Concepts have many linguistic realizations, especially if (as in this experiment) one actually considers complex, multifaceted concepts. In particular, almost every concept can be expressed by phrases that have constituents in singular or plural. For example:

   employee with disability,
   employee with disabilities,
   employees with disability,
   employees with disabilities.

C. Count repetitions. For example, count *the ADA* twice in this: To operationalize [...] under the ADA, 22 items [...] were constructed using the current literature on the ADA [...]

D. Be lenient and creative. For example, count *physically disabled* in the phrase *physically disabled employee* as concept 19.

Concepts found in units selected for summaries

Unit #	Relevant concepts	# of other concepts
3	10, 16	1
5	1, 2, 7	0
14	1, 1, 4	6
15	1, 2, 10	1
16	1, 7	0
17	1, 7, 14	2
18	3, 7	1
19	3, 8, 16	1
20	1, 2	0
21	1, 2, 4	6
22	1, 2	0
25	4	1
31	14	0
37	2, 4, 9, 13	2
38	4, 9	4
42	2, 3	1
45	2, 14, 15	1
52	2	1
54	3	1
61	10, 16	0
63	16, 18	1
72	18	3
74	19, 19, 19	1
77	3	0
79	13	3
82	4, 4	4
87	1, 1, 2, 16	4
115	4, 7, 14	1
128	14, 15, 17, 17	4
132	3	0
134	3, 14	2
138	4	4