The benefits of human resources certification

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This study examines whether Human Resources (HR) certification is beneficial to HR professionals and organizations and explores the antecedents of HR certification. We surveyed 422 HR professionals from local chapters of the Society of Human Resources Management. The results indicated certified HR professionals received more pay (even after controlling for level of education and years of HR experience) and had higher occupational commitment than uncertified HR professionals. We also found that when organizations provided support for certification, HR professionals were more likely to obtain certification and had higher organizational commitment. Because we did not manipulate any variables, we were unable to make causal inferences. All of the instruments were self-reported measures (mono-method bias). Because we relied on a convenience sample, our sample might not be representative of the HR profession. HR certification may have some positive benefits for professionals such as more pay and employees who are more committed to their occupation. Organizations may want to support their employees’ HR certification efforts because of its positive relationship to organizational commitment. A certified HR professional may invest mental energy, time, and even his or her own financial resources to become and remain certified.

Keywords: Human Resources certification, certification motivation, organizational support, occupational commitment, organizational commitment, salary.

INTRODUCTION

Many HR professionals devote hours of their own time studying for HR certification exams. Once they become certified, those HR professionals devote their own financial resources and time to continuing education so that they can maintain certification. Over the years, a certified HR professional invests mental energy, time, and maybe even his or her own financial resources into certification. The main purpose of this study was to examine whether HR certification offers benefits to those HR professionals and their organizations. Another objective of this study was to explore antecedents of HR certification. What makes an HR professional more or less likely to become certified? Before exploring these topics, it might be helpful to provide the reader with some background on the history and variety of HR certifications available today.

History of HR certification

Before discussing the history of HR certification, it may be useful to differentiate between licensure and certification. HR is not a licensed profession, such as medicine or law. To practice medicine or law, for example, one must obtain a license from the state. The purpose of a license is to protect the public from incompetent practitioners. State regulatory boards determine who receives a license to practice in a licensed field. For many non-licensed professions, such as HR, a professional organization that represents the profession may create a certification to indicate that the possessor is able to meet certain standards of professional practice. Although certification is not required to practice, if the certification is recognized across the field as an indicator of professionalism, professionals will be motivated to acquire certification.

The American Society for Personnel Administration (ASPA) was established in 1948 and the creation of HR certification originated with the ASPA Accreditation Institute in 1973 (Leonard, 1998). Today, the ASPA has transformed into the Society for Human Resource Management (SHRM) and the ASPA Accreditation Institute has transformed into the Human Resource Certification Institute (HRCI) (Cherrington & Leonard, 1993; Wiley, 1992). While SHRM and HRCI are legally separate organizations and have separate governing boards, they are closely intertwined. In the past decade, the number of certified HRCI professionals has grown from 43,000 in 2000 (Aguinis, Michaelis, & Jones, 2005) to over 135,000 worldwide in 2015 (HRCI, 2015). Thus, close to 50% of SHRM’s worldwide membership of over 275,000 are certified by HRCI. SHRM and HRCI are headquartered in Washington, DC, USA.

According to Lester, Mencl, Maranto, Bourne, and Keaveny (2010), HRCI’s certifying exams are accredited by the National Commission for Certifying Agencies. HRCI offers three major certification exams: Professional in Human Resources (PHR), Senior Professional in Human Resources (SPHR), and Global Professional in Human Resources (GPHR). HRCI also offers the Professional in Human Resource (PHR-CA) and the Senior Professional in Human Resource (SPHR-CA) exclusively for the state of California. Lengnick-Hall and Aguinis (2012) point
out that there are six main topics for the PHR and the SPHR exams: strategic HR management, work personnel planning and employment, human resource development, total rewards, employee and labor relations, and risk management.

In addition to the HR certifications offered by the HRCI, there are other HR certifications available. For example, the Chartered Institute of Personnel and Development (CIPD) headquartered in London, England, is another association for HR professionals. It has over 135,000 members across 120 countries. It offers qualifying exams at foundation, intermediate, and advanced levels (Chartered Institute of Personnel and Development, 2015).

There are also HR associations devoted to more specific aspects of HR work. For example, WorldatWork is a non-profit organization that offers education and research related to global human resources subjects such as work environments, compensation, and benefits. Through WorldatWork Society of Certified Professionals, it offers its members five types of certifications (WorldatWork Society of Certified Professionals, 2015). With only 70,000 members and subscribers, WorldatWork lacks the clout of SHMR and HRCI or CIPD, but its certifications are highly recognized by compensation and benefits professionals (WorldatWork, 2015). The International Foundation of Employee Benefit Plans (IFEBP) is a non-profit organization that focuses on employee benefits, compensation, and financial education and information. It sponsors four certifications (IFEBP, 2015). The American Society for Training and Development (ASTD) which represents learning and development professionals, offers a certification called Certified Professional in Learning and Performance (CPLP) through the Association for Talent Development (Association for Talent Development, 2015). While other HR certifications exist, these are the best known and respected because they are backed by large, professional HR organizations.

Demand for HR certification

There is limited demand for HR certification in the HR labor market. For example, Aguinis, Michaelis, and Jones (2005) conducted a study of 1,873 HR job announcements on job hunting websites, such as www.monster.com, www.shrm.org, www.hotjobs.yahoo.com, and www.careerbuilder.com, for a period of one week. Results revealed that only nine job announcements required HR certification and only 70 job announcements preferred applicants with any type of HR certification. According to Aguinis, Michaelis, and Jones, there are few HR institutes or professional organizations (e.g., Society for Industrial and Organizational Psychology) related to employee selection and assessment that recommend or promote the use of HR certifications when hiring. These authors concluded that:

The field of HR needs to do a better job of gathering evidence about validity, utility, and lack of adverse impact regarding the use of certification in selection and assessment decision making. Once this evidence is collected, employers may perceive HR certification as a more critical signal of a job applicant’s future contributions (p. 160).

Perceived benefits of HR certification for employees

In spite of the limited demand for HR certification, many HR professionals invest their time and money to acquire certification. There are various reasons individuals seek certification. According to Wiley’s (1992) study, the reasons individuals pursue certifications include demonstrating one’s professional achievement, fulfilling personal satisfaction, helping in career advancement, enhancing one’s understanding of the field, and earning recognition from peers. Fertig (2011) analyzed the value of certifications to individuals from three perspectives: signaling theory, acquiring power, and intrinsic motivation.

Signaling theory. Earning a certification may help an individual make a favorable impression during a job interview (Fertig, 2011; Jones & Pittman, 1982). Signaling theory suggests that earning a certification is like sending out a signal to the potential employer that an individual has acquired the needed knowledge and competency in the field and has the capability to do the work (Dimaggio & Powell, 1983; Spence, 1973). Cohen (2012) pointed out that obtaining an HR certification shows an individual’s dedication to his or her HR career and the willingness to obtain up-to-date HR knowledge. It demonstrates that an applicant is more likely to work harder to achieve a higher level of advancement for his or her career. Thus, a potential employee with a certification may create a more positive image compared to other applicants without a certification.

Acquiring power to be influential. Rosenfeld, Giacalone, and Riordoan (1995) argued that one reason people acquire power is to be more influential. When an individual acquires a certificate, it may intimidate others (Fertig, 2011; Jones & Pittman, 1982) because it signals that he or she is more competent, more qualified, and capable of performing better. In group decision making, other HR professionals may defer to the certified employee’s judgments and, over time, the certified employee would be more likely to assume leadership positions.

Intrinsic motivation (personal satisfaction) of earning an HR certification. Obtaining a certification can boost a professional’s self-confidence and self-satisfaction (Wiley, 1992) and enhance his or her professional self-identity because he or she feels more competent and able to solve problems.
that employers have been relying more on certifications as the
certifications help organizations determine whether applicants
and salary level when HR job openings required or preferred
Alternatively, if HR professionals believe that
certification is related to higher pay and advancement, many
will be motivated to pursue certification for those rewards.
Anderson, Barrett, and Schwager (2005) found that HR
professionals with more than 10 years of HR experience valued
certifications more than those with less experience. Thus, if an
HR professional has a seasoned boss, becoming HR certified
might be a good idea. Also, certifications can be especially
helpful to professionals who lack the resources to earn a college
or advanced degree (Eck, 1993). Supporting this point,
Lengnich-Hall and Aguinis (2012) argued that HR professionals
who do not have college degrees or do not have a college
degree in an HR-related field would be the most likely to benefit
from earning an HR certification.

Perceived benefits of HR certification for employers

From the organization’s perspective, professional certifications
are used in many fields as an important selection tool to
identify qualified candidates. According to Chatman (1989),
certifications help organizations determine whether applicants
or employees can perform at an acceptable level or whether
they are appropriate for a certain position. Carter (2005) noted
that employers have been relying more on certifications as the
Hypothesis 1: HR professionals who perceive more benefits associated with being certified (e.g., better chances for getting hired or a greater sense of occupational identity) will be more likely to either have an HR certification or be planning to get one compared to those who perceive fewer benefits.

Hypothesis 2: HR professionals whose organizations support HR certification will be more likely to be certified or be planning to get certified than HR professionals whose organizations do not support HR certification.

Hypothesis 3: HR professionals who have an HR certification will be paid more than HR professionals who do not have an HR certification or who have no plan to get certified, after controlling for level of education and years of HR experience.

Hypothesis 4: HR professionals who have an HR certification or who are planning to get one will have greater affective organizational commitment than HR professionals who do not have an HR certification.

Hypothesis 5: HR professionals who have an HR certification or who are planning to get one will have greater occupational commitment than HR professionals who do not have an HR certification.

Method
Participants
We collected data by contacting every local chapter of the Society of Human Resources Management (SHRM) in fifteen different states. Four hundred twenty-two HR professionals responded. Seventy-five percent of the participants were women and 25% were men. The average age was 46 ($SD = 10.4$). Eighty percent of the participants were non-minority members and 20% were minorities. Two percent of the participants had only a high school degree, 15% had an associate’s degree or some college, 44% had a bachelor’s degree, and 39% had a graduate degree. Also, 30% of the participants had a specialized degree in Human Resources or Industrial-Organizational Psychology, 43% had a degree in Business, 17% had a degree in the Behavioral Sciences or Education (e.g., psychology, sociology and education), and 10% had a degree in some other subject. The average number of years of HR experience for the participants was 16 ($SD = 8.1$). The average income for the participants was between $60,001 to $80,000. An examination of the participants’ work places revealed that the organization size was between 100-1,000 employees for most participants and the average HR department size was four to five employees.

Measures

HR certification. This variable was measured with a one-item scale. The participants were asked, “Do you have any Human Resource certifications?” If they checked, “No, I do not, nor do I have any immediate plans to get certified,” they received a score of 1. If they checked, “No, I do not, but I certainly plan to get certified in the next year or two,” they received a score of 2. If they checked, “Yes, I am certified,” they received a score of 3.

Of the 422 participants, 71.2% had an HR certificate, 12.4% were planning to get one, and 16.4% had no plans to get one. We asked those with HR certifications whether they obtained certification before or after starting work with their current employer and 45.5% replied before, 49.5% replied after, and 5% replied some before and some after.

Certification motivation. This variable captured the participants’ motivation for obtaining an HR certificate. Participants were asked three questions about external motivation: (a) will be more likely to be hired, (b) will be paid more, and (c) will advance faster. Participants were also asked three questions about internal motivation: (d) will be more respected by fellow HR professionals, (e) will have greater knowledge of the HR field, and (f) will have a greater sense of occupational identity. This variable was measured with six items using a seven-point Likert scale which ranged from 1

Figure 1. HR certification model.
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( strongly disagree) to 7 (strongly agree). Coefficient alpha was 0.89 for this instrument, which indicates good internal consistency.

Organizational support for certification. This variable captured the amount of support the participants’ employers provided for obtaining an HR certificate. It was measured by asking whether their employers offered (a) training materials, (b) training instruction or classes, (c) time off for study, (d) exam fees, and/or (e) travel fees for instruction or for taking the exam. Participants simply responded yes or no. Coefficient alpha was 0.78 for this instrument, which indicated adequate internal consistency.

Salary. This variable was measured with a single item. Participants were asked to indicate their salary range. There were nine ranges to choose from, starting with “less than $20,000” and ending with “more than $100,000.”

Affective organizational commitment. This variable was measured using Meyer and Allen’s (1997) eight items with a seven-point Likert scale which ranged from 1 (strongly disagree) to 7 (strongly agree). In a study of 366 nursing students, Meyer and Allen found internal consistency of 0.82 for the affective organizational commitment measure. In our study, coefficient alpha was 0.87 for this instrument. It seems this instrument has effective internal consistency across the nursing and HR professions.

Occupational commitment. This variable was measured using a version of Meyer, Allen, and Smith’s (1993) six-item instrument with a seven-point Likert scale which ranged from 1 (strongly disagree) to 7 (strongly agree). In the same study of 366 nursing students mentioned above, Meyer, Allen, and Smith also found internal consistency of 0.82 for the occupational commitment measure. In our study, coefficient alpha was 0.85 for this instrument. Similar to the instrument above, it seems this instrument also has effective internal consistency across the nursing and HR professions.

Procedure

Before collecting any data, we visited each SHRM chapter’s web page online and contacted the chapter’s president. We asked each chapter president if he or she would help distribute the cover letter and survey to all of the chapter members. If the chapter president agreed, then he or she emailed each chapter member the cover letter explaining the study’s objectives and informed consent. Also contained in the letter was a link to an electronic version of the survey created by Surveymonkey.com. The survey was anonymous. Once the participants completed the survey, the results were immediately sent back to the data base and saved on Surveymonkey.

Unfortunately, our procedure made it difficult for us to determine our response rate because we did not contact the SHRM chapters’ members directly. Not only were we unsure of how many members each chapter had, we were unsure of which chapter presidents followed through on our request to contact their members. All we saw were the surveys that were returned.

RESULTS

Main research questions

The first hypothesis was that HR professionals who perceived more benefits associated with being certified would be more likely to either have an HR certification or be planning to get one. This hypothesis was supported (r = 0.31, p < 0.001). When we broke down the data by the types of benefits, we found all of them were significantly related to either having an HR certification or planning to get one. The types of benefits included: (a) more likely to be hired (r = 0.27, p < 0.001), (b) more likely to be paid more (r = 0.15, p < 0.01), (c) more likely to advance faster (r = 0.20, p < 0.001), (d) gaining more respect from fellow HR professionals (r = 0.33, p < 0.001), (e) greater knowledge of the HR field (r = 0.29, p < 0.001), and (f) a greater sense of occupational identity (r = 0.32, p < 0.001). Thus, more pay was the least critical motivator for obtaining an HR certification.

The second hypothesis was that employees whose organizations supported their HR certification efforts would be more likely to either have an HR certification or be planning to get one. This hypothesis was supported (r = 0.22, p < 0.001). To examine the impact of each type of organizational support (provided or not provided), we treated HR certification as a categorical variable and used chi-squared tests to examine independence. Specifically, we found that organizational support for training materials (χ²(2) = 19.1, p < 0.001), training classes (χ²(2) = 15.7, p < 0.001), and exam fees (χ²(2) = 16.7, p < 0.001) were all positively related to the percentage of participants who were certified. However, the relationship between the variables of time off for study (χ²(2) = 5.0, p > 0.05) and travel fees for instruction or for taking the exam (χ²(2)
The third hypothesis was that employees with HR certification or planning to get one would actually make more money. This hypothesis was supported. An ANOVA was used to investigate whether those with an HR certificate have higher salaries. They do ($F(2,320) = 10.3, p < 0.001$). Specifically, the average salary for those with an HR certificate was 7.1 ($SD = 1.46$) compared to those thinking about getting an HR certificate ($M = 6.1, SD = 1.63$) or those not thinking about getting an HR certificate ($M = 6.5, SD = 2.13$). To make some sense out of the three means, a score of seven indicated a salary range of $60,001 to $80,000, while a score of six indicated a salary range of $50,001 to $60,000. In other words, those who have an HR certificate appear to make about $5,000 to $10,000 a year more than those without one. Using a Tukey’s post hoc test, we found that the group with an HR certificate was significantly different from the two groups without an HR certificate. Thus, it was not enough to simply be planning to get a certificate.

We wanted to see whether HR certification would be able to predict salary after controlling for education level and years of HR experience. Using multiple regression, we found that all three variables added explanatory variance. We first entered education into the equation and its Beta coefficient was significant ($p < 0.01$). Next we entered years of HR experience into the equation and its Beta coefficient was significant ($p < 0.001$). Finally, we entered HR certification into the equation and its Beta coefficient was significant ($p < 0.01$). Together these three variables explained 29% of the variance in salary.

The fourth and fifth hypotheses stated that employees with an HR certification or planning to get one would have greater affective organizational commitment and greater affective occupational commitment. The relationship between HR certification and affective organizational commitment was not significant ($r = 0.06, p > 0.05$). However, the relationship between HR certification and occupational commitment was significant ($r = 0.28, p < 0.001$).

**Exploratory analyses**

In addition to the main hypotheses, we also examined other potential relationships in Figure 1. For example, we found that the HR professionals who received more organizational support for HR certification had greater affective organizational commitment than those who did not receive as much organizational support ($r = 0.23, p < 0.001$). We also found that organizational support for HR certification was not related to occupational commitment ($r = 0.06, p > 0.05$).

We found that the HR professionals who perceived more benefits of HR certification were more occupationally committed than those who perceived fewer benefits ($r = 0.29, p < 0.001$). However, the HR professionals who perceived more benefits of HR certification did not have greater affective organizational commitment ($r = 0.01, p > 0.05$). This was opposite the relationships found for organizational support.

Finally, we examined how the demographic variables (age, sex, minority status, education level, HR experience, HR department size, and organization size) were related to the criterion variables (HR certification, salary, organizational commitment, and occupational commitment). As can be seen in Table 3, the criterion variable that was most related to the demographic

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**Table 2. Organizational support and HR certification.**

<table>
<thead>
<tr>
<th>Organizational support offered by employer</th>
<th>No plans to get certified (%)</th>
<th>Plan to get certified (%)</th>
<th>HR certified (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training material</td>
<td>41</td>
<td>45</td>
<td>68</td>
</tr>
<tr>
<td>Training classes</td>
<td>38</td>
<td>52</td>
<td>67</td>
</tr>
<tr>
<td>Exam fees</td>
<td>42</td>
<td>43</td>
<td>67</td>
</tr>
<tr>
<td>Time off for study</td>
<td>20</td>
<td>24</td>
<td>35</td>
</tr>
<tr>
<td>Travel fees for taking the exam</td>
<td>22</td>
<td>19</td>
<td>31</td>
</tr>
</tbody>
</table>

Notes: 68% of the participants whose employers offered training materials for HR certification were certified, but only 32% of the participants whose employers did not offer training materials for HR certification were certified. 45% of the participants whose employers offered training materials for HR certification were planning to get certified, but 55% of the participants whose employers did not offer training materials for HR certification were not certified but planning to get certified. 41% of the participants whose employers offered training materials for HR certification were neither certified nor planning to get certified, but 59% of the participants whose employers did not offer training materials for HR certification were neither certified nor planning to get certified.
variables was annual salary. Not surprisingly, the HR professionals who made the most tended to be older, male, more educated, more experienced, and working in larger HR departments. Experience was the most powerful predictor of salary.

Also, there was a slight tendency for HR professionals with more HR experience and who work in larger HR departments to have greater occupational commitment.

**Discussion**

The main findings of our study are illustrated in Figure 2. The confluence of relationships between the motivation for HR certification, HR certification, and occupational commitment points to the importance of HR certification for professional identification. For example, the most important reasons for HR certification were gaining more respect from fellow HR professionals, a greater sense of occupational identity, and greater knowledge of the HR field. Being hired, receiving higher pay, and advancement, while important, were less predictive of HR certification. These results are consistent with Blau, Fertig, and Zeitz’s (2009) findings that an important benefit of earning professional certification is to enhance professional self-identity. Fertig (2011) found that employees with the internal motivation to get certified evinced greater occupational commitment and job competency because they were more dedicated to their work and they pursued personal achievement in their career. So it seems the primary reasons HR professionals obtain HR certification are to enhance how they feel about themselves, how they feel about their relationship with the HR profession, and how they are viewed by fellow HR professionals. None of those rewards puts money in one’s pocket, but they all feel good.

Does HR certification increase one’s chances of getting hired, being promoted, or receiving higher pay? Lester, Mencl, Maranto, Bourne, and Keaveny (2010) found that those with PHR certificates were more likely to be hired than those without a certificate. On the other hand, Aguinis, Michaelis, and Jones (2005) found that few organizations ask for HR certifications when hiring HR professionals. In our study, we found that HR professionals with certifications have higher salaries than HR professionals without certifications, even after controlling for the effects of education and years of HR experience. Chatman (1989) observed that certifications can be used to determine whether employees can perform at an acceptable level of performance or whether they are appropriate for a position. Thus, an organization may be willing to pay more for an employee if it feels more certainty about what it is getting with that employee. This is consistent with Cohen’s (2012) proposition that certified HR professionals should have higher salaries than uncertified HR professionals because they bring extra credentials which can enhance the trust of organizational stakeholders. Eck (1993), Blau, Fertig and Zeitz (2009), and Lengnich-Hall and Aguinis (2012) suggested that certifications can improve employees’ likelihood for obtaining higher salaries. Spence (1973) used signaling theory to explain how certification can be tied to higher salaries. He argued that certification can help to promote an employee’s appearance of job competency. Even if certified HR professionals are not superior performers,
the belief that they are can lead to more pay or better advancement opportunities.

When organizations offer support for HR certification, the participants in our study were more likely to be certified or planning to become certified. One reason for this result could be that support is a way for an organization to communicate to an employee that they value organizational commitment. This could serve as a subtle form of pressure in the form of “you do not have to do it, but it is recommended.” Another reason may be that when organizations are offering a positive workplace, employees may see this as an opportunity to take advantage of organizational resources for self-gain. Another explanation could be that support reflects an organization’s investment in its employees’ development, which could make HR employees feel more valued and, subsequently, be more likely to invest their time and mental energy to improve themselves.

Lee and Bruvold (2003) argued that organizations that invested more in employee development would be more likely to have employees with higher affective organizational commitment because the employees would perceive the organizations as caring about their career development. Blau, Fertig, and Zeitz (2009) argued that employees who worked hard to become certified would become more committed to their organization. We did not find this to be the case. While HR certification was related to occupational commitment and salary, it was not related to affective organizational commitment. One possible reason for this result could be that many of the employees were already certified before joining their employer, so they did not connect certification to their organizational membership. Or perhaps they obtained their certification while employed by their current employer, but they received no support in obtaining their certification.

Our results suggest that those with an HR certification focus their sense of identity more on what they do, not where they do it. This is consistent with research on workers from individualistic cultures, such as America, where the focus is more on individual goals than the whole group (Hofstede, 2001; Li & Karakowsky, 2001). It is also consistent with research on the specialized career paths of Western workers (Ouchi, & Jaeger, 1978).

If HR certification does not improve an employee’s affective organizational commitment, an organization may legitimately ask why it should contribute resources to help its HR professionals get certified. The answer is that it is not getting certified that is the key, it is offering organizational support for HR certification that is the key to affective organizational commitment. We found that the HR professionals whose organizations offered support for HR certification had greater affective organizational commitment. Thus, perhaps it is not whether the employees take advantage of that support, but simply their awareness that the organization is concerned about their professional development. Because affective organizational commitment is related to a host of positive organizational attitudes and behaviors, as Meyer, Stanley, Herscovitch, and Topolnytsky (2002) found in their meta-analysis of organizational commitment, offering support for HR certification could be an investment with a positive return. In addition, word of mouth advertising about that organization’s support of its HR professionals’ development could also improve recruitment of quality HR people.

The three types of organizational support that were most related to certification were providing training materials, training classes, and exam fees. In Porter and Lawler’s (1968) model of performance, they posit that performance is influenced by three factors: motivation, ability, and situational constraints. By offering its employees support, an organization is removing important situational constraints, such as a lack of time and money, and providing motivation by signaling to employees that HR certification is seen as important to the organization.

Several demographic variables were related to salary: age, sex, education, and years of HR experience. Regarding age and experience, older and more experienced HR professionals make more money. This is hardly surprising. Aguinis, Michaelis, and Jones (2005) found that there is a greater demand for experienced HR professionals, such as HR directors and specialists, in the job market than for lower level HR jobs, and it takes time to acquire the knowledge and skills for these jobs.

Regarding education, those with more traditional education tend to make more money. This may be because HR professionals with graduate training in business or I-O psychology use their knowledge to perform better than their peers, and hence move up into better paying positions. Or it could be that the same skills that allow an individual to acquire graduate training, good work habits and cognitive ability, also allows them to succeed in the work place. Or it could be that educational degrees act as a passport to higher paying jobs if they are a job requirement. Perhaps all three play a role.

Regarding the sex of an HR professional, men make more money than women. It could be argued that HR is a female profession. For example, 73% of our participants were women. However, the men in this profession make significantly more money than the women. The subject of pay discrimination is beyond the scope of this study, but it seems the HR profession is not immune from the glass ceiling.

LIMITATIONS AND FUTURE RESEARCH

One limitation of this study is the homogeneity of the participants. They were members of local SHRM chapters.
Thus, the sample does not accurately represent the entire population of HR professionals. We would have liked more compensation and training professionals. Also, most of the participants were HR certified and more than half of them were in the position of HR manager or higher. Therefore, the sample underrepresented HR employees in lower level positions who are not certified. Future studies on a more heterogeneous sample of HR professionals are needed. For example, we would like to explore the benefits of other HR certifications, such as those related to compensation, benefits, and training.

In addition to external validity issues, the main threat to internal validity was the fact that we did not manipulate any variables. Thus, we were unable to make any causal inferences. Also, the new instruments that we developed to assess certification motivation and organizational support for certification are new and untested. While they had acceptable internal consistency, there may have been parts of each construct domain that our instruments failed to capture. Finally, all of the instruments were self-report measures, which make our findings subject to mono-method bias. Future studies on how HR certification impacts hiring and promotion decisions, in addition to pay, are needed. As Aguinis, Michaelis, and Jones (2005) suggested, more research on the validity of HR certifications as a selection tool is needed. Longitudinal studies that follow HR professionals with and without certifications might shed more light on the predictive validity of HR certification.

CONCLUSION

Although Hyland and Muchinsky (1990) found no significant relationship between professional certifications and one’s job performance, there are still many advantages to certification for the HR professional. From a pocketbook perspective, we found that HR certification was related to higher pay. Although the pay difference was only on the magnitude of $5,000 to $10,000, over the course of a career that could add up to a considerable sum of money, more than enough to justify the investment in time and money required to obtain and maintain HR certification. In addition, obtaining an HR certification can serve as a symbol of professional competence and achievement both to oneself and others. We found that HR certification was related to greater occupational commitment. Perhaps the hard work required for certification creates cognitive dissonance so that the individual needs to justify his or her efforts by becoming more committed to his or her profession. In addition, if one’s co-workers view the HR certification as a symbol of competence, this can create a Pygmalian Effect in which other people’s beliefs and high expectations cause the certified professional to live up to those expectations and become a better performer (Eden & Shani, 1982; Rosenthal, 1973).

Although Aguinis, Michaelis, and Jones (2005) found low demand for HR certification in HR job announcements, our research indicated that offering organizational support for HR certification was related to the affective organizational commitment of an organization’s HR professionals. While this result was only correlational, we would recommend carrying out research to see whether offering training materials, training classes, and offering to pay for exam fees for HR certification enhance HR professionals’ affective organizational commitment, which is related to many positive organizational outcomes.

REFERENCES


Using ArcGIS to quantitatively measure sketch map quality for the comparison of theoretical frameworks of spatial microgenesis

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Spatial microgenesis describes the method through which individuals build mental maps of their environment. Understanding of the process was strongly influenced for many years by the dominant theory of Siegel and White (1975), which presents a three-step process. More recently, the continuous theory (Montello 1998) presents a more nuanced view of the process. In comparing the two theoretical frameworks, ArcGIS’s georeferencing tool is used to quantitatively assess sketch map metric accuracy. While the continuous framework provides a better explanation of spatial microgenesis, both frameworks fall short in regards to improving knowledge over time. The method of using georeferencing to assess sketch map quality was found to be a practical and straightforward approach to assessing metric accuracy of sketch maps.

Keywords: spatial microgenesis, sketch map, cognitive geography, ArcGIS.

INTRODUCTION

As humans, we make use of spatial skills every day. While we now have a wide array of GPS-enabled technologies to help us with the daily task of navigation, we all must rely to some degree on our internal mental abilities. It may happen consciously or subconsciously, but through the process of spatial microgenesis, we create cognitive maps of the environments we inhabit. Since Trowbridge (1913) first introduced the idea to the world and Tolman (1948) coined the phrase, the cognitive map has been important to our understanding of how we think about and recall spatial layouts. Cognitive maps serve our navigational needs by answering four important questions: …whether to go somewhere; why go there; where [the destination is]; and how to get there (Kitchin 1994, pg. 7). These vital questions apply whether we are talking about navigation within a building, across town, or across the globe. Today, mental maps are considered to be important enough to geographic thought that they are included as one of the 18 geographic knowledge standards compiled by the National Council for Geographic Education (National Council 2015).

There are multiple ways to measure an individual’s internal cognitive map(s) and one of the most commonly used is the sketch map. These sketch maps, historically hand-drawn on paper, are useful for understanding individuals’ knowledge and perceptions of the world and its spatial layout (Appleyard 1970, Blades 1990, Cadwallader 1979, Lloyd and Heivy 1987, Lynch 1960, Wong 1979). This study explored spatial microgenesis and used sketch maps to measure the accuracy of spatial knowledge. The focus is on a quantitative measure of sketch map quality, or locational accuracy, using Esri’s ArcGIS software to measure accuracy in an attempt to better understand spatial microgenesis.

Spatial microgenesis is the process that describes how people acquire knowledge about the spatial layout of the world around them (Montello 1998). Spatial microgenesis has also been referred to as ‘cognitive mapping’ by Downs and Stea (1973), who used a similar definition of the process: Cognitive mapping is a process composed of a series of psychological transformations by which an individual acquires, codes, stores, recalls, and decodes information about the relative locations and attributes of phenomena in his everyday spatial environment (pg. 9). Other researchers have also discussed this process and what it entails, such as Golledge and Spector’s (1978) Anchor-Point Theory and the influential views of Siegel and White (1975). Siegel and White explained it as a progression through three states of spatial knowledge: landmark, route, and survey knowledge. In this framework, landmarks are objects that stand out from the surrounding area and are remembered as ‘snapshots’ or images. Using landmarks, route knowledge is subsequently generated as a series of pathways from one landmark to the next in a linear fashion. As many routes grow and overlap, they reach the final stage of survey knowledge, which is an allocentric, metrically scaled (meaning it represents accurate geometric properties of space), map-like mental representation of space. This survey state is a sophisticated understanding of space in which individuals can create and navigate through novel pathways based on the completeness of their knowledge of the space.

Siegel and White’s theoretical framework has been an important influence on the thinking about the subject for many years, and has come to be referred to as the dominant framework of spatial microgenesis. More recent work by Montello (1998) expands and clarifies the dominant framework with what is referred to as the continuous framework. Broadly speaking, the continuous framework describes spatial microgenesis as a process in which people continuously gather and integrate

Spatial microgenesis is the process through which individuals build mental maps of their environment. Understanding of the process was strongly influenced for many years by the dominant theory of Siegel and White (1975), which presents a three-step process. More recently, the continuous theory (Montello 1998) presents a more nuanced view of the process. In comparing the two theoretical frameworks, ArcGIS’s georeferencing tool is used to quantitatively assess sketch map metric accuracy. While the continuous framework provides a better explanation of spatial microgenesis, both frameworks fall short in regards to improving knowledge over time. The method of using georeferencing to assess sketch map quality was found to be a practical and straightforward approach to assessing metric accuracy of sketch maps.

Keywords: spatial microgenesis, sketch map, cognitive geography, ArcGIS.
Reaction time measurement with force plates

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Reaction time (RT) is an index of the time required for movement preparation that depends on a variety of task, situation, and personal characteristics and is a relatively enduring characteristic of an individual (Magill, 2011). Reaction time measurements can be based on the activation of a switch or onset of changes in pressure as movement is initiated. We compared simple and choice RT from finger and foot movements on a switch with foot movements on force plates. The purpose was to compare the effects of these different methods of measuring RT. The sample consisted of 25 college students. Each participant completed 12 trials in each of 5 conditions: (1) simple visual RT with the dominant index finger pressing a switch, (2) 2-choice visual RT using either index finger to press a switch, (3) simple visual RT lifting the right foot from a force plate, (4) 2-choice visual RT lifting either foot from a force plate, and (5) simple visual RT pressing a switch with the right foot. Comparisons revealed no RT differences between pressing a switch with a finger versus a foot and significant correlations for two out of six possible comparisons. RT based on pressure changes was shorter than RT based on pressing a switch. These results help to demonstrate the differences between RT measurement methods for different body parts.

Keywords: reaction time measurement, movement initiation detection.

INTRODUCTION

Reaction time (RT) has traditionally been defined as the interval of time between presentation of a stimulus and initiation of a response (Magill, 2011). What specific event defines initiation of the response? This event often refers to the depression—or in some cases the release—of a response key or switch. Although this method of determining the exact moment of response initiation has been widely used, various methods have been reported (Kosinski, 2006). For example, one method involves identifying onset of electrical activity in the agonist muscle or muscles using electromyography (EMG) equipment. This method is known as fractionated RT since it involves dividing the RT period into two fractional periods. The first period is the time between the presentation of the stimulus and onset of electrical activity in the effector muscles for the response. This has been labeled the pre-motor period, and it is taken to represent the time needed for the central processing to occur (Magill, 2011). This second RT interval period is the motor period when temporal summation occurs in the effector muscles, but it is not yet sufficient to cause an observable movement of the body part. Temporal summation refers to the stimulation of the muscle in order for it to contract more rapidly than it can relax. This stimulation results in progressive shortening and increased tension. The length of the motor period covaries with the moment of inertia of the body part that would have to be moved for the response. Since larger body parts have more weight and inertia, they show longer motor periods because they require more temporal summation to produce movement of the body part (Anson, 1989).

Another method that identifies initiation of response involves detection of onset of force or pressure development. This method has practical applications such as monitoring false starts in competitive situations such as sprint starts in track and field (Pain & Hibbs, 2007) by using sensors in the starting blocks that are sensitive to the force exerted on them by the athlete’s shoes. In 1942, Franklin Henry designed an apparatus to study the forces that a sprinter exerted on the starting blocks. Modern apparatuses permit a more accurate measurement of these forces. The governing body of track and field operates under the assumption that no sprinter should be able to react faster than 100 milliseconds (Pain & Hibbs, 2007). By monitoring the forces exerted by the athlete on the starting blocks, authorities can determine whether a runner should be charged with a false start when the forces show too much change prior to 100 milliseconds after the starting gun has been fired. The specific changes in the forces that flag the runner for a false start seem to be proprietary trade secrets and possibly vary with specifications of various manufacturers of starting blocks.

Staude, Flachenecker, Daumer, and Wolf (2001) find identification of onset of EMG activity particularly important in RT research (p. 67). Although several methods have been developed for this purpose, they express the need for more objective and comprehensive measures that determine accuracy in onset detection in SEMG [surface electromyography] (p. 67). In addition to the subjectivity of the event that defines initiation, the methods used to identify onset of RT lack well-defined procedures. The most frequently
used RT lab tasks define initiation of the response as the completion of a movement in terms of pressing a response key. Since muscular activity must occur before force is developed and force must be developed before movement occurs, these two phenomena would logically comprise the sequence of events that occur in all movement-based RT responses. The literature inadequately characterizes a sequential chronology of these events.

We conducted research to gain insight into the chronology of RT by comparing the traditional method of using a switch to measure RT to a method based on force plates. In addition to comparing the switch-based method to a method based on measuring force changes, we also compared RT measurements derived from different body parts, such as fingers versus legs. This was done so that we could detect potential interactions between the two methods of measurement and the various body parts measured.

Using force plates to measure RT based on leg movements is comparable to the method used in starting blocks used in track and field events. However, we developed the method used in the study in order to determine initiation of the response since we needed a system that would allow the determination of response initiations based on changes in the force exerted on a force plate. If successfully employed, this method would provide insights into the chronology of RT by indicating the influence of the method of detection on the various body parts. In addition, we wanted to find out if RT measurements based on different body parts and different types of measurement would be correlated. If RT is a relatively enduring characteristic of an individual, then, although various factors would increase or decrease RT, any specific measure of RT should correlate between individuals. In other words, someone identified with a faster than average RT would appear faster than average consistently relative to someone with slower than average RT, regardless of the method of measurement.

**HYPOTHESES**

We hypothesized that: (a) RT based on finger tasks would be shorter than RT based on foot movement tasks; (b) RT based on finger tasks would correlate with RT based on foot movement tasks; and (c) RT based on pressure changes would be shorter than RT based on moving a switch.

**METHOD**

The study included 25 college students comprised of 14 males and 11 females, ages 21-25 years. We considered additional variables or such as handedness, mass or overall health conditions irrelevant due to the relatively small sample size.

**Apparatuses**

The apparatuses used for the finger-based RT tasks was a Lafayette Visual Choice RT (Model 63035), including the Response Panel (Model 63035) and Stop Clock (Model 54030). All equipment was manufactured by the Lafayette Instrument Company in Lafayette, Indiana. We built the apparatuses used for the pressure-based RT tasks and the foot switch RT task and used Vernier force plates (model FP-BTA) to acquire the force-based data. The foot switch used was an on/off foot pedal used by electronic keyboard musicians. Data acquisition from both RT devices involved the construction of a custom electronic circuit with an embedded processor. We combined a Parallax BS2px-IC processor and specialized integrated circuits for data storage, timing, and analog to digital conversion to form the acquisition device which was capable of acquiring 250 samples per second with a resolution of 4 milliseconds.

**Procedures**

After completing an informed consent form, each participant completed RT tests in five different conditions. Prior to testing in each condition, participants received written instructions and completed two practice trials. Following the practice trials, we recorded the results from 12 test trials for each participant in each of the five conditions. To avoid any session effects, we randomized the presentation of the five conditions across participants.

Condition 1 was a simple visual RT based on a finger pressing task designed to mimic a common RT test condition. Participants were seated with the index finger of their dominant hand resting on the response button directly below a colored light identified as the stimulus. Participants were unable to view the initiation of the stimulus, and they received an audible warning – the word ready – from us. Prior to initiating the stimulus, we used a two to four second variable foreperiod. Participants then pressed the response button as quickly as possible on detection of the stimulus light. We then recorded the results in milliseconds from the Stop Clock—without feedback to the participants—and proceeded to the next trial until 12 trials were recorded.

Condition 2 was identical to Condition 1 except that a two-choice RT test was used. Participants began with the right hand index finger resting on the button below the colored light on the far right side of the apparatus and their left index finger resting on the button below the light on the far left side of the apparatus. Participants were asked to press the button under whichever side the stimulus light was illuminated as quickly as possible. Apart from the two-choice aspect, the
testing was conducted in a manner identical to that used with Condition 1.

In Condition 3, participants stood on two Vernier force plates with one foot on each plate. The plates were arranged side by side so that participants could stand on them in a natural position with their feet about shoulder width apart. In this condition, the stimulus was a colored light mounted on a circuit board which was mounted directly to the standing eye-level of the participant. Participants were instructed to lift the right foot off the force plate as quickly as possible on detection the stimulus.

In Condition 4, also using the force plates, the task was identical except that the task was modified to parallel the two-choice finger task. Specifically, participants were asked to lift either the right foot or the left foot as quickly as possible to correspond with the position of the illuminated stimulus. As in the two-choice finger task, the stimulus was mounted either towards participants’ right side or towards participants’ left side.

In Condition 5, participants were instructed to stand with the right foot resting on the foot switch. The stimulus was a single colored light positioned similarly to Condition 1. We asked the participant to press the foot switch as quickly as possible upon detecting the stimulus.

**Data Treatment**

Correlations were computed between all combinations of the five RT conditions. Paired sample t-tests were used to test for possible differences between the one-finger task and the foot switch task and for the one-choice foot/force and the one-choice foot/switch conditions. Alpha levels were adjusted with Bonferroni correction.

**RESULTS**

Results are presented in Tables 1 and 2. Each of the 25 participants responded to 12 trials in each of the 5 conditions, with a total of 1500 responses in the study (see Table 1). The mean response time in milliseconds ranged from 214 for the 1-foot/force plate to 303 for the two-finger press, with a difference of 89 milliseconds. The standard deviations among the five response conditions ranged from 19 milliseconds for the 2-finger press to 32 milliseconds for the 1-foot/switch. Between the responses measuring finger-generated responses, the 1-finger press required less time (M=257 ms) than the 2-finger press (M=303 ms), but there was less variability between the 2-finger press (SD =19 ms) and the 1-finger press (SD =28 ms). The three conditions measuring the foot/feet body movements ranged in time from 1-foot/force plate (M=214 ms) to 2-foot/force plate (M=233 ms) to 1-foot/switch (M=270 ms). The variation for foot-generated movements ranged from the 2-foot/force plate (SD =22 ms) to 1-foot/switch (SD =25 ms) to 1-foot/switch (SD =32 ms).

<p>| Table 1. Means and standard deviations for each of the five response conditions |</p>
<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean (milliseconds)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-finger press</td>
<td>257</td>
<td>28</td>
</tr>
<tr>
<td>2-finger press</td>
<td>303</td>
<td>19</td>
</tr>
<tr>
<td>1-foot/force plate</td>
<td>214</td>
<td>25</td>
</tr>
<tr>
<td>2-foot/force plate</td>
<td>233</td>
<td>22</td>
</tr>
<tr>
<td>1-foot/switch</td>
<td>270</td>
<td>32</td>
</tr>
</tbody>
</table>

| Table 2. Correlations and p-values (in parentheses) between each of the response conditions |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                  | 1-finger press  | 2-finger press  | 1-foot/force plate | 2-foot/force plate |
| 1-finger press | — | 0.48 (0.014) | -0.06 (0.764) | 0.30 (0.142) | 0.44 (0.026) |
| 2-finger press | — | — | 0.46 (0.022) | 0.56* (0.004) | 0.41 (0.042) |
| 1-foot/force plate | — | — | — | 0.66* (<0.001) | 0.02 (0.927) |
| 2-foot/force plate | — | — | — | — | 0.22 (0.301) |
| 1-foot/switch | — | — | — | — | — |

Butler and Pheatt
As shown in Table 2, only two of the ten correlations were significant at the Bonferroni-adjusted alpha level of 0.005. There was no significant difference between the one-finger task and the foot-switch task, \( t(24) = -1.90, p = 0.04 \). There was a significant difference between the 1-choice foot/force condition and the 1-choice foot/switch condition, \( t(24) = -7.06, p < 0.001 \).

**Discussion**

The findings did not support our first hypothesis which was that RT based on finger tasks would be shorter than RT based on foot movement tasks. We compared the Condition 1 one-finger with the Condition 5 foot switch tasks to test this hypothesis. This was the only comparison used with RT based on finger press with a foot movement tasks, but both conditions involved a similar type of measure with a switch-based measurement. The lack of a significant difference between these tests is unexpected and difficult to explain unless it was due to a lack of statistical power or possibly an insufficient sample size.

The second hypothesis was that RT based on finger tasks would correlate with RT based on foot movement tasks. As shown in Table 2, only one of the six pairs of correlations between finger and foot tasks was significant at the adjusted alpha level. Therefore, this hypothesis was not supported. This result fails to support the idea that RT is a single motor ability as suggested in the literature (Magill, 2011). However, given the relatively small sample size and the conservative nature of the Bonferroni correction used, this is not a strong finding. The majority of the correlation values are sizable with four of the non-significant correlations being greater than .40. So while this result does not support the hypothesis, again, it may reflect insufficient statistical power.

The third hypothesis was that RT based on pressure changes would be shorter than RT based on moving a switch. This hypothesis was supported. However, only one comparison addressed this hypothesis without confounds, the comparison between Conditions 3 and 5, the 1-choice foot/force and the 1-choice foot/switch, respectively.

Although RT is thought to be a single motor ability (Magill, 2011), many factors affect RT (Kosinski, 2006). It was expected that RT would vary according to the known factors and circumstances of the conditions, but our results were not well-aligned with this expectation. It was also expected that all conditions would correlate. Surprisingly, this was not the case.

As previously suggested, this may have been due to a lack of statistical power; otherwise, this becomes an interesting result. It may turn out that there were unidentified factors that varied between measurement conditions that affected the correlation. It is also possible that the statistical methods used to analyze the data generated artifacts (Whelan, 2008). The typical pattern that resulted from the force plate method of measurement in the majority of participants first increased force on the plate before reducing the force and lifting the foot from the plate. This unexpected pattern would influence the force plate method of detection, but it would not influence the RT measurement if a switch was used.

Results of this research suggest that further research is needed to better understand the chronology of RT. One approach would be to measure onset of EMG, force development, and the movement of a switch for the same experimental trials using various body parts. That approach should show the entire chronology and reveal the relative timing between the different events. In addition, stronger and more direct comparisons between the different events and different body parts are needed. Although RT measurements based on different events or different body parts would necessarily differ, if RT is a single motor ability, then all variations of the measurement should correlate. If this is not the case, then the nature of RT as a single motor ability may need reexamination.

**References**


metrically scaled spatial information about the environments they inhabit. One of the largest differences between Montello’s work and the dominant framework is that the continuous nature of Montello’s framework shows that people gain metrically scaled survey knowledge from the first exposure to place, and that no states of pure landmark or route knowledge will exist. This lack of pure landmark and route information is the first tenet of the dominant framework. The second tenet states that as experience with a place grows, so too will knowledge, while the third tenet states that the integration of separately learned places into a hierarchically organized knowledge structure is a sophisticated step in the process. The fourth tenet says that given the same level of exposure to a place, different individuals will have different amounts of knowledge. Large differences in individual ability have been found in prior work, and this has made it difficult to make general statements about the process of spatial microgenesis. Finally, the fifth tenet states that linguistic systems provide for the existence of relatively pure topological, or non-metric, knowledge of space. Such non-metric knowledge exists in addition to metric spatial knowledge, not as a required precursor or intrinsic component (Montello 1998).

In this study, the first two of the tenets of the continuous framework were compared to the dominant framework’s description of spatial microgenesis. The first hypothesis indicates if the first tenet is correct, upon an initial exposure to a novel environment there will be no evidence of pure landmark or route knowledge lacking metrically scaled spatial knowledge. Regarding the second tenet, the hypothesis was that knowledge of space will grow over repeated exposure. Both frameworks posit this growth, albeit in different ways. These tenets were tested by measuring individuals’ spatial recall of a novel environment, partly through drawing sketch maps (for a larger examination, see Aber 2012).

Measuring ‘quality’ of sketch maps can be a subjective process. Certainly, the numbers and types of objects on the map can be measured, or the overall usefulness of a sketch map can be assessed as if it were to be used as a navigational aid, but quantitatively measuring the metric accuracy of sketch maps is a more complex undertaking. Various approaches have been used in the past including using a panel of ‘experts’ to judge map quality (Billinghurst and Weghorst 1995). This approach helps to remove some of the subjectivity found in a single researcher’s analysis of map quality, however it still retains a subjective element. Bidimensional regression, which is a standard statistical regression extended to compare two-dimensional distributions, was pioneered by Tobler (1965, 1966, and 1994). His approach has also been used to assess map quality and provides as close to an objectively quantified sketch map quality metric as can be expected given the imperfect nature of sketch maps. It has been used to measure the accuracy of sketch maps in both the psychology and geography worlds (Friedman and Kohler 2003, Ishikawa 2002, Ishikawa and Montello 2006).

In the process of exploring the two frameworks of spatial microgenesis, this study used ArcGIS’s georeferencing tools to measure map quality. Other studies have used ArcGIS to measure sketch maps, although in slightly different contexts. Polonsky and Novotny (2010) vectorized participant sketch maps in order to understand students’ conception of the location of major world regions. In their study, paper sketch maps were scanned as raster images (a format that stores image information as a grid of pixels) and regional boundaries were converted into a vector GIS format. As vector data, continents were represented as polygons, as opposed to the pixels that made up the original raster scans. The vector data were loaded into ArcGIS 9.1, where the maps were overlaid to generate a map showing the generalized locations of regions as perceived by participants. The accuracy of individual sketch maps was explored using the borderline-strengthening method in an aggregate approach as a way of understanding broad conceptions of the layout of the world’s regions. Tu Huynh and Doherty (2007) skipped the paper step entirely and had participants draw their sketch maps using tablet PCs. The process and output of drawing were recorded and analyzed in order to understand the sequence of the sketch map creation process. For the current study, the use of tablet PC input was not an option, and so a combination of paper sketch maps and digital manipulation was used to measure the quality of individuals’ spatial knowledge.

Methods

Fifty-eight participants were recruited from undergraduate geography courses at Kansas State University and compensated for their time in extra course credit. The data collection procedure allowed the participants ten minutes to explore a virtual environment on a desktop PC after being instructed to pay attention to the location of eight specific landmarks in the environment. The virtual environment was a modified forested scene from the video game Left 4 Dead. The area itself is a winding path that allows for quite a bit of lateral movement in some areas, but still leads participants from a starting location to an end point. Participants were not limited to following the path from start to finish, they could backtrack and navigate in any manner they desired during the ten minutes. Following exposure to the environment, they were presented with direction, distance, and sketch map drawing tasks in order to measure their ability to recall the metric configuration of the environment. For the sketch map task, participants each received a blank 8.5x11-inch piece of paper and were instructed to draw a map including the eight landmarks. No further instructions were provided regarding how the maps should be drawn. Some participants asked if they should include specific features from the environment.
beyond the eight landmarks, and were informed that they could draw anything they felt should be included. This routine of exposure to the environment followed by tests of spatial recall ability was repeated three times over as many weeks. At the end of this period, three sketch maps per participant were collected for a total of 174.

Much like Polonsky and Novotny (2010), sketch maps were hand-drawn on paper, and a digital transformation was necessary in order to leverage ArcGIS’s spatial capabilities. First, the paper maps were scanned as digital raster images. The scanned images were processed by adjusting the brightness and contrast for readability and also to remove empty white space on the page. Not all participants used the entire page to draw their maps and the size of the map on the page does not reflect relative positional accuracy between the landmarks. The maps were rotated so that the direction considered north in the virtual environment was at the top of the images.

After the 174 participant maps were prepared, the reference map and the participant maps were loaded into the ArcGIS 9.3.1 software for georeferencing (ESRI, Redlands, CA). In typical usage, georeferencing involves taking control points with known geographic coordinates from a reference layer and tying them to a target layer in order to transfer a known coordinate system to the target. This is often used in the context of transforming satellite or aerial imagery for geospatial analysis. During the process, error is measured for each control point, indicating how far in map units from the correct location each point is. The final result is a combination of the error for all control points between the layers. This root mean square error (RMSE), is described by Esri as follows:

When the general formula is derived and applied to the control point, a measure of the error—the residual error—is returned. The error is the difference between where the ‘from’ point ended up as opposed to the actual location that was specified—the ‘to’ point position. The total error is computed by taking the root mean square (RMS) sum of all the residuals to compute the RMS error. This value describes how consistent the transformation is between the different control points (links). (ArcGIS Desktop Help 2013)

The level of accuracy in participants’ ability to recall the layout of the virtual environment was assessed quantitatively by looking at the RMSE values returned for each sketch map. Although ArcGIS 9.3.1 was used in this study, the process is identical in newer versions of ArcGIS such as 10.0, 10.1, and 10.2.

The eight landmarks from the virtual environment were used as the control points for the georeferencing of each participant’s map. The positioning of control points can introduce error, and although it assumes participant intent, the center of each drawn object was used as the position of the control point in order to be consistent from one map to the next. In some cases, participants drew an ‘X’ next to a label to indicate landmark location; in these cases the center of the X was used as the control point. In ArcGIS the control points were connected between the real and sketch maps by clicking first on the location on the reference map, then again on the corresponding location on the sketch map. Figure 1 shows an in-progress view of georeferencing, with the links between reference and sketch map visible. The order in which the points were connected was consistent across all participant maps starting from the ‘first’ landmark to be seen (the one visible when the virtual environment first loads) to the ‘final’ landmark in the environment (the one farthest from the initial starting point). The transformation used was the first-order polynomial affine, which allows for rotation, scale change, and translation of the raster image. For maps that had high levels of distortion (such as landmarks wildly out of order), it was not possible to complete the georeferencing process, as the map became so distorted during the process that it was impossible to interpret visually.

Maps with high levels of accuracy had RMSE values between 50 and 100, while maps with high error (but still capable of being georeferenced) fell within the range of 400-540. Maps that had landmarks wildly out of order and were incapable of being georeferenced were initially given an arbitrary RMSE value of 999. However, these numbers skewed statistical analyses dramatically, so a value of 550 was settled on to both reflect the poor quality of the knowledge and fall outside the upper bound of valid observations. Of course, RMSE values are reported in map units, and since in this instance neither the reference map of the virtual environment nor the sketch maps had a true spatial reference, this number was reported in pixels. The reference map was 2000x2469 pixels in size; if the reference map were to change in size, the RMSE range would be different. For example, if the reference map had fewer pixels in it, the range of RMSE values would also shrink. When measuring sketch maps, the upper bound of the range must be considered on a case by case basis given the scale and units of the reference map in question.

**RESULTS**

Once the georeferencing was completed and numbers representing quality were associated with the maps, it was possible to use statistical tests to compare elements of the theoretical frameworks of spatial microgenesis. The primary question of the study was testing tenets of Montello’s continuous theoretical framework for validity and comparing them to Siegel and White’s dominant framework. The analyzed sketch maps were used to test the first and second tenets of
the continuous framework. If the first tenet of the continuous framework of spatial microgenesis was correct, all sketch maps must have some form of metric knowledge contained within them, even if it is a poor level of knowledge. In order to determine if a stage of pure landmark or route knowledge (that is to say knowledge without metric information) existed in any of the sketch maps, 44 sketch maps were acquired from the first exposure to the virtual environment (the larger study involved some participants who were allowed to view a map prior to entering the virtual environment, see Aber 2012). These maps were qualitatively categorized into four groups: landmark, route, survey, and other. Qualitatively speaking, virtually all of the maps were definitively described by the three categories provided by Siegel and White’s dominant framework. Landmark maps contained nothing but, route maps were linear pathways strung among landmarks, and survey maps were more complete and map-like, including additional supplementary spatial information, such as the shapes of the land areas the route covered. Examples of the map types can be seen in Figure 2. Only four maps fell into the ‘other’ category, and these maps could not be easily categorized; they mostly looked like first-person scenes from the environment. The RMSE values of the four different qualitative map types were compared to one another using the Mann-Whitney U Test to see if they were different from one another; the results are shown in Table 1.

The statistical analysis of the three dominant framework categories reveals that none was significantly different from one another in terms of RMSE values. The only pairings that were significantly different from one another at the 0.05 significance level were those involving the ‘other’ category. Given the small sample size of the other category (four maps)
and the generally high levels of error in these maps, this is neither surprising nor particularly enlightening. Maps in this category still showed evidence of metric knowledge, but it was poor knowledge presented in views that did not include the characteristics of a map. That the other primary categories were not significantly different from one another is also not surprising, as the RMSE values indicate that metric spatial knowledge existed in all three groupings of maps.

To test the second tenet of the continuous framework, performance was compared between the first and final sessions for 20 of the 58 participants (this subset of participants shared the same exposure conditions across all three sessions, see Aber 2012). Both frameworks describe spatial microgenesis as a process in which knowledge will grow over time, and if this is correct, improvements in metric quality should be seen from the first to final sessions. Looking at the first and final sketch maps, a few individuals showed improvement in their RMSE, but the majority of the participants drew roughly the same map in each session with minor changes from one session to the next. In light of this, the change in mean performance is not statistically significant, dropping from 366.9 RMSE to 344.9 RMS, with a Mann-Whitney U Test returning a p-value of 0.7660 and a p-value adjusted for ties of 0.7629. This was consistent with previous findings, such as Ishikawa and

<table>
<thead>
<tr>
<th>Pairing</th>
<th>p-value</th>
<th>p-value adjusted for ties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landmark x Route</td>
<td>0.7953</td>
<td>0.7953</td>
</tr>
<tr>
<td>Landmark x Survey</td>
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<td>Route x Other</td>
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<tr>
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</tbody>
</table>
Montello (2006) and Gärling, Böök, and Ergezen (1981), who found that beyond the first sessions, performance did not generally improve much if at all, even over the course of ten sessions across as many weeks. This study had a shorter period of exposure than the above studies, with sessions over the course of three weeks, and reached a similar conclusion regarding improvements in performance.

**Conclusions**

The statistical results support the hypothesis regarding tenet one of the continuous framework: no pure landmark or route knowledge was found, metric spatial information was included in all sketch maps. The level of metric accuracy of all three of the primary categories of sketch maps following a single exposure was statistically indistinguishable from each other, indicating that even though there was variance in quality, metrically scaled knowledge existed in all the map types. This directly contradicts Siegel and White's dominant framework, as the participants were capable of bypassing the landmark and route states of knowledge. As described by Montello (1998), it is difficult to reconcile the idea of non-metric cognitive space, given that perceptual space is clearly metric (pg. 147). While it is possible that an individual could memorize a series of landmarks presented outside of the context of metric space, it is difficult to imagine that same individual gaining knowledge from environmental navigation while simultaneously not gathering any metric spatial knowledge at all. In this context, the continuous framework does a better job of explaining spatial microgenesis than the dominant framework.

However, from a qualitative perspective, it is clear that the landmark, route, and survey map types provided by the dominant framework are still valuable descriptors of how people conceptualize and communicate spatial information. Since none of the participants were given instructions on how to draw their maps (only that they should include the eight landmarks), the presence of maps that clearly can be considered landmark-, route-, or survey-type speaks strongly to these forms as being a part of our conceptualization of what maps are regardless of the quantitative metric quality of the map knowledge.

The results of the exploration of the second tenet are less positive for either framework, as the quality of maps in the first session was not significantly better than that in the final session. While a few of the participants improved their accuracy over the sessions, the vast majority drew roughly the same map with the same level of accuracy each time. The continuous framework does not say that spatial microgenesis will occur in the absence of attention: ... it is likely that people do not acquire much metric knowledge without paying attention to the environment and/or to their movement (Montello 1998, pg. 148). However, given that participants in this study were specifically asked to pay attention to the environment and remember the locations of landmarks, it is problematic that the improvements in spatial knowledge over time are small and statistically insignificant. These results, as well as those of Ishikawa and Montello (2006) and Gärling, Böök, and Ergezen (1981), suggest that repeated exposure to an environment alone may not be enough to lead to improvements in spatial knowledge. Neither the dominant nor continuous framework account for this adequately.

From a methods perspective, the use of ArcGIS's georeferencing function in this study was a straightforward and useful procedure for measuring the metric quality of sketch maps. While other methods of sketch map assessment exist and have effectively been used to answer questions related to mental mapping (Billinghurst and Weghorst 1995, Ishikawa and Montello 2006, Polonsky and Novotny 2010), the RMSE values provided by ArcGIS's georeferencing tool were found to be a practical metric to assess the spatial accuracy of the sketch maps. This approach could be employed by anyone with access to and a working knowledge of ArcGIS, the only caveat being that the spatial extent and map units of the study area be considered when calibrating the upper bound of the error values.

**Citations**


Communication science and information science: Convergences and divergences

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In the last few decades, the disciplines of communication science and information science have experienced a tremendous increase of published works. Although faculty from both fields have participated in shared research programs, the subject of their relationship as disciplines has lacked scientific inquiry. Three factors account for this situation. First, the terms information and communication often are understood as interchangeable disciplines. Second, research topics in information science and communication science include new digital technology which leads to redundancy and ambiguity. Third and lastly, required research methods cross-cut disciplines without distinguishing methodologies associated with communication science from information science. This paper discusses the relationship between communication science and information science in terms of major divergences and convergences in order to offer a clearer identity and more contributive work in both disciplines.

Keywords: communication, information, information science, communication science.

Introduction

Since their foundation as articulated disciplines in the 1800s, the social sciences have undergone important developments. Several disciplines have taken shape under the auspices of the social sciences. In recent years, for example, the fast-growing information and communication technologies have brought the fields of communication science and information science to light. However, the identities of communication science and information science have received less attention than have information and communication technologies. As Wilson (2010) noted, “it is also evident that the link between information and communication is necessary and strong: and yet, there is little research connection between communication studies and information science. Surely this is a major gap” (n.p.). This paper suggests the breaking of barriers between the works done in communication science and information science. Surely this is a major gap” (n.p.). This paper suggests the breaking of barriers between the works done in communication science and information science. Also, this paper seeks to raise awareness about the duplication of works, the ambiguity of identities, and the lax use of the terms communication and information in defining one’s works. It calls communication scientists and information scientists to a tighter and clearer synergy in increasingly budget-short and competitive university settings.

The increased segmentation and sub-specialization in academia calls for greater collaboration among researchers. Wilson (1996) remarked, “most research in the social sciences and humanities is done by scholars working alone” (192). This type of research also impacts works done in communication science and information science. In 2010, Cooren discussed the increasing, and at times alarming, fragmentation of communication science. To this effect, a mutual recognition of published works in areas of communication science was proposed. “It would rather suggest the complexity, of amending it, or even of seeing the question in its entirety, but always with the idea in mind to stimulate a dialogue [emphasis mine] capable of countering fragmentation in the field of communication” (Cooren 2010, 104; see paraphrased idea Cooren 2012, 2; Eadie 2011).

IIl s’agirait plutôt de la complexifier, de l’amender, voire de la questionner dans son entièreté, mais toujours avec en tête l’idée d’alimenter un dialogue [emphasis mine] capable de contrer une fragmentation du champ de la communication” (Cooren 2010, 104; see paraphrased idea Cooren 2012, 2; Eadie 2011). Several authors have raised the same concerns in information science (Brier 1999, 2008; Day 2010, 2011; Leckie, Given, and Buschman 2010; Saracevic 2010a). For example, the lack of collaboration deplored in communication science was also noted in information science. “The relative isolation is conceived as unproductive for all areas [of information science]” (Saracevic 2010a, 2573). This paper takes the debate to the relationship between communication science and information science, wherein awareness about the works of one must be acknowledged. The remarks leveled in both communication science and information science resonate with the observation Kunz and Rittel (1972) made that information-related fields have evolved in silos. Rather than offering a unified definition and theory of information-related disciplines, this paper examines different perspectives regarding communication science and information science to allow for clearer mutual recognition, stronger connections, and firmer contributions between two of the closest, yet still distinct, disciplines of academia: communication science and information science.

There should be as many definitions, theories, and concepts in communication science and information science as there are research questions. Nonetheless, we cannot deny the object of our works. Academia requires researchers to make
contributions to and connections with others’ works, especially when these works relate to the same topic. Failure to take account of this in our respective bodies of works defeats our mission as scientists. Scientific work is defined by the researcher’s proposed theories. The proposed theories are the means by which our work is a continuation of and a response to the concerned bodies of knowledge. Cibangu (2013) discussed the contributions of information science to the broader academic research. The stronger the connections of our works are to the concerned literature, the more contributive are our findings.

It is important to avoid the pride of universality (see Cibangu 2012a), whereby information-addressing publications tend to be lumped together for the sake of representativity by region or topic without any connective tissue between them. With the best of intentions, authors can forget the basic statistical rules of sampling in regard to adequate representativity. Representativity may be tempting in the production of encyclopedias and large-scale publications of information topics wherein authors are invited because of their expertise and/or origins in the hopes of covering the broadest or most global spectrum of research. However, behind the façade of representativity, the concerned bodies of research may lack grounded connections of contributions. It is also important to avoid the particularities commonly manifested in applied research of information technologies and up-to-date novelties. While they can be beneficial, novelties of information technologies do not qualify us as scientists. Rather, the theories arrived at qualify us. Our proposed works ought to be grounded in the relevant literature, tracing the gaps and insufficiencies in order to craft a theory. Just as in the social sciences, theory creation needs more attention in both communication science and information science (see Cibangu 2012b). We cannot undertake scientific works that bypass the bodies of knowledge of both communication science and information science by assuming that the reader will figure it out. Grounding research in the bodies of knowledge helps furnish a field’s methodological and related positions. This paper launches the debate at the roots, namely our identities as to what we do and say we are as communication scholars and information scientists. While it does not seek a unified identity within and beyond any science, the paper calls for greater clarity about our works in a highly interconnected world.

Significant advances of communication and information technologies have brought the concepts of communication and information, and the disciplines that deal with them, to the forefront of our daily lives. One would expect that concepts as salient as communication and information would be straightforward in people’s minds. In more ways than one, however, both experts and the general public are under the impression that communication and information are too elastic to be dealt with effectively (see also Ibekwe-SanJuan and Dousa 2014). All too often, the concepts of communication and information are treated as means, rather than as ends in themselves. Imagine that we treat the following concepts yet known to be elastic as means: culture, peace, love, and family. What would be our sense and knowledge of these concepts? We would end up with little to no knowledge about what peace really is and requires, regardless of the means at hand. As long as communication and information lack focus in research, confusion will abound. Consequently, ambiguity as to what differentiates communication science from information science has become pronounced. Meanwhile, as will be apparent below, the bodies of knowledge, research goals, activities, organizations, and publication venues of communication science and information science are shown to be separate and distinct. Disinterest in the convergences and divergences of communication science and information science can only lead to confusion, poor management decisions, and redundant research priorities and programs. Moreover, there are other disciplines than communication science and information science which are at once close and distinct. Instances of close and distinct disciplines with full-blown doctoral programs include nursing/medicine, statistics/mathematics, business/economics, literature/language, art/drama, physics/atmospheric sciences, etc.

Communication and information technologies, the present dominant focuses of communication science and information science, have been proven as vital factors in phenomena as diverse as genocides (e.g., Rwanda, Kosovo, Khmer Rouge, etc.), terrorist bombings of innocent civilians around the world, the change of regimes in North Africa and the Middle East in early 2011, reduction of cancer spread in developed countries, prevention of disaster in population-dense and flood-prone places, etc. Given the importance of these phenomena, we cannot afford poorly conceived sciences that deal with products as widespread and pressing as communication and information technologies. Drawn from all facets of our information-loaded societies, sustained inquiries of communication and information technologies and related disciplines are needed to make the world a better place. While communication science and information science are not a panacea for the world’s problems, fragmentary and unengaged views of communication science and information science leave us unequipped in our fast-changing and information-intensive world.

This paper regards the social sciences in the broader sense of the word, in which the social sciences and human sciences or humanities are interchangeable and involve the study of people’s interactions and inner expressions (see Cibangu 2012a). The humanities and social sciences share the same challenges and characteristics with respect to humans and their relationship with information and communication technologies, the current focus of communication science and
information science. The paper uses the words communication science and information science for communication studies/disciplines and information studies/disciplines, respectively, but both communication science and information science are examined within the socio-human sense rather than in the strict sense of network engineering (Bawden and Robinson 2013; Buckland 1999, 2012; Cibangu 2002, 2010c, 2012a, 2012b; Craig 1989, 1999, 2009; Ibekwe-Sanjuan 2012; Ibekwe-SanJuan and Douza 2014; Simonson, Peck, Craig, and Jackson 2013). Technical dimensions may well be implied so long as they are based primarily on the socio-human sense of research. The socio-human sense involves the human agency and its related behaviors, artifacts, values, institutions, etc. The paper uses Liddell’s and Scott’s Greek-English Lexicon and Lewis’s and Short’s Latin Dictionary. This paper is organized around five points: (1) brief history of communication science, (2) brief history of information science, (3) convergences, (4) divergences, and (5) practical considerations.

**Brief history of communication science**

Systematic works of communication go as far back as Antiquity, of which some of the most indicative were Aristotle’s and The Eloquent Peasant’s (Parkinson 1991) writings. Although tailored to the skills of rhetorical persuasion, these writings provide milestone reflections about the field of communication. For the history of the idea of communication, Peters (1999) contributes a commendable seminal work whereas the works of Littlejohn and Foss (2009, 2011) provide substantive guidance for the theories of communication science. Other works such as Anderson (1996), Craig (1989, 1999), Craig and Muller (2007), Herbst (2008), Johannesen, Valde, and Whedbee (2008), Miller (2005), Poe (2011), and Scannell (2012) are particularly noted for their theoretical reflections about communication science. From Antiquity to the 1700s, communication issues were debated under the umbrella of the humanities and arts. The humanities were taught in the forms of persuasive speech, creative writing, graphic painting, engaging conversation, sublime meditation, inner examination, moving drama, expressive building, descriptive artworks, and victorious sports and games. The humanities sought to supply humans with communicative skills in order to live better lives. The humanities elevated the soul and body of humans to a fuller life. The humanities dealt with lifeworlds, valuing and enhancing all human sensory expressions. Human expressions such as the arts, writing, building, speech, and objects were considered as the means with which to methodically fulfill human potential. Communication was, and still is, the portal of life accomplishment.

One of the most powerful examples is found in Plato (Phaedrus, 275d-e) who resisted the hegemony of writing, complaining that it hampered the richness of human oral communication.

Aristotle stated the object of written and spoken words as follows:

> Therefore, things (expressed) in the voice are symbols of the experiences in life, and things written are symbols of the experiences in the voice. But just as writings are not the same for all, so neither are voices. Nevertheless, the experiences of life, of which these (voices and writings) are principally the signs, are the same for all. And the things, of which voices and writings are the images and facts are indeed the same. ([On interpretation, 16a 5]

Voices and writings are signs of lived experiences. Signs do no monopolize the object, but rather point to it. While they are unique per individual and case, lived experiences display the same effects, structures, and processes. No human being experiences that which cannot, will not, or never has been experienced by other humans. The experiences of life such as death, birth, suffering, joy, famine, immigration, poverty, abuse, and entertainment are the same among humans. Stated differently, the things of which voices and writings are the images such as pictures, videos, artworks, and records and facts that include matter, format, style, and number remain identical. For example, concepts such as table, river, sun, infant, peace, and rain are the same, but their images and facts are shaped and constructed according to spaces and times. Aristotle laid the foundation of epistemology, putting in unison realism and constructivism. In this sense, the basics of human communication, namely the sharing of meaning and experiences, were outlined (Habermas [1981] 1984, [1981] 1987). It is through human interaction that voices and writings receive their fuller expression. Of note is the view of voice and speech as items that are more inclusive than the mere fixed and monolithic expressions of an author (Bakhtin 1986, 60-102). Reality and related experiences are not mere human creations and formulations, but discrete entities with which humans mysteriously interact. Reality remains real, but its representation varies.

Experiences encountered in the voice and spoken words correspond to the whole sense-experiences. Therefore, the experiences of life surface in people’s communication. The Greek participle παθηµάτα [pathêmata], from the noun πάθος [páthos] meaning: conditions, emotions, experiences, sufferings, etc. reflects the lifeworlds with which human communication is filled and concerned. More specifically, despite the fact that writings and speeches differ among humans, communication remains the same in that it conveys and responds to the experiences of life. Pertinently, concerning written and spoken words, Aristotle used the Greek noun σύμβολον [sümblon], meaning covenant, contract, pledge, etc. In detail, written words hold a contract with spoken words,

1. Accent marks of some Greek diacritics are not fully reproduced.
and vice versa (Harris 2000, 22-23). Written and spoken words are not above each other; rather, despite their diversity among humans, they each unravel and actualize the experiences of life. Upon this contract and the underlying life experiences, lifeworlds is then anchored human communication.

Furthermore, Aristotle laid the foundation of communication science with the statement that “λόγον δὲ μόνον σωφρονος εχει τον ζωων” [then, of the living beings man alone owns conversation (chitchat)] (Politics, 1253a 10). Humans are conversation makers. For various reasons, humans undertake conversations. While chitchat may be deemed as a disturbance, it is a distinctive feature of humans. It is part of human nature to be a chitchatter; no other being is. The statement that conversation is the central descriptor of humans largely inscribes itself against the Enlightenment era. The Greek word λόγον (logon), commonly translated by the English word reason, from the Latin ratio, is not as rational as usually thought, although it received the powers of reason in the Enlightenment era. Besides the meaning of reason, λόγον signifies speech, discourse, conversation (chitchat), expression, opinion, tale, story, fable, and prose. Equally, the Latin word ratio, used for the Greek logos, displays a meaning more mundane than rational. Ratio also signifies business, affairs, interests, and matter. As an example, fables and interests figure among the most irrational human entities. It is no accident that a word as strong as logos would involve unruly and irrational items in its primary meanings. It follows that, in addition to having reason, humans are beings of speech, discourse, conversation, expression, opinion, tale, stories, fables, and prose, all of which are the topics of communication science.

Nonetheless, in the mid-1700s, the commendation of human expressions and experiences met with rejection among the Enlightenment champions. Emphasis was placed on reason to conquer nature and its laws. Reason became the privileged tool of scientific work. Senses and life experiences were deemed irrational and unfit for scientific work. Hence, this era was also called the Age of Reason, and the spectacular achievements and discoveries of the Industrial Revolution in England sparked the Enlightenment dreams. The most influential works were the writings of the English philosopher Francis Bacon (1561-1626) and French philosopher René Descartes (1596-1650). Bacon’s ([1620] 1889) Novum organum and Descartes’s ([1637] 1987) Discourse on the method set a new tone in the methodology of scientific research. Novum organum and Discourse on the method called into question the tenets inherited from Aristotle’s magisterial works, especially the Organon which put sensory expressions to the center stage of human communication. The goal was to dominate nature and replicate its laws. Communication revolved around the laws of nature, and the humanities and related human sensory expressions were considered to be insignificant. Communication had to follow the objective norms and methods of reason in order to replicate the universal laws embedded in nature. Feelings, opinions, and emotions were rejected as idols and deterrents of the objective methods of science. Descartes noted that the only thing that characterizes us as humans, and distinguishes us from animals was reason, and reason needed strict methods free from feelings, ideas, stories, conversations, fables, and prose. The Antiquity-propelled themes of communication such as speech, rhetoric, conversation, art, and drama lost their potency. In this Enlightenment-celebrated world view, human communication was supplanted by computation, matter, rationality, technology, conquering power, natural forces, and material inventions. It was in this context that most universities in North America and Western Europe were created, and that the traditional branches of the social and human sciences were officially established. The social and human sciences were modeled on quantitative, normative, and prescriptive methods of communication to comply with the aim of the Enlightenment.

In the 1800s and 1900s, however, the universal powers of reason acclaimed by the Enlightenment proponents came under attack from within the emerging social sciences. Some of the most vocal opponents of absolute and demonstrable rationality were Dilthey (1833-1911), Freud (1856-1939), Husserl (1859-1938), Marx (1818-1883), Simmel (1858-1918), Bakhtin (1895-1975), and Vygotsky (1896-1934). With their multidisciplinary reflections, these and several 18th- and 19th-century authors put forth masterly materials for the variety of topics raised in the history of communication science which called into question the sanctity of reason. Dilthey ([1922] 1988) brought into focus the meaning of human reality, all of which required not replication but interpretation. Freud ([1900] 1913) drew attention to the fact that the powers of reason are shaped and propelled by the deep-seated feelings, emotions, and impulses of humans. Husserl ([1913] 1962) showed the importance of research about human experiences. Marx ([1857] 1977) demonstrated that reason and the laws of society were determined and constructed according to the economic and class interests of the bourgeoisie. Simmel (1908) advocated for the unmanipulated and non-preset knowledge about others and their worlds. Bakhtin (1981, 1986) defended the complexity and multi-activeness of writing and authorship. Vygotsky ([1934] 1986) found that the child development unfolds through human interaction. Absolute rationality and its correlate conquest of nature and knowledge, the dreams of which the Cartesian and Baconian tenets were the vehicle, were challenged, and therefore ceased as the canon of scientific discourse. As could be anticipated, far beyond the idea of nature-conquering reason, communication received different areas of research interest. For space constraints, however, I will address the perspectives of Bakhtin and Vygotsky.
Bakhtin (1981, 1986) strongly defended human speech. Against the Cartesian belief of reason (*I think, therefore I am*), he developed the idea that *I speak, therefore I am*. Emphasizing the notion of speech genres, Bakhtin refuted the simplistic views that limit speech, more precisely, communication to oral means. Human expressions involve more than simple mouth movements. “The nature of the utterance and of the speech genres is of fundamental importance for overcoming those simplistic notions about speech life, about the so-called speech flow, about communication and so forth” (Bakhtin 1986, 67). Knitted by elements as diverse as world views, customs, milieus, systems, values, individuals, and histories, speech life transcends a simple transfer of words. An excellent example is poetry, a well-known genre of writing. Imagine that someone limits the notion of writing to poetry, by founding a department of poetry. How much would the person know about writing and its numerous genres? This is what happens with speech, wherein the whole human communication is limited to mouth manifestations. Communication achieves social dialog within which humans experience their lifeworlds, and of which words are only a fraction.

The living utterance, having taken meaning and shape at a particular historical moment in a socially specific environment, cannot fail to brush up against thousands of living dialogic threads, woven by socio-ideological consciousness around the given object of an utterance; it cannot fail to become an active participant in social dialogue. After all, the utterance arises out of this dialogue as a continuation of it and as a rejoinder to it. (Bakhtin 1981, 276)

Social dialog gives life to words. Words represent a continuation and a response to life. Communication science seeks to investigate and promote social dialog. This reminds us of the Aristotelian definition of humans previously discussed, namely the contract between spoken and written words and the experiences in life.

Although predominantly known in psychological circles, Vygotsky’s work put speech on a par with reason. Spoken words regain their role as integral to human experiences. “Therefore we all have reasons to consider a word meaning not only as a union of thought and speech, but also as a union of generalization and communication, thought and communication [emphasis mine]” (Vygotsky [1934] 1986, 9).

Speech takes the connotation of human-filled communication in and by itself. In another ingenious contribution to communication, Vygotsky (1978) laid foundations for interpersonal communication with his idea that the child internalizes and appropriates concepts, words, and skills through the interaction he has with society’s members. Interaction becomes the basis of communication through which the child’s abilities develop. With these two authors, speech and human communication recovered their centrality over the absolute power of reason.

Authors of the traditional social and human sciences came to grips with a variety of communication topics.

The study of communication emerged as a special field of research in the United States from the late 1930’s through 1950’s. Scholars who made contribution to communication focused principally on critical issues associated with emerging new media systems… Studies of communication began attracting interest in Europe in the 1960’s and 1970’s and soon gained supporters worldwide. (Schiller 2001, 887)

Coupled with scholarly publications, associations of communication science started to collect and research the works done on communication. Different inventions of information technologies (Bellis 2012; Fidler 1997) contributed to the reinvigoration of communication discussions. Associations of communication science helped sharpen the domains and perspectives of communication science and gave rise to specific bodies of works (Ruben 2002). Formerly called the Speech Association of America, the National Communication Association (http://www.natcom.org/) was formed in 1914, and publishes ten scholarly journals each of which devoted to a specific aspect of communication: *Communication and Critical/Cultural Studies, Communication Education, Communication Monographs, Communication Teacher, Critical Studies in Media Communication, Journal of Applied Communication Research, Journal of International and Intercultural Communication, Quarterly Journal of Speech, Review of Communication*, and *Text and Performance Quarterly*. In addition to the National Communication Association, there exist four major regions: West, East, South, and Central of communication research association in the US (i.e., http://www.westcomm.org/, http://associationdatabase.com/aws/ECA/sp/p_Home_Page, http://www.sscenet.net/, and http://www.csca-net.org/aws/CSCA/sp/home_page) and the International Communication Association (http://www.icahdq.org/).

Today, under diverse focuses, communication science displays an increasing array of themes and domains (Devito 2011; Johannesen, Valde and Whedbee 2008; Littlejohn and Foss 2009, 2011; Simonson, Peck, Craig, and Jackson. 2013). These themes speak to and derive from the history of communication science. The most prominent themes and related research domains that have characterized communications science the last several decades include argument/rhetoric, speech delivery/speech communication, media/mass media, person-to-person interaction/interpersonal communication, intercultural communication, intrapersonal communication, international communication, organizational communication,
communication for development, and online interaction/social or digital media. These history-inherited themes have entailed specific bodies of works and publication venues that can be now classed under the banner of communication science. The scenario is not entirely different from that of information science.

**BRIEF HISTORY OF INFORMATION SCIENCE**

Humans had sought information for different reasons. Discussions related to information date back far into history. For the history of the concept of information, Capurro (1978, 2009) and Capurro and Hjørland (2003) provided helpful reflections, whereas the works of Case (2012), Fisher, Erdelez, and McKechnie (2005), Hjørland (2014), Leckie, Given, and Buschman (2010), Spink (2010), and Spink and Cole (2006) constitute important sources of theories for information science. In recorded history, the earliest scholarly works of information are found in ancient Egypt (Parkinson 1991) in various contexts (e.g., health, relationships, agriculture, pasturage, construction, travel, astronomy, metallurgy, trade, language, culture, law, etc.). The construction of edifices as immense and millennia-lasting as the pyramids speaks to sophisticated works of information acquisition and organization concerning the design, plan, landscape, conduct, management, implementation, coordination, manpower (e.g., health, safety, nutrition, housing, etc.), equipment, materials, transport, and maintenance of the buildings. Pyramids display systematic structural uniformity from place to place and time to time across Egypt. Such an enormous and well done enterprise could not be possible without duly conserved and transmitted information packages.

With a statement so consequential for information science, Aristotle presented knowledge as naturally inscribed in human beings. Aristotle wrote, "πάντες ανθρώποι τον εἰδέναι ὁρείχα τον φύσα [all men, by nature, yearn for the act of knowing (concrete knowledge)]" (Metaphysics, 980a 22). The Greek infinitive εἰδεῖναι [εἰδείαν] means to see, behold, perceive, know, or be versed in. Therefore, the verb εἰδεῖναι conveys the connotation of knowledge involving the whole senses. Moreover, since the infinitive is used here as a noun, it indicates an active meaning of the word. It implies that information is a deeply longed for and senses-processed phenomenon. In this regard, information is context-bound. Humans are information beings. Another of Aristotle’s correlated statements, foundational to information science, showed human nature as compatible with scientific knowledge. Aristotle argued, "καθ'όπερ ανθρώποιν το ζωον θίητον επιστήμης δεκτικών [just as exactly concerning man a mortal living being (that is) receptive to scientific knowledge]" (Topics, 128 b 35). The Greek word επιστήμης [ἐπιστήμης] has the meaning of scientific or expert knowledge/information. In the Age of Reason, human nature and the related feelings and emotions were seen as idols that hindered the acquisition of scientific information. However, without any qualifier, the whole package of human nature, including feelings and emotions, is shown to be welcoming scientific knowledge. Not only do humans strive for information, but their nature is the receptacle of scientific information. It shows that scientific knowledge can dwell among humans. Scientific information was thought to be reserved to the gods in Antiquity.

While books, and more precisely paper and papyrus, constituted important information technologies in Antiquity, they were not the means by which the term information was exhausted. Believed to have its siege with the gods, information in Antiquity was manifested in a variety of materials such as buildings, mummies, masks, paintings, and personal objects. The Middle Ages relayed the beyond-papyrus/paper conception of information and witnessed a tremendous technological progress with the artful and expressive construction of cathedrals, museums, libraries, monasteries, and castles across Europe (see Cibangu, 2012b). Information then enjoyed a holistic view.

In the Modern Times, however, with the works of the Enlightenment fathers, particularly those of Bacon (1561-1626) and Descartes (1596-1650), came the idea of information as a power with which to conquer nature, humans, and reality. Presently, the nature-control idea of knowledge stills rules technological inventions and authors’ philosophical underpinnings across disciplines. Bacon insisted, “nam et ipsa scientia potestas est [and indeed knowledge itself is power (emphasis mine)]” ([1597] 1857, 241). The Latin word scientia reflects the sense of practical/concrete knowledge. It is safe to argue that the Baconian meaning of the word scientia, translated by knowledge, is that of practice- or task-oriented information. Practice-oriented information is largely employed in current social science materials. For example, concrete knowledge is presented as key in the famous diagram of the concept of information (Taylor 1986; for action-oriented knowledge in general see Buckland 1991a, 1991b, 1991c, 1996, 1997, 1999, 2012). This is a knowledge that has the practical connotation of skill and/or action. Taken this way, knowledge was, in extensive areas of Bacon’s oeuvre, presented to have the nature of power (see Bacon [1620] 1889, 180, 192, 347-48, 569). One example is sufficient: “Etenim ipsum Posse et ipsum Scire naturam humanam amplificant, non beant [in fact, power and knowledge each extend human nature, but they do not make humans happy (fulfill them)]” (Bacon [1620] 1889, 180). As is clear below, although acknowledged by Bacon, the inability of practical knowledge to fulfill human potentials has been largely overlooked in academia. Remember that happiness/fulfillment involves a great amount of inner feeling/emotion. Extending humans’ practical knowledge does not necessarily imply happiness. In addition, Descartes recommended knowledge to be methodic and rational, namely free of the human feelings and ideas.

Along these transformations, information science has inherited two major trails of research (see also Cibangu 2010a, 2010b, 2010c). On the one hand, the Enlightenment-infused perspective values the measurement and controllability of information. The explication, implementation, measurement, and control of information technologies and related forces dominate the discussions of information. On the other hand, the Antiquity-led perspective emphasizes the transcendence of information encountered in people’s lifeworlds. The immersion into and/or compliance with people’s agency, experiences, struggles, cultures, and values become the overarching theme of research and its conclusions.

An important precision to make about information science regards the field of information systems, variably called information management. While information systems refers to the concept information in its works, it is not the sub-field of information science in the strict sense of the word. Information systems is a branch of management science that seeks to supply corporates and executives with greater organizational and managerial skills and hands-on business models (Anderson et al. 2011; Hillier and Hillier 2010; Ladley 2010; Rainier and Cegielski 2012; Ross n.d.). Information use is only one of the many aspects that characterize the business world, though it is an important one. As Ross (n.d.), the CISR’s [Center for Information Systems Research] director, stated, “since its establishment in 1974, MIT [Massachusetts Institute of Technology (USA)] CISR has been studying one question: *How do organizations generate business value from IT [Information Technology]?*” [emphasis in original]” (n.p.). The end product is not information, but greater business (i.e., managerial, entrepreneurial, financial, and administrative skills and tools) using information technologies. Major areas of information systems (Anderson et al. 2011; Hillier and Hillier, 2010; Ladley 2010; Rainier and Cegielski 2012; Ross n.d.) include operations research [operations management], business decision-making, finance, accounting, business strategy, entrepreneurship, marketing, stochastic processes, administration, and manufacturing. “The three areas of major and continuing interest [of information science] are information retrieval [knowledge organization], user and use studies [human information behavior], and metric studies [citation analysis, bibliometrics, Webometrics, etc.]” (Saracevic 2010a, 2573). Authors need to be aware that information systems and information science represent two separate bodies of knowledge, with different activities, organizations, venues, and goals.

In 1958, the Institute of Information Scientists, UK, was formed, and was merged in 2002 with the British Library Association to become the Chartered Institute of Information Professionals (http://www.cilip.org.uk/). In 1937, the American Documentation Institute was formed, and in 1968, the American Documentation Institute became the American Society for Information Science, and the American Society for Information Science and Technology [ASIS&T] in 2000 (http://www.asist.org/). ASIST publishes the *Journal of the American Society for Information Science and Technology* [JASIST]. Information was seen as document. Newly identified information scientists followed traditional methods of engineering. In 2012, due to an increasing number of international contributing scholars within its venues, the ASIS&T changed its name to the Association for Information Science and Technology, and the *Journal of the American Society for Information Science and Technology* became the *Journal of the Association for Information Science and Technology* (Sonnenwald and Bruce 2014). The name change took effect in 2013, but the acronyms JASIST and ASIS&T continue to be used. The term American has been dropped. As Sonnenwald and Bruce (2014) explained, “this change reflects increasing recognition among ASIS&T members that the challenges addressed by the information sciences cross geopolitical and socio-cultural boundaries, in addition to crossing disciplinary boundaries” (1). The major journals of information science include *Journal of Information Science*, *Library and Information Science Research*, *Journal of the Association for Information Science and Technology*, *Journal of Documentation*, *Information Processing & Management*, *Library Trends*, and *Information Research*. The underlying assumption behind the conquistador-mindset of nature was one of the replicability and universality of human knowledge, harnessed to experiment, implement, and devise artifacts and actions across spaces and times. In the 1900s, as the Cartesian and Baconian beliefs received further impetus from the inventions of information technologies, they underlie the discussions and associations concerned with information. For example, in 1945, Vannevar Bush conceived the Memex, a device with which to process and control information (Bush 1945). In 1948, Shannon developed the information theory to measure information. In 1952, however, Garfinkel (2008, 101-265) gave one of the most comprehensive accounts about information and communication (detail below). This groundbreaking work has received minimal attention in communication science and information science. The terms *information science* and *information scientist* were first used by Farradane in 1953 and 1955, respectively (Farradane 1953, 1955).

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Convergences

Several points conflate communication science and information science, of which I have selected three most recurrent: (1) transmission of information, (2) information and/or communication, and (3) ways in which communication science and information science are presented. First, the transmission of information concerns a variety of information phenomena: process, measurement, access, dissemination, transfer, and effects. One of the best analyses of the transmission of information can be found in Shannon’s (1948) work. Interestingly enough, Shannon considered communication and information as interchangeable, leaving an indelible mark on the social sciences. For example, according to The Oxford American Dictionary, communication is the practice and science of transmitting information whereas Bates (1999), Bates and Maack (2010), Borko (1968), and Saracevic (1992, 1999, 2010a, 2010b) listed the transmission of information among the defining features of information science. Dissemination is another concept of information transmission. Peters wrote, “my aim here is to contrast two Grundbegriffe in communication theory, dialogue and dissemination of information” (1999, 35).

Likewise, information science is presented as the discipline of information dissemination (Bates 1999; Bates and Maack 2010; Borko 1968; Saracevic 1992, 1999, 2010a, 2010b). Relayed by the Shannonian perspective of information, the word communication does not improve clarity either. The second point of conflation is information and/or communication. In 1971, curricula of information science simply included communication and information theory (Belzer, Isaac, Finkelstein, and Williams 1971). Information and communication were considered synonymous terms, and this perspective has persisted. In 1992, Ruben noted close relationships between communication and information. The Shannonian influence could and can still be seen. Ruben claimed, “communication study focuses on the ways in which individuals process information” (2002, 157). In 2007, Bonito proposed the concept information sharing to make sense of communication in small groups. In 2012, debating risk communication models, Braun and Niederdeppe developed the idea of information sufficiency, with a view to improve communication models, Braun and Niederdeppe developed the idea of information sufficiency, with a view to improve communication models, and Maack (2010), Borko (1968), and Saracevic (1992, 1999, 2010a, 2010b) listed the transmission of information among the defining features of information science. Dissemination is another concept of information transmission. Peters wrote, “my aim here is to contrast two Grundbegriffe in communication theory, dialogue and dissemination of information” (1999, 35).

The conceptual mix-up, or some would argue, an offspring of fragmentation, is still with us. In defining what is unique to information science, Robinson and Karamuftuoglu (2010) argued, “the information scientist therefore has a uniquely generalist approach to all aspects of the communication of information” (n.p.). In 2013, Robson and Robinson presented a new model in information science, saying, “a new model is now presented that incorporates these factors affecting the communication of information and links information seeking and communication” (185). Describing the field of communication science, Calhoun (2011) emphasized, “the topics studied by communication researchers are extraordinarily diverse. They range from extremely micro accounts of the use of mobile phones to extremely macro accounts of global flows of information and influence” (1486). The same is true of information science (see Dillon 2012; Furner 2012; Hjørland 2014). On the one hand, communication is considered central in defining information science, and on the other, information is considered central in defining communication science. It follows that there needs to be collaboration between communication science and information science.

The third and last point of conflation regards the ways in which authors suggest the complexion of communication science and information science. For example, in his information science’s review, Saracevic (2010a) classed communication theory and communication science as areas of information science, whereas information science is presented as part of communication science in the International Encyclopedia of Communication (see Ingwersen 2008). In other words, communication science and information science consider each as the container of the other. Such description implies areas of convergence. It is noteworthy that, due to the wide array of convergent points found between them, information science and communication science are considered by French speaking scholars as one discipline called ICS [information and communication science(s)] (Ibekwe-SanJuan 2012). Not
surprisingly, Ibekwe-SanJuan (2012) noted, “the cohabitation of information science with communication science in the same (inter-) discipline brings its own trials that render the quest for identity and visibility more difficult” (1706). Consequently, convergence does not exclude distinctiveness.

D I V E R G E N C E S

The themes, venues, activities, organizations, and ensuing bodies of literature clearly differentiate communication science and information science. Describing what is unique to information science in one of her most forgotten reflections, Bates explained that information science, journalism, and education, for example:

... deal with distinct parts of the transmission of human knowledge – information science with the storage and retrieval of it in recorded form, education with the teaching and learning of it, and journalism with the discovery and transmission of news [emphasis mine]. (1999, 1044)

Storage and retrieval represent a core feature of information science. Recording information means to deposit in a given form such as culture, language, paper, and custom. Recorded information is a sign/pointer, not a possessor of the information universe. As Garfinkel remarked, “it must make sense to talk of its [of information] clarity or ambiguity, of its uniqueness and typicality; of its private, public, personal, impersonal, anonymous or identified character... without implying any notion of a finite total [emphasis mine]” (2008, 111). The information universe resists totalitarian usage and reification. Information represents the world of pattern(s). “Information is information, not matter or energy. No materialism which does not admit this can survive at the present day” (Wiener [1948] 1965, 132). Closely related to this characteristic is the organization of information. Organization here concerns the deliberate selection of information for future usage. Bates elaborated, “the domain of information science is the universe of recorded information that is selected and retained for later access” (1999, 1044). The most distinctive feature of information science proves to be storage, organization, and retrieval of information.

In their landmark study outlining the specifics of communication science, Brenders and Norton stated, “the word communication is reserved to mean more than simple information [emphasis mine]... Communication works interactively” (1996, 17). Brenders and Norton clarified, “communication incorporates the notion of the enthymematic process... a process in which selected information triggers an enthymematic response characterized by nonrandom connections corresponding to and coordinated with the sender's connections [emphasis mine]” (1996, 17). Note the notion of nonrandom and coordinated connections. An important aspect of communication science is the heart-to-heart dialog. As Peters noted, “communication is a registry of modern longings ... where nothing is misunderstood, hearts are open, and expression is uninhibited” (1999, 2). Communication implies openness of hearts and of nonverbal and verbal expressions. Stated differently, communication deals with negotiated behavior of information and/or meaning. “For human communicators the process of communication is viewed as a complex set of interactions, transacted (negotiated) across a wide spectrum of cultural and situational contexts” (Findlay 1998, 33). Dialogical information characterizes communication science. As Cooren stressed, communication studies deal with “ça communique” (2012, 12). This French expression refers to the whole-package interaction-intensive phenomena within which interactants share information. Communication is based on comprehensible expressions and undertakings between the dialog’s participants. Communication engages “net-work” (Garfinkel 2008, 114). Communication science studies the processes of nonrandom connections, open dialog, and/or transacted behavior. Bringing a distinct flavor, Calhoun (2011) asserted, “my own sense [of the communication field] is that media is most defining, but that the most creative media studies don’t stand on their own, they connect media to other issues” (1481). As for the information field, Hjørland (2014) concluded, “the unique focus of LIS in relation to other disciplines is therefore: the study of the information ecology in order to facilitate its utilization for many specific purposes” (225).

P R A C T I C A L  C O N S I D E R AT I O N S

It is one thing to invoke information technologies and their adoptions in communication science and/or information science, but it is another thing to be aware of and contribute to the works of others. To make things worse, definitions are controversial among researchers. Researchers are hesitant to define and identify their works for fear that there will be a blast of criticism, blame, rejection, and disappointment. Rather than proposing a war of definitions, this paper stimulates dialog among researchers. We cannot help our readers and policy makers, nor make progress about information technologies by assuming that the works of others are different from ours. The best example is with housing. Although we use the same construction materials, equipments, contractors, and places to build our houses, we are not confused as to where and what our houses are. Rather than knowing the best definition of a house, a person should know how to arrive at her own house in a yet confusing neighborhood. This is how we can make progress in our neighborhood, community, and nation. In this case, communication science and information science. Another aspect of work that specialists in communication science and information science all too often acclaim is that of interdisciplinarity. There is no such thing as a science that
does not involve and/or require other disciplines. Our works will be more contributive if we can show how our interdisciplinarity differs from that of others. Experts on both sides, namely communication science and information science, have come to the realization that the concepts used in respective fields are “in need for systematic consideration” (Hjørland 2014, 205) or “call for rethinking” (Putnam and Mumby 2014, 14).

This paper offers an invitation to concerted works of communicators and information scientists rather than provide an exhaustive and prescriptive account of achievements in the disciplines of communication science and information science. In a networked world, we cannot thrive in ghettos. For a theme as immense as information and communication, collaboration will only strengthen contributions and reduce duplications. As Ibekwe-SanJuan reminded us, “it has been particularly difficult for ICS to distinguish itself as a separate scientific field from other neighboring fields such as sociology, psychology, anthropology, ethnology, semiotics, journalism, and even computer science” (2012, 1697). There are other cognate areas from which a distinction is needed both in communication science and information science, such as philology (rhetoric), literature, museum studies, ethics (philosophy), education, management, development studies, women studies, ergonomics (in its section of Human Computer Interaction), and public health. By addressing or borrowing theories/topics that cross-cut domains and/or belong under established expertise and bodies of literature, the works of others should be acknowledged as best as possible. This paper calls communication- and information-related researchers to move beyond a preoccupation with new communication and information processes and tools to the identification of research questions true to their respective niches. Researchers in communication science and information science can then avoid duplication.

One of the most influential figures in the fields of communication science and information science, the American mathematician Norbert Wiener (1894-1964), deserves a special mention. It is inexcusable that although Shannon unequivocally acknowledged how his “communication [information] theory is heavily indebted to Wiener for much of its basic philosophy and theory” (1948, 34), Wiener had received only passing attention in communication science’s and information science’s literatures. Wiener argued:

If the difficulty of a physiological problem is mathematical in essence, [then] ten physiologists ignorant of mathematics will get precisely as far as one physiologist ignorant of mathematics, and no further. If a physiologist who knows no mathematics works together with a mathematician who knows no physiology, the one [former] will be unable to state his problems in terms that the other [latter] can manipulate, and the second will be unable to put the answers in any form that the first can understand. … A proper exploration of these blank spaces on the map of science could only be made by a team of scientists, each a specialist in his own field but each possessing a thoroughly sound and trained acquaintance of the fields of his neighbors; all in the habit of working together, of knowing one another’s intellectual customs, and of recognizing the significance of a colleague’s new suggestion. … We had dreamed for years of an institution of independent scientists, working together in one of these backwoods of science, not as subordinates of some great executive officer, but joined by the desire, indeed by the spiritual necessity, to understand the region as a whole, and to lend one another the strength of that understanding. ([1948] 1965, 2-3)

Communicators and information scientists are urged to fill the blank spaces left on the map of information-related specialties. This is not to bring about an executive body of officers to patrol the dos and don’ts of communication science and information science. The habit of working together is not acquired overnight, but takes time and committed action. Such effort raises awareness about our divergences and convergences. For example, in an era where agreement is difficult to reach within and between families, groups, neighborhoods, corporates, and nations, communication science has its hands full. Or, in an era where, one format of information, be it digital, tends to take over the world of information, information science must lose no time.

Conclusion

As scholars in the disciplines of communication science and information science, we have been doing and saying the same things for too long, leaving aside the paths that take us to brighter horizons. This paper is a small contribution to the much needed debate about a clearer and firmer cachet of the bodies of works claimed to be distinctive of information science and communication science, respectively. We may use, as is often the case in science, the same methodologies, concepts, laboratories, theories, and facilities, and make a difference. Heroes who have preceded us inhabited the same language, culture, institutions, technologies, and friendships, yet they made a difference. Our work about information needs to be different from that of others. However, difference does not come without confluence. Communication science is the science of deliberate connections, open dialog, net-work, open-hearted moves, and/or negotiated behavior, whereas information science is the science of information retrieval, storage, and/or organization. Moreover, information science is a discipline that investigates the world of patterns and selected formats. As seen in the history of communication science and information science, the utility of the holistic views
of information and communication cannot and should not be supplanted by one format and/or area of study.

References


Edmund Burke: Politician
What Burke Teaches Us About Defining Representation

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Edmund Burke was a politician, not a traditional, canonical political theorist. His long, statesman’s career included a single term as an elected representative of Bristol. Burke developed the oft-cited “Burkean” (or trustee) model of representation from his own experiences as a legislator. Burke failed to secure re-election to the Bristol seat, and his difficulties there serve as a caution to modern-day elected officials who choose to emulate Burke’s trustee approach. Modern-day Burkeans must take care not to be perceived as aloof and unengaged in the affairs of the district. As for scholars, Burke’s choice to eschew metaphysics and imaginary hypothetical scenarios in favor of learning from experience, direct us toward more respect for the wisdom that comes from experience, and ultimately, toward more practical and usable theories of representation.

Keywords: Edmund Burke, deliberation, Richard Fenno, home style, representation, Speech to the Electors at Bristol, trustee.

INTRODUCTION

It is striking that Burke was made the purveyor of a Theory necessary to healthy politics. If there is one recurrent theme in Burke’s letters, speeches, and writings, it is his emphasis on the moral and political evils that follow upon the intrusion of theory into political practice. It is theory as such that he rejects; his emphasis on the evils of intrusive theory is not balanced by a compensating reliance on sound theory that men would need as a guide to their politics. Sound theory, to him, would seem to be self-denying theory. Harvey Mansfield Jr.¹

Learning what ‘representation’ means and learning how to represent are intimately connected. Hanna Pitkin²

Edmund Burke was not a traditional political theorist. He was a politician. Burke did not hone his oft-cited concept of representation in an exercise of academic theory-building. Rather, he did so through his activities in politics and statesmanship. Burke shaped his approach to representation during the brief portion of his career in which he served as one of the elected MP’s from the city of Bristol, Great Britain. In other words, Burke proffered a definition of representation while working, and serving, as a representative. Traditional scholarship on the Burkean (trustee) model of representation pays little or no heed to the way in which Burke developed his view—that is, through the actual practice of serving as a representative. The way in which Burke developed his “Burkean” model of representation shows the promise—and pitfalls—of Hanna Pitkin’s prescient observation in her quote at the beginning of this paper.

SCOPE

Here is a word on what this short, tightly-focused paper is not. It is not a comprehensive, temporal biography of Burke like the work of Carl Cone.³ It is not a contemporary, thematic biography of Burke in the vein of Conor Cruise O’Brien’s recent offering, The Great Melody.⁴ It is not a hagiographic introduction to the nuts-and-bolts of Burke’s life and career, as is Russell Kirk’s Edmund Burke: A Genius Reconsidered.⁵ This paper does not delve deeply in a broad swath of Burke’s voluminous speeches and writings, as does Mansfield’s work. This paper’s scope is far narrower: it is concerned only with the method used by Burke to derive his oft-cited trustee, or “Burkean” model of representation, during the short period he served as an elected MP. Readers interested in learning more about Burke’s long career as a statesman are referred to the books cited above for far more comprehensive accounts of his life, career, and advocacy on behalf of Irish Catholics, Indians under the yoke of the British East India Company, and taxed-but-not-represented American colonists. Of course, these and other sources also feature in-depth analyses of Burke’s alarm and outrage over the French Revolution, and his foretelling of its bloody aftermath and the rise of a dictator, who later emerged in the person of Napoleon Bonaparte.⁶

BURKE AS GROUNDED THEORIST: DEFINING IT BY DOING IT

As scholars observe legislators learning how to represent, we also learn what representation means. What do actual representatives tell us about defining representation? Legislators approach representation as a grounded process—that is, a process in which the generalizations about what one
is doing evolve together with the activities based on those generalizations as part of one’s experiences. Grounded processes are related to the grounded theory methodology of qualitative research. That is, grounded theory is the academic study of grounded processes. Barney Glaser argues that grounded theory means “generating theory and doing social research [as] two parts of the same process.”

Grounded theorists Anselm Strauss and Juliet Corbin (1994) continue this thought, adding that “theory evolves during actual research, and it does this through continuous interplay between analysis and data collection.”

I contend that Edmund Burke attempted his own prototypical grounded theory through his own experiences as a legislator. However, he failed to firmly ground his approach to representation in interactions with constituents. He had a general sense of the politics of the district, but also presented himself as aloof and uncommunicative. The “Speech to the Electors at Bristol” is a remarkable attempt to set things right—but one which was too little, too late.

Approaches to representation may be studied in careful, qualitative detail by observing representatives as they go about their tasks. In Burke’s case, we must reconstruct his approach using his own writings and other historical materials. Burke believed that his district was too divided and fractious to be effectively represented by a “delegate” who reacted and responded to the constituents’ instructions. As Ernest Barker notes, the idea of an instructed delegate legislator was popular among radicals in Burke’s time. Burke saw too much division and conflict in Bristol—and indeed, throughout the growing, industrial society of Britain—for effective delegate representation. He opposed the radicals. As a prototypical grounded theorist, he sought to respond to this with a starkly different alternative: a trustee legislator whose decisions are made by his own wisdom, in anticipation of the district’s best interests.

Burke had begun to develop his trustee viewpoint before his election in Bristol. Barker points out that in Burke’s 1770 essay, “Thoughts on the Cause of the Present Discontents,” he articulated opposition both to shorter legislative services and to a ban on legislators’ being allowed to hold other public offices. Here Burke began to articulate the argument that the public should not constrain the legislator’s ability to act on the basis of his own wisdom and judgment. Burke wrote the “Thoughts…” while serving as Secretary to the Marquess of Rockingham. In this position, Burke served as a Whig leader in the House of Commons without sitting for election in a constituency. This changed in 1774, when he was elected to represent Bristol, though he did not live there (British law did not require Members of Parliament [MPs] to live in their districts.) Before being elected, he articulated the view that legislators must make decisions in the best interests of the whole nation, and that they should do so based on wisdom, not instructions. His campaign, service, and struggle for re-election in Bristol forced him to sit for election and re-election, thus developing his view of virtual representation further and articulating it as an approach to representing his constituents.

In the “Speech to the Electors at Bristol,” Burke defended virtual representation in terms of its fit with his district. In so doing, he succeeded in bringing a powerful approach representation into the canon: the Burkean model, also referred to as trustee or virtual representation. However, Burke failed at re-election. More fundamentally, he failed at developing a successful home style: a term later coined by American political scientist Richard Fenno to describe the interaction between an elected representative and those she represents. Burke’s success was in bringing to the canon a new way to do political theory: one that is grounded in experience with the concept one seeks to define. Ironically, Burke himself failed to sufficiently ground his own approach to representation: that is, he paid insufficient attention to the interactions between himself as representative, and the constituents that he represented.

**Burke’s Approach to Doing Theory**

Burke’s theory is derived from accumulated experience: both a nation’s tradition and his own experiences as a legislator. Burke seeks to preserve accumulated information, wisdom, and prior understanding. Glaser, Strauss, and Corbin refer to this as grounding. Of course, a different legislator may not reach the same definition of representation from her experiences as Burke did from his own. This is because, as Donald Searing notes, other representatives have different preexisting biases, and they will have different experiences in different institutional contexts. The resulting grounded process of representation is therefore likely to be different for each representative. But the salient point here is that Burke relied on practical experience and accumulated wisdom to create a new definition of representation.

Staying above the tumult of day-to-day politics was crucial to effective public service, according to Burke. This in turn depended on one’s position in a social hierarchy—certain people (not necessarily the wealthiest) were uniquely privileged to develop their education and wisdom. Destroying that social hierarchy, in turn, destroyed the system that produced those so uniquely fit to serve, thus compromising the nation’s best interests. Still, Burke did believe that these uniquely fit public servants had a responsibility to return to the district and justify their actions taken in previous legislative sessions. The “Speech” was Burke’s attempt at doing just that.
Burke sought an approach to representation that would keep him above the fractious fray. He sought to stay above the district’s tumult, rather than to successfully negotiate it. Thus Burke turned to a ‘whole nation’ focus. Six years before the “Speech to the Electors,” he made history with a shorter speech to supporters. According to Cone, that earlier speech “is the first recorded instance of a candidate [for British MP] explaining to voters his views on national questions.” In that earlier speech, he stressed his commitments to commerce and tolerance of Catholics.

For Burke, the district’s interests in national matters were best understood by the deliberating representative. But the electorate’s immediate opinions were another matter. Constituents may be impulsive or foolish. The philosophy of virtual representation is often illustrated with the following famous quote:

I did not obey your instructions: No. I conformed to the instructions of truth and nature, and maintained your interest, against your opinions, with a constancy that became me. I am to look, indeed, to your opinions; but to such opinions as you and I must have five years hence.

This quote is remarkable for two reasons. The first is the way in which Burke reached this conclusion, and the second is his focus on time. In the “Speech,” this comment followed Burke’s criticism of colonial policy toward Ireland and America. Burke argued that the British policies toward Ireland and America only served to provoke violence and war, thus dividing the British realm. In both cases, he notes, many of his own constituents were adamantly in favor of the no-compromise positions. Yet he relied on his own past and present experiences to judge what would be best for the nation and the district. He argued that unrest in Ireland and the successful revolt of angry, overtaxed colonists in America both served to harm Britain. They also hurt the trading interests so crucial to Bristol’s economy. Burke’s views did not derive merely from his interest in serving Bristol. An Irishman of mixed Catholic-Protestant heritage himself, Burke had a passion for repealing anti-Catholic laws that stemmed from his own life experiences. Still, he was able to articulate his own interest in terms of the district’s best interest, even on an issue so close to his heart. Furthermore, Burke had less of a personal stake in the American Colonies than he did in Ireland, and his view of that matter did derive heavily from his view of what was best for Britain, and for Bristol. According to Burke, those calling for no-compromise positions on America and Ireland had not thought carefully about their own interest. The representative must not act upon these constituents’ immediate demands or he will sacrifice both national and local interest to popular passions.
For Burke, the public servant had the resources—and the duty—to deliberate on such policy matters and learn from events. The experiences of being caught between a divided and passionate constituency, on one hand, and his own deliberations on the nation’s long-term interests, on the other, formed the basis of his philosophy. For Burke, the legislator must take time to distinguish a nation’s and community’s true interests from the immediate popular passions back home.

**TIME: THE KEY TO DELIBERATION**

For modern legislators, as for Burke, there is one particularly important resource at her disposal: one which is required for proper deliberation. Fenno writes, “time is a House member’s most precious resource.” This insight is readily generalizable to any legislator. Note the stress on time in the ‘I did not follow your instructions’ quote. Burke told the electors, “I am to look... to such opinions as you and I must have five years hence.” For Burke, the legislator must both use time to deliberate properly, and consider the effects of time as he does so. Several years earlier, Burke had said, “nothing shews a more weak undetermined unsystematic spirit than to fall into a little hurry of weak premature, undigested measures either of force or of Policy and not to rest steadily.”

Pitkin interpreted Burke’s argument as follows, “Voting, the counting of noses in Parliament, is of no importance; what is required is that all the facts and arguments be accurately and wisely set forth.” She added, “Deliberation is the heart of ‘the representative function’ for Burke.” For Burke, taking and using time was more important than passing laws. Improper deliberation is the basis of bad law, and “bad laws are the worst sort of tyranny.”

This is not to suggest that simply taking time is an adequate approach to representation. Time is for deliberation, not simply an excuse for inaction. Consider how Burke spoke of his opponents regarding a bill to repeal anti-Catholic laws (Burke favored the repeal).

“Parliament,” they assert, “was too hasty, and they ought, in so essential and alarming a change, to have proceeded with a far greater degree of deliberation.” The direct contrary. Parliament was too slow. They took fourscore years to deliberate on the repeal of an Act which ought not to have survived a second session.

For Burke, deliberation was intended for understanding the county’s interests, not to justify inaction in the face of bad laws. Bad laws, in turn, exclude certain interests from representation—interests such as those of the American colonists, the Irish, and Roman Catholics. Deliberation was crucial. It was the key to understanding these objective interests, and for shaping appropriate policy to serve them. A legislator must use his most precious resource of all—time—to determine these interests and decide a course of action. Constituents, by contrast, can often be impulsive. They may act without taking time to deliberate, and without considering the effects of time (“five years hence.”) Burke said, “Such a representation I think is to be in many cases even better than the actual... The people may err in their choice; but the common interest and the common sentiment are rarely mistaken.”

Burke was optimistic that the constituents would also come to understand better the true interests of community and nation, in time. On his opposition to debtors’ prisons, he told the electors that constituents would come to embrace his own position “as we become enlightened.” Yet Burke also believed that the representative faced the unique opportunity and duty to anticipate these changes of opinion—to vote as they would wish him to, five years hence. Constituents can deliberate, too. But the representatives’ own deliberation must be a few steps ahead of the constituents.

Burke defined deliberation as a sort of settling process, in which the true interests of community and nation can be isolated from temporary passions and divisions. He illustrated this point with his discussion of the Reformation. He wrote,

The Protestant religion in that violent struggle, infected, as the Popish had been before, by worldly interests and worldly passions, became a persecutor in its turn... It was long before the spirit of true piety and true wisdom, involved in the principles of the Reformation, could be departed from the dregs and feculence of the contention with which it was carried through.

Here Burke deplored Reformation-era Protestants for their behavior, not their ideas. Time played a key role, in allowing for the true best interests of the Reformation to be separated from worldly interests and passions (“it was long before...”). (A few years later, Burke would be horrified by the French Revolution, with its violent trampling of accumulated traditions, interests, and attachments that had settled over time.) Burke thus exhibited profoundly mixed views of the human character—including the character of his own constituents. Caught up in these passions, people often overlook the true interests of community and country. They may be blinded by prejudices or a thirst for revenge (both of which combined to bring about the anti-Catholic laws which Burke voted to repeal). They may be simply impulsive. The deliberating representative must anticipate what true interests will come into clearer view, once time has allowed them to settle.
Clearly, time is an indispensable resource to any legislator. Yet, Burke’s own approach to time—using it to set himself above, and apart from, constituents—ultimately failed him as an approach to home style.

**What Burke Got Wrong**

Burke’s virtual representation was not a successful strategy for his re-election. Barker notes that immediately before the 1780 election, Burke withdrew, realizing he had no hope of a second term. According to Cone,

> Unfortunately, amid the clash of interests that developed during the following six years [after his election], Burke’s lofty views of the proper relationship between a member of parliament and his constituents became uncongenial to the people of Bristol. Less justifiably, Burke’s aloofness and his failure to nurse his constituency did him irreparable damage by the time the next election occurred.34

Heinz Eulau criticized Burke for his excessive party loyalty and his tendency to ignore his constituency. “The core problem involved in representation,” Eulau wrote, “is the relationship that exists between representative and represented.”35 On this score, Eulau noted, Burke fell disappointingly short. Eulau relied heavily on Barker’s discussion of Burke and Bristol for his background information on Burke’s career. Barker noted that Burke did not live in his district and visited less than once per year. More fundamentally, Barker argued that Burke failed to develop a successful strategy of interaction with the constituents. Barker wrote,

> His normal belief of the union of minds was confined to a narrow circle, and the area of discussion was an area of the elite. He hardly regarded himself as engaged in discussion with the people of Bristol, or the people of Bristol as engaged in discussion with him….36

In essence, Barker argued that Burke failed to develop a successful home style. Instead, Burke developed a view of deliberation featuring a distinct elite bias. That is, it excluded the perspectives of nonelites.37 He sought to rise above the tumult within his district, rather than to successfully negotiate it. Thus he became perceived as aloof and unresponsive.

Heinz Eulau and Paul C. Karps suggested that symbolic responsiveness is one of a representative’s essential tasks.38 Malcolm Jewell placed that task at the very core of home style.39 Symbolic responsiveness refers to the way in which a representative, through actions, words, and priorities, that she is connected to her constituents, understands their values and interests, and responds to them. Because of this failing, Burke had limitations as a grounded theorist. This is not to argue that re-election is the ultimate test for a political theory’s validity. Burke’s is a deeper problem: his failure to ground his theory. His unsuccessful re-election bid was a symptom of that problem, it was not the problem itself. Barker noted Burke’s failure to develop a grounded theory of representation, writing,

> Burke had many Quaker friends… But there was one Quaker idea which he never really learned. It is the idea of ‘the sense of the meeting,’ the idea of a union of minds, in a common purpose, attained through a process of general thought to which we may all contribute, and by a mode of amicable discussion in which we may all participate. It is this idea which underlies any grounded belief in democracy.40

This is not to argue that a trustee (Burkean) legislator is doomed to failure. But even modern-day Burkeans must develop successful patterns of interactions with constituents in the right environment.

Eulau noted a remarkable number of modern legislators who do take a “Burkean” approach—stressing their own judgment over the instructions of constituents.41 I found two such legislators in my own research. I labeled them, simply enough, the “Burkeans.” Their words and actions were much along the lines of what Burke suggested. They stressed making decisions based upon their own wisdom, not upon a survey of district opinions. One legislator, a former academic, delighted in discussing his “friend” Burke’s ideas with me. Another said, “my district elect[s] me based on who I am to come down here and make some decisions…. You don’t elect somebody down here that’s ‘gonna take a poll,’ because if you do, you don’t need me down here. And so that’s my attitude.”42

Yet these Burkeans implemented Burke’s own principles more successfully than Burke himself did. They returned to the home district much more frequently to explain and defend their votes to the constituents. They also struggled to show clearly the relationship between the good of the state and the good of the district. And finally, they engaged in rather mundane name recognition activities that Burke would probably have seen as beneath him. Imagine Burke handing out rewards to high-school wrestlers, or riding on a float for the “skillet days” parade. Modern Burkeans put virtual representation into practice more successfully than Burke himself, in districts where the approach seems a better fit.

**Conclusion: Burke the Politician, Defining Representation**

Burke ultimately failed at grounding his approach to representation in interactions with constituents. What are the consequences of this shortcoming, for the Burkean model of representation? Eulau suggested that the entire dichotomy between trustees and delegates—a dichotomy which Eulau
himself had integrated into his own previous research—was radically challenged by Burke’s shortcoming. According to Eulau, because Burke was not able to master the relationship between representative and represented—the core problem of representation—the trustee/delegate dichotomy is not particularly useful to us today in understanding representational styles.

Eulau’s critique of Burke’s failures is valid. The trustee/instructed delegate framework is not well-grounded in empirical studies of legislator-constituent interactions. It is not responsive to the fact that legislators may respond differently on different issues, for example, by systematically taking a trustee approach to certain policy categories and a delegate approach to others. It is idealistic, and presupposes that a legislator can ‘rise above’ his own identification with factional interests within and beyond the district, as well as his own prior biases. Further, it does not include a role for party loyalties. This is notable, because Burke was so heavily involved in the factional struggle to define the values and policies of his own party, the Whigs.

Eulau’s critique also has a downside: it ignores what Burke got right. Eulau noted, with seeming frustration, that Burke’s trustee/delegate dichotomy survived too long and is in need of replacement, not repair. This is true. But Burke’s own approach points the way toward developing that replacement. Burke’s single term as an elected MP leaves us with this core insight: the concept of representation may be usefully defined by engaging in its practice. This is a major challenge to the ideas that representation is defined, for example, through a list of assumptions, an imaginary state of nature, or metaphysics. In attempting to define representation by doing it, Burke fell short. He did not develop an effective home style grounded in representative-represented interactions. Yet he pointed the way for political theorists to continue studying the concept. Burke triumphs by showing us that representatives define representation through their own engagement the concept, that is, by putting it into practice. He falls short in negotiating the nexus between who is representing, and who is being represented. Politicians and states-persons take note: approaches to representation must be thoroughly grounded in legislator-constituent interactions, or they will not succeed. For academics, it follows that definitions of representation are much more useful when they derive from empirical observation of those interactions.

NOTES

12. Fenno, Home Style
23. Fenno, Home Style, p. 34. Emphasis added.
44. Eulau and Wahlke, *The Politics of Representation*.
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