



Power-Users and New Hires: Contrarian Insights on Technology Skills for Entry into the Accounting Profession

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**Power-Users and New Hires: Contrarian Insights on Technology Skills for Entry into
the Accounting Profession**

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INTRODUCTION

The Association to Advance Collegiate Schools of Business (AACSB), American Accounting Association (AAA), American Institute of Certified Public Accountants (AICPA), Institute of Management Accountants (IMA), and the Big Four public accounting firms have all called for more technology skills for new hires. The AACSB Standard A7 now requires accredited accounting programs increase technology and “integrate current and emerging accounting and business information technologies” (AACSB Sept. 2014). The Pathways Commission Recommendation #4 Action Item 4.1.6 states academics should “transform learning experiences to reflect current and emerging technologies and global trends in business” (The Pathways Commission 2015). A Technology Taskforce was convened to provide additional guidance for this action item, which included an academic and practitioner focus group that ranked electronic spreadsheet as the #1 technology accounting graduates should know (The Pathways Commission 2015). Furthermore, the AICPA and IMA recognize the influence of technology on the profession and included technology competencies in their core competency frameworks for professional skills (American Institute of Certified Accountants 2016, R. A. Lawson, et al. 2014).

The use of technology is continually increasing in the field of accounting, with the profession calling for a wide range of technical skills from the use of personal productivity applications such as Microsoft Excel spreadsheets to performing advanced data analytics and visualization. Specifically, both large and small employers are asking new hires to have ‘more Excel skills’, but what exactly is ‘more’ – in terms of the specific types of spreadsheet skills and the depth of skill knowledge? How should this Excel knowledge be taught? Does ‘more’ knowledge include developing the ability for logical abstraction and utilizing computer skills?

What are the best practices for using computers as tools across various disciplines as academics overhaul accounting curricula to include this revised skillset?

This study focuses on uncovering a more refined understanding of what “more” entry-level Excel skills are in demand. It makes two contributions to the literature on accounting technology usage. First, this study documents the perspective of three constituencies regarding both *required* and *desired* entry-level spreadsheet skills necessary for a career in accounting. Second, this study provides guidance for enhancement of identified spreadsheet expertise for new hires by recommending a more discerning learning strategy towards the mastery of required skills and an awareness of desired skills.

This study utilizes survey research to determine a standard set of Excel spreadsheet skills necessary for success as an accounting new hire. Excel spreadsheet abilities are in demand across the breadth of accounting sub-disciplines and across the wide range of firm sizes. To address the question of what are the important ‘more’ skills in demand by employers, surveys gathered insights from Excel Power-Users, accounting New Hires and current accounting Students. Subsequent analysis then compared the perceptions of these different types of users to derive a clearer understanding of the spreadsheet skills required for successful entry into the accounting profession. Respondents rated a common set of individual spreadsheet functions and features – identifying each as either: a) a job entry requirement, b) desirable for job entry or c) not a job entry requirement. Further, the different perceptions between the three groups of respondents were analysed as the basis to make training and curriculum recommendations for preparing accounting new hires.

The remainder of the paper is organized as follows. Section 2 reviews prior literature, and

Section 3 discusses the research method. Section 4 presents the study findings. Section 5 concludes with a brief summary, study limitations and future research.

PRIOR LITERATURE

In the premiere volume of the *Issues in Accounting Education* journal, technology was considered a beneficial foundational competency for accountants (Fetters, McKenzie and Callaghan 1986). Recently, Rebele and St. Pierre (Rebele and St. Pierre 2015) found there is a lack of research on the use of technology in the teaching of accounting, which is cause for great concern given the accelerating pace of change and the growing importance of technology in the accounting profession. In identifying the accounting areas lacking in education research, Rebele (2015, p. 131) states, “Relatively few accounting education papers have been published on educational technology. For a professional where technology is critical, the fact that very few published papers are focused on technology issues is a major deficiency.”

Thought leaders in accounting education have long supported the benefits of using accepted business technologies in conjunction with teaching students accounting practices (Fetters, McKenzie and Callaghan 1986, Borthick and Clark 1986). Perhaps most important to educators, the use of technology (mainly spreadsheets) in conjunction with teaching accounting procedures has been found to promote initial learning among all students, and to sustain learning among weaker students (Fetters, McKenzie and Callaghan 1986, Stone, Arunachalam and Chandler 1996). An early study of teaching accounting using computers in an Intermediate II course found technology use to be beneficial to learning accounting procedures (Friedman 1981). Today, firms’ pervasive use of computing provides ever more motivation to teach using technology to better match accounting practice.

The use of technology is increasing in the field of accounting, with the profession calling

for more advanced technical skills including personal productivity applications such as Microsoft Excel (AACSB Sept. 2014, R. A. Lawson, et al. 2014, The Pathways Commission 2015, American Institute of Certified Accountants 2016). Many studies regarding technology use in the profession include spreadsheet skills as the first or second most important technology skill for a career in accounting (Edmonds 1988, Brown and Pike 2010, Cory and Pruske 2012, Drew 2012, Chen, et al. 2009, Welch, Madison and Welch 2010, Ahadiat 2008, Beaman and Richardson 2007). Yet, Yu et al. (2013) found employers perceived the spreadsheet skills of recent interns as inadequate. Limited studies have extended the research to include specific lists of spreadsheet skills perceived as necessary for accounting career success (Bradbard, Alvis and Morris 2014, Ragland and Ramachandran 2014, Ramachandran Rackliffe and Ragland 2016). Moreover, these studies tend to focus on individual career tracks (or sub-disciplines) within accounting – either in an industry or in public accounting. As tasks differ within accounting career tracks, it is natural that the functions and features differ in order to complete routine sub-discipline tasks (Bradbard, Alvis and Morris 2014, Ragland and Ramachandran 2014). This study surveys both industry and public accounting Excel Power-Users, New Hires and Students (pursuing a career in either industry or public accounting) to provide a broad overview of skills needed at the entry-level for any accounting career.

Acquisition of Technology Knowledge

Prior accounting education literature is sparse about the types of information systems currently needed in the accounting profession, and says little about the range of technology knowledge that is considered essential today (R. A. Lawson, et al. 2015, R. A. Lawson, et al. 2014). Excel is an entry level technical skill and often used in a wide range of accounting contexts and is often the first choice for learning an initial technology in support of accounting

tasks. But, there is a lack of detailed guidance regarding spreadsheet knowledge and features of importance in preparing for an accounting career.

What types of knowledge must be gained to acquire technology expertise in Excel spreadsheets? Research into Excel knowledge will typically ask about discrete spreadsheet features and how important it is to learn them. Failing to recognize Excel as an individual productivity technology may suppress the range of features and the various contexts in which they are taught. Both aspects deserve investigation as innovations continue in business technology and the set of technology systems to consider continues to expand.

A theoretical context is needed within which to consider the approach to Excel technology education. Typical use of Excel situates the application usage into a single-user, task-oriented domain. Prior research in the domain of single-user, software application knowledge repeatedly finds that there are many levels of software knowledge to attain productive use (Sein, Bostrom and Olfman 2001, Bostrom, Olfman and Sein 1988, Santhanam, Seligman and Kang 2007). Their hierarchy of application knowledge commences with a foundational level of application knowledge starting with *command-based navigation* and then a *tool procedural knowledge* of the feature (Kang and Santhanam 2003). Subsequently, with experience and study, further levels of knowledge for *tool-conceptual* and *business procedures* are acquired.

Another way of describing these different levels of knowledge required for computer software usage is derived from analysis of actual technical support reports of end-user knowledge gaps. Three types of technical knowledge were derived based on an empirical study (Santhanam, Seligman and Kang 2007). These three types are listed below, followed parenthetically by the related theoretical category:

- (1) *Know-how* - steps to complete a system-related task. (*command-based navigation*)
- (2) *Know-what* - knowledge of an aspect or a conceptual understanding of the system, or knowledge that a system component is not functioning as intended. (*Tool Procedural*)
- (3) *Know-why* - knowledge of the business rules (dynamics and inter-relationships) in the system, or adjustments to usage for a business-related need, or knowledge that the system does not fit a user's business task. (*tool-conceptual* and *business procedures*).

The empirical study supported the four theoretical levels, and found that any missing type of knowledge hindered usage of the technology (Santhanam, Seligman and Kang 2007). Santhanam et al. (2007) found that users were able to rely on technical support for most of the '*know-how*' knowledge and a good amount of '*know-what*' knowledge. However, the main source for the important '*know-why*' knowledge came from business peers known to be power-users, who understood *both the business goals and context of use*, as well as had a productive working knowledge of the software application within that business context.

RESEARCH METHOD

To better understand the perceived spreadsheet skills necessary for an entry-level position in an accounting career, this research study was designed to capture the opinion of Excel skills from accounting practitioners (experienced managers and new hires) and students (undergraduate and graduate). This study utilized a survey to examine the following research questions:

RQ-1: What spreadsheet skills do employers require or desire of new hires?

RQ-2: What spreadsheet skills do New Hires find were actually required and desired by their employers?

RQ-3: What spreadsheet skills do students perceive are required and desired by prospective employers?

RQ-4: What is the degree of agreement among Power Users, New Hires and accounting Students regarding which spreadsheets skills are required and desired by employers?

The survey was comprised of three parts. Part 1 consisted of demographic questions about the respondents, including years of professional employment experience, business area of expertise, education, industry experience, and role in hiring process or student classification. Part 2 consisted of 24 items¹ (see Table 2) to determine the respondent perception of Excel skills necessary for success as an entry-level new hire into an accounting career. Part 3 asked respondents to list any entry-level skill specific to their company or job function not covered by the survey items in Part 2.

Respondents

The Excel Power Users that participated in this study were from an Advanced Power Excel seminar hosted at a local university near a large Midwest City in the United States, see Appendix B for seminar announcement details. The seminar was marketed towards experienced accounting and business managers who had extensive Excel knowledge and were well prepared to begin advanced training sessions. A paper survey was administered to the Advanced Power Excel attendees by the researchers, in which attendees were asked to complete the survey by the

¹ Advanced Excel features related to data analytics (planned for future research), task-based feature combinations and plugin tools were deemed beyond the scope of this study.

end of the 8-hour seminar. A verbal explanation was provided for the importance of the research and the need to focus on what skills new hires should enter their career with versus the skills they would acquire in the first years of employment. From the 46 attendees, 32 usable anonymous responses were received with a response rate of 70% (see Table 1, Panel A).

Insert Table 1

The New Hires that participated in this study were recent accounting graduates from two universities near the same large Midwest City as the Advanced Power Excel seminar. The new hires were identified as former students of the researchers that had graduated in the last two years and had current full-time work experience. A digital version of the paper survey was created in Qualtrics and emailed to New Hires by the researchers, in which New Hires were asked to complete the survey within a two week response period. A written explanation was provided for the importance of the research and the need to focus on what skills they should have entered their career with versus the skills they would acquire in the first years of employment. Of the 73 accounting graduates contacted, 41 usable anonymous responses were received with a response rate of 56% (see Table 1, Panel A).

The Students that participated in this study were from a university near the same large Midwest City as the Advanced Power Excel seminar. The Students were currently enrolled in an undergraduate AIS course or a graduate Managerial Accounting course at the time of the survey². A link to the digital version of the paper survey created in Qualtrics was provided to

² The AIS course is a required second semester junior level course for all majors. The graduate Managerial course is a required first semester course for all Masters of Accountancy students.

Students through the researchers' learning management system to be completed voluntarily within a one week response period. A verbal and electronic announcement was conveyed for the importance of the research and the need to focus on what skills they believed they should have to enter a career with versus the skills they believed they would acquire in the first years of employment. A total of 23 out of 28 possible anonymous graduate student responses and 12 out of 21 under-graduate responses were received, a response rate of 82% and 57% respectively (see Table 1, Panel A).

The survey respondents were allowed to identify multiple education disciplines in the demographic section (see Table 1, Panel B). As expected, the majority of respondents identified accounting as a primary discipline in their education: Power Users 81.25%, New Hires 92.68% and Students 92.49%, with finance identified as the second most common primary discipline: Power Users 37.50%, New Hires 9.76% and Students 17.14%. Over half (61.11%) of the survey respondents have pursued some level of graduate course work: Power Users 46.88%, New Hires 70.73% and Students 62.86%. The use of Excel in both accounting and finance curriculum is assumed and provides an indication of the respondents' exposure to most of the Excel skills listed in the survey.

The amount of professional work experience, as shown in Table 1, Panel C, ranges from none for Students to 33 years for Power Users. The average length of professional work experience for Power Users is 19 years (mean = 19.25), which is not surprising given the marketing for the seminar focused on experienced business managers with extensive Excel knowledge used to make strategic business decisions. The average length of professional work experience for New Hires is 4 years (mean = 4.28 and max = 12), despite the New Hire group being identified as graduates within the last 2 year. The Students report the average length of

professional work experience as 3 years (mean = 3.15 and max = 25), which is indicative of the student population of the universities involved in the study, often working full-time while attending college. The use of Excel in professional work experiences for business majors is assumed and provides an indication of the respondents' exposure to most of the Excel skills listed in the survey. It should be noted, the recent graduates and current students of one of the participating universities are typically non-traditional and full-time working students, indicating students are already employed for some period of time and have returned to college to pursue professional certification and/or advancement opportunities.

All respondents were allowed to identify multiple areas of work experience and hiring roles for Table 1, Panel C and D. Respondents indicated 26.85% had public accounting experience, 22.22% had management accounting experience and 80.56% had other professional work experience. Interestingly, the Power Users and Students report more diverse experiences, whereas the New Hires responses will be influenced by public accounting experience (41.46%). New Hires and Students have limited or no roles in the hiring process, whereas roughly 40% of Power Users report involvement in the new hire process (interview = 46.88% and hiring decision = 37.5%) and roughly 60% report working with new hires (manage new hire = 40.63% and work directly with new hires = 68.75%). The Power User group has extensive access to new hires allowing them to set expectations for new hire Excel skills necessary for career success, while the new hires have timely exposure to Excel skills expectations and students are relying on perceptions of the Excel skills expectations.

Excel Skills Survey

The items contained in Part 2 of the survey were selected based on researcher experience,

guidance from employers and colleagues and prior research (Bradbard, Alvis and Morris 2014, Ragland and Ramachandran 2014, Ramachandran Rackliffe and Ragland 2016). The list was restricted to a sample of 24 novice, intermediate and advanced items to comply with time limitations imposed by the conference organizers for the Power User group.

The Student, New Hire and Power User groups were given the same set of items to evaluate. The survey provided definitions and/or examples for each Excel spreadsheet skill so that all respondents could assess the skill, even those who may not be familiar with the name or label. This approach better ensured that all respondents would understand and recognize the Excel spreadsheet skills for more accurate survey results. The assessment of these items were mapped to the following values: 1 – not required skill for entry-level employment, 3 – desired skill for entry-level employment, and 5 – required skill for entry-level employment.

Study Findings

Perception of required and desired spreadsheet skills for new hires

Table 2 reports the number of responses, means, standard deviation, median and mode by participant group for each Excel skill: Power User (Panel A), New Hire (Panel B) and Students (Panel C). An analysis of the median and mode for each group identifies Excel skills each group perceives as required for new hires. Required skills have both a median and mode score of 5. The likely required skills are considered candidates for required skills as a result of the mixed result between a median score of 3 (the middle value for the item of an ordered dataset) and a mode score of 5 (most frequent value for the item in the dataset). Required Excel skills for new hires implies knowledge of the command based navigation and procedural knowledge of the skill (Kang & Santhanam, 2003). Power Users perceive basic math skills, find and replace, filter and

sort data, custom formatting and cell referencing as definitive required skills and pasting special as a likely required skill (mixed score of 3 and 5). New Hires share required skills perceptions of basic math skills, find and replace, filter and sort data, custom formatting and cell referencing with the Power Users. However, New Hires deviate on additional perceived required skills of keyboard shortcuts, importing data, linking to other worksheets and graphs and charts and likely required skills of named ranges, password protect and pivot tables. Students' perceptions are similar to New Hires in that required skills include basic math skills, find and replace, filter and sort data, keyboard shortcuts, custom formatting and cell referencing and likely required skills of pivot tables. Students deviate from New Hires on required skills perception of pasting special and likely required skills of importing data, linking to another worksheet and graphs and charts. Interestingly, the deviation between Students and New Hires had Students underestimating New Hire identified required skills as likely required.

Insert Table 2

Further analysis of the median and mode for each group identifies Excel skills each group perceives as desired (score of 3) or not necessary (score of 1) for new hires. Desired Excel skills for New Hires implies an awareness of the command based navigation and declarative knowledge of the skill. Excel skills that are perceived as not necessary implies New Hires may be aware of the existence of a command, however employers have a willingness to develop skill knowledge within the first years of employment. Power Users perceive arrays, index and match, Boolean statements, encryption and macros as not necessary. These skills seem reasonable given they are relatively advanced Excel skills and would likely not be encountered by a new hire upon entry into the accounting profession. It is interesting to note that New Hires and Students didn't

perceive any skills as not necessary and New Hires indicated arrays, encryption and macros were likely desired, implying each skill should be required or desired for subsequent employment.

The means reported in Table 2 were utilized to create an ascending sort order of Excel skills by group as reported in Table 3 (Bradbard, Alvis and Morris 2014). Overall, the three groups sorted the same skills in the top nine skills required for new hire career success, albeit in slightly different order. The top nine skills sorted by all three groups in Table 3 most closely replicates the list of required and likely required skills identified by the New Hire participants in Table 2, Panel B. All three groups rated basic math skills, filter and sort data and custom formatting among the top five. Power Users rounded out their top five selection with find and replace and pasting special types, while New Hires preferred keyboard shortcuts and linking to another worksheet and Students preferred find and replace and keyboard shortcuts for their top five list. Interestingly, the three groups rated array formula, index and match, encryption, macros and linking to external data in their bottom five skills necessary for new hire career success, implying these skills can be learned on the job in the first years of employment.

Insert Table 3

Difference in Perception of spreadsheet skills for new hires

There were two initial comparisons of sample means per respondent group whereby all Excel skills were combined. This combined mean comparison was used to determine if each sample was rating skills in similar ranges. Both grouped difference of means tests in Table 4, Panel A and B reveal a general difference in rating scale between Power Users and New Hires. This reveals Power Users rated Excel skills lower, in general. The Table 4, panel B paired difference of means tests had paired the rating for similar Excel skills. This was of even higher statistical

significance. However combined difference of mean tests showed Students and New Hires tended to rate in the same range as there is not a statistically significant difference. Therefore, in Table 4 Panel C, it is not surprising to find Power Users with lower ratings than New Hires for individual Excel skill.

Insert Table 4

An analysis of the differences between the skill means of the three participant groups is provided in Table 4, Panel C. The right two columns describe the t-statistic and p-value for the differences between the means of New Hires and Students. The analysis of the results imply New Hires and Students are statistically similar with a single statistical marginal difference at the 10% level (t-stat = -1.695, p-value = 0.094) for filter and sort data. The mean derived sort order for New Hires for filter and sort data skill is 1, while the Students is 4. A comprehensive analysis of the means (Students = 4.257, New Hires = 4.610), medians (Students and New Hires = 5), modes (Students and New Hires = 5) and sorted order (Students = 4, New Hires = 1) reveal Students and New Hires similarly perceive filter and sort data as a desired skill for entry into the accounting profession.

The left two columns of Table 4, Panel C describes the t-statistic and p-value for the differences between the means of Power Users and New Hires. The analysis of the results imply ten statistical differences between the two groups of professionals: conditional formatting, arrays, index and match, graphs and charts, Boolean (and or) statements and encryption at the 1% significance level; linking to another worksheet at the 5% significance level; find and replace, named ranges and macros at the 10% significance level. A comprehensive analysis of the means, medians, modes, codes and sorts of the eight skills is provided in Panel D. The results

reveal New Hires sorted means for these skills are consistently higher than Power Users, with the exception of find and replace, which both groups rate near the top (Power User rating = 2, New Hire rating = 6) and are considered required (Power User and New Hire median and mode = 5) for entry into the accounting profession. Arrays, index and match, Boolean statements (exclusive), encryption and macros are considered not necessary for entry into the accounting profession by the Power Users, whereas New Hires consider these skills desired (index and match and Boolean) or likely desired (array, encryption and macros). The remaining skills in this list (conditional formatting, named ranges, linking to another worksheet and graphs and charts) are considered desired skills by Power Users, whereas New Hires consider these skills required (linking to another worksheet and graphs and charts) or likely required (named ranges). Similar to Power Users (sorted order = 19), New Hires (sorted = 11) deem conditional formatting a desired skill for entry into the accounting profession. The skills in Panel D are not central to creation of cell content or formulas and necessitate multi-step action for a pre-post activity involving mental simulation or procedural thinking to execute. When used in combination with other features, these skills often accelerate productivity.

CONCLUSION

Discussion

Strong Excel skills enable New Hires to have more immediate impact on the job and to distinguish themselves professionally early in their career. On their submersion into the accounting profession, New Hires quickly develop strong impressions about which Excel features stand out as most valuable in the real work environment. New hires experience productivity expectations and accelerated learning on their new job, as compared to previous,

more structured classroom learning experience shared between the students. Their awareness is steeped in the context of real accounting tasks, with its large data sets, need to use combinations of Excel features to perform computations, and with time demands requiring a higher level of productivity. Now, highly motivated by the exposure to practice, these New Hires have newly-gained respect for the value and complexity of leveraging Excel's high utility features.

Power Users are rare study participants. On the opposite end of the spectrum from New Hires, Power Users have very advanced Excel knowledge developed over a long career where they proactively sought their accumulated knowledge to respond to the real demands of their profession. These Power Users have found that candidates for jobs do not have deep Excel knowledge, and so hiring activities seek trainable candidates with foundational skills. Power Users may even under-appreciate the extent of their own investment in gradually learning a wealth of technology skills which, by nature of being situated in the real accounting practice, naturally include business-context knowledge. Possible explanations for the disparity between New Hires perspectives and Power-Users' views could include the following differences, taken from two different participant group's perspective.

New Hires in this study are likely to have:

1. Short duration of business experience with accelerated pressure to extensively use most useful Excel spreadsheet features which they previously lacked). So, such Excel skills would likely be deemed *Required*.
2. Heighted on-the-job motivation to learn, explore and exploit valuable features – as they are assigned tasks and perhaps even told to employ a specific feature. They likely are made aware of features that more experienced professionals find highly beneficial. For

example, many New Hires are pressured to use shortcut keys to achieve greater time productivity.

3. As members of the 'digital native' generation, New Hires are expected to have strong technical knowledge already, and may seek added pressure for skills they lack.

Power Users in this study are likely to have:

1. Much longer duration of business experience where they gradually learned Excel spreadsheet features through repeated exposure, experimentation, practice and experiential learning.
2. Motivation to learn, explore and exploit any given valuable feature – as over time repeat usage will offer more perspective about which job tasks would benefit the most from employing a specific feature. (Features that are found to be more useful, save the most time, or produce needed results)
3. Variety of different opportunities to use and diversity of useful situation/ opportunities to employ a given EXCEL feature.

Contributions

This study includes insights from two very diverse segments of the accounting Excel spreadsheet user spectrum – that of New Hires and Power Users. The Power User participants are rarely available for research, are highly experienced accounting and finance professionals who actively participate in hiring decisions. These participants were from diverse accounting sub-disciplines, including both Public and Managerial Accountants. Advancing the past empirical study's ranking of a limited set of Excel skills, this study's data collection and analysis asked for job skills requirements, with features rated as 'required', 'desired', or 'not needed'.

Analysis included between group difference of means analysis which revealed contrary views between Power Users and New Hires

RECOMMENDATIONS

Excel spreadsheet skills education should be considered in light of the logical, conceptual and algorithmic approaches needed to deal with technology in the accounting discipline. Placing Excel training into a more realistic context of use could better address the need for Tool procedural and business conceptual aspects of Excel education which currently appear to be overlooked. This approach would address Excel skills that were differentially identified by New Hires as much more important in this study. This study's analysis of the New Hire perceptions of required skills necessary for career success results in nine required skills (basic math skills, find and replace, filter and sort, keyboard shortcuts, custom formatting, importing data, cell referencing, linking to another worksheet and graphs and charts) and three likely required skills (named ranges, password protect and pivot tables). Required Excel skills for new hires implies knowledge of the command based navigation and procedural knowledge of the skill. This level of knowledge requires multiple exposures to the specified skills across the accounting curriculum in which to obtain the recall necessary for a required skill.

A comprehensive analysis of the New Hire perceptions of desired skills necessary for career success results in nine desired skills (paste special, text to column, conditional formatting, index and match, Boolean statements, vlookups, logic formulas and linking to external data) and three likely desired skill (array, encryption and macros). Desired Excel skills for New Hires implies an awareness of the command based navigation and declarative knowledge of the skill. This level of knowledge requires an introduction to the specified skills in a select course in which to obtain an awareness of the required skills existence and how it can be used. The likely

desired skills are perceived as not necessary for New Hires. Although New Hires may be aware of the existence of a skill, employers have a willingness to develop the skill knowledge within the first year of employment. A curriculum that introduces these skills typically cover slightly more advanced skills (macros, arrays, index and match) and provide an additional benefit to their students.

Leaders in accounting education espouse the approach of incorporating technology across the accounting curriculum (R. A. Lawson, et al. 2015, R. A. Lawson, et al. 2014). Multiple exposures and applying Excel spreadsheets in varying contexts should better prepare students with the fuller set of Excel skills needed for entry into the profession. Effectively employing technology in performing accounting jobs is an essential skill. To develop real-world professional skills now demands the additional mental processing capabilities of analytical and algorithmic thinking. This type of mental capability (for analytical and algorithmic thinking) includes performing analyses using a spreadsheet. This is because effectively using a spreadsheet requires creating instructions to execute mathematical relationships on a set of data variables. In other words, logical structural design with a technology requires a form of mental processing that is best developed when using the target, i.e. some form of technology itself. Performing contemporary accounting functions and solving modern accounting problems when using computer technology by its very nature requires logical, algorithmic and programming-like mental skill. While accountants may not directly program computer instructions, they do need to ‘speak the language of logic’ to use the interface of those computational objects. The utility of Excel spreadsheets and their applicability across such a diverse set of problem spaces derives from the recognized attributes of Excel spreadsheets – they are algorithmically-based but present a familiar ‘tables of numbers’ format to an accountant. Excel spreadsheets offer a growing range

of functionality, and provides a blank slate on which the user can organize data, design a solution logic and program the instructions.

Limitation

The Power User participants were not randomly selected but had self-selected themselves into a highly advanced Mr. Excel power Excel training seminar. These participants had a history of deep knowledge of Excel and continuing high level of motivation to expand their understanding of this technology tool. A central limitation of this study, and possibly of this literature stream, are that participants are asked to rate the importance of spreadsheet features without a clearly defined business context, business task and without added clarity about rating term itself. For example, the business context is not stated and no standardized definition of “Required” of “Needed” is provided.

Future Research

As thought leaders in accounting education (Pathways, AACSB, etc.) call for greater use of current and emerging technologies in the classroom, there is a great need for guidance on what, how and when to teach technology skills across the accounting curriculum. This study’s findings of several rating disparities indicate possible fruitful directions for future research. The different participant contexts or task assumptions are possible explanations for the disparity of item ratings given for some Excel features. The basic skills for both public and industry accountants are similar. However the tasks performed by both groups would be different. More work needs to be done on small groups of skills necessary to perform specific tasks and whether New Hires have the knowledge to apply an appropriate skill to specific tasks. Also, technology education needs to develop an underlying knowledge and practices, beyond merely using

spreadsheets as a faster and reusable calculator to save time and effort, the new accountant faces tasks that must be done with/through the technology and which required significant computational thinking.

After teaching the standard point-and-click menu navigation skills, typical Excel training often under-represents these aspects of application usage. As such, accounting technology education fails to address application procedural learning by not providing combined use of features, and fails to develop business task-related knowledge by not situating application use in a realistic accounting context. These gaps in accounting technology education represent a lack of addressing technology-related critical thinking & conceptual knowledge (Sein et al. 1999). Traditionally, training is objectivist, teaching concrete usage in prescribed ways, and fails to use constructivist (task based, experiential) learning approaches which demands effort and more critical thinking.

Sein and Bostrom's levels of software knowledge (Sein, Bostrom and Olfman 2001) provides a hierarchy of learning of technology, and identifies the building blocks toward productive use of an application. At the most basic level, user interface navigation skills are required to form an awareness of the a) existence, b) location in the menu and c) component parts for each feature. These participants have each used Excel in very different business environments, on varying levels of task complexity, and bring a breadth of experience. So these participants may project different meaning or assume different usage contexts onto the same survey item response (e.g. required, desired, not needed). It would be beneficial to specify a context and an accounting task in future spreadsheet skills studies. Additionally, the survey about Excel skills did not cover the full span of features nor were feature combinations chosen to

reflect the various levels of software knowledge (Sein, Bostrom and Olfman 2001). Future studies need to address a larger number of Excel skills and more advanced Excel features.

Strong forces are at work in the changing accounting profession. Technology use across the field of accounting is certainly a major element of that change in the profession – the importance of technology knowledge to graduates on entering the profession should be addressed as we see widening gaps between accounting education and accounting practice (Rebele and St. Pierre 2015).

Summary

In general, information systems technologies are valuable productivity enhancements – saving time and effort in doing data management, analysis and reporting. By productively using appropriate technology features, an accountant should be capable of increasing the quality and quantity of their work. With the myriad of features contained in the Excel spreadsheet application, it is important to identify a baseline knowledge of Excel to move onto more advanced Excel abilities that enhance individual productivity in performing accounting and related tasks. This study points out several types of Excel skills that New Hires found were most important in their recent experience in the accounting profession. Many of these were basic skills which New Hires were familiar with in their education, but they previously underestimated the Excel features importance within the context of accounting practice. These Excel skills are especially valuable for optimizing repetitive tasks (e.g. shortcut keystrokes), managing complex spreadsheets, determining optimal structure and design for new spreadsheet, documenting and securing spreadsheets and producing effective spreadsheets in support of data analysis activities and decision support (e.g. use of pivot tables, lookup functions, macros, and visualization). Yet, learning spreadsheets often focuses on individual features of Excel, and is guided by spreadsheet

textbooks that focus on point-and-click navigation details. While those navigation skills are foundational, it is time to acknowledge the importance of spreadsheet design and the role of multi-feature combinations used to perform a complete task or that combine to solve a business problem.

The accounting profession relies extensively on the use of spreadsheets and requires spreadsheet proficiency among new hires as its use enhances productivity and contributes to decision-making. To improve the coverage in accounting curricula, accounting programs should use this input to guide continual improvement in their use of foundational technology skills. Accounting educators need to prepare entrants for the accounting profession by developing better data management and data analysis skills using Microsoft Excel spreadsheets. The emphasis on advancing accounting new hire's spreadsheet analysis capabilities for 'Little Data Analytics' (i.e. spreadsheets) is an important stepping stone towards identifying professional technology competencies and preparing accounting curricula to address data analytics.

The public accounting profession has escalating demand to hire candidates ready to handle Big Data analysis which has much greater computation requirements than basic Excel skills. Big data analysis activities address attributes of high volume, high velocity, and high variety along with issues of data veracity and validity (Mayer-Schönberger and Cukier 2014). How do we prepare accounting candidates to handle the wealth of data and complex, accelerating analysis that accompany it? Developing Little Data skills in the form of Excel spreadsheet knowledge will serve as an invaluable minimum to prepare for the revolution of Big Data Analysis that could transform the accounting profession.

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Table 1
Demographic Statistics

	<i>n</i>						
<i>Panel A: Participant Groups</i>							
Excel Power Users	32						
New Hires*	41						
Students	35						
Total (n)	108						
	Power Users	%	New Hires	%	Students	%	
<i>Panel B: Participant Group Education</i>							
Some College	2	6.25	1	2.44	10	28.57	
Undergraduate Degree	15	46.88	11	26.83	3	8.57	
Some Graduate Education	2	6.25	16	39.02	19	54.29	
Graduate Degree	13	40.63	13	31.71	3	8.57	
<i>Discipline</i>							
Accounting	26	81.25	38	92.68	33	94.29	
Finance	12	37.50	4	9.76	6	17.14	
Education	2	6.25	1	2.44	0	0.00	
Information Systems	3	9.38	3	7.32	1	2.86	
Management	9	28.13	1	2.44	0	0.00	
Marketing	3	9.38	2	4.88	0	0.00	
Other	5	15.63	1	2.44	2	5.71	
					Min	Max	Mean
<i>Panel C: Participant Group Professional Work Experience</i>							
<i>Years</i>							
Excel Power User					5.00	33.00	19.25
New hires					0.50	12.00	4.28
Students					0.00	25.00	3.15
	Power Users	%	New Hires	%	Students	%	
<i>Area / Industry</i>							
Public Accounting	13	40.63	17	41.46	9	25.71	
Management Accounting	13	40.63	5	12.20	6	17.14	
Governmental	4	12.5	1	2.44	1	2.86	
Financial	14	43.75	5	12.20	5	14.29	
Management	9	28.13	3	7.32	1	2.86	
Non-Profit	7	21.88	0	0.00	0	0.00	
Other	15	46.88	6	14.63	16	45.71	
None	0	0	5	12.20	2	5.71	

	Power Users	%	New Hires	%	Students	%
<i>Panel D: Role in the Hiring Process</i>						
Interview	15	46.88	3	7.32	0	0.00
Recruitment	2	6.25	2	4.88	0	0.00
Hiring decisions	12	37.50	3	7.32	0	0.00
Manage new hires	13	40.63	3	7.32	0	0.00
Work directly with new hires	22	68.75	10	24.39	0	0.00
I am a new hire	3	9.38	41	100.00	0	0.00
Retired	2	6.25	0	0.00	0	0.00
Student	0	0.00	0	0.00	35	100.00

*A new hire is defined as a participating university recent graduate with a full time job, at their current position less than 3 years. Although a new hire may be a part-time graduate student, they are not counted in the student sample.

Table 2

Excel Skill	Provided Description or Example	N	Mean	Std Dev	Median	Mode	Code
<i>Panel A: Power Users</i>							
Basic Math Functions	Count, sum, average, max, min...	32	4.875	0.492	5	5	R
Find and/or Replace	Using a dialog box to locate cells to locate cells	32	4.625	0.793	5	5	R
Filter, Sort data	feature to rearrange or extract data in cells extract data in cells	32	4.533	0.860	5	5	R
Keyboard Shortcuts	Ctrl+C to copy/ Ctrl+V to paste	32	3.563	1.366	3	3	D
Pasting Special Types	using a dialog box to paste complex items using specific attributes or mathematical functions	32	3.750	1.320	3	5	LR
Custom Formatting	change display within a cell: floating point, currency, text, date	32	3.750	1.414	5	5	R
Text to Columns	separate contents of a cell using the data menu, transposing column to row	32	3.000	1.265	3	3	D
Conditional Formatting	using a dialog box to self-create a formula rule for formatting of specific cells, often used when built-in formatting isn't enough	32	2.355	1.199	3	3	D
Importing data	import data from another source	32	3.313	1.148	3	3	D
Absolute/Relative Cell Ref	\$A\$1	31	3.645	1.582	5	5	R
Named Ranges	name cells using the name box at left end of formula bar	32	2.438	1.162	3	3	D
Linking to another worksheet	=[Filename.xlsx]Sheetname!CellReference	32	3.375	1.385	3	3	D
Array formula	=function[(stored array)(operator){array constant}]	31	1.323	0.909	1	1	N
INDEX and MATCH	=INDEX (array, row number); =MATCH (lookup value, lookup array, match type)	32	1.438	0.840	1	1	N
Graphs & Charts	using the chart group	32	2.625	1.289	3	3	D
Boolean Statements	AND OR	32	1.813	1.120	1	1	N
Encryption	working with the protect workbook menu	32	1.938	1.243	1	1	N
Password Protect	passwords to open, view, modify	32	2.938	1.480	3	3	D
Excel Macros	self-created functions to perform specific tasks	13	0.719	1.085	0	0	N
Vlookup	=vlookup(Cell reference, array, column index, [True/False])	32	3.313	1.355	3	3	D
Pivot Table	data summarization tool for large amount of data	32	3.313	1.256	3	3	D

Logic Formula	=if (logical_test, value_if_true, [value_if_false]	32	3.063	1.190	3	D
Boolean Statements	Exclusive or, not equal	32	2.438	1.268	3	D
Linking to external data	external to the workbook using the workbook connections dialog box in the get external data group	32	2.750	1.414	3	D
<i>Panel B: New Hires</i>						
Basic Math Functions	Count, sum, average, max, min...	41	4.561	0.94997	5	R
Find and/or Replace	Using a dialog box to locate cells to locate cells feature to rearrange or extract data in cells extract data in cells	41	4.073	1.34889	5	R
Filter, Sort data		41	4.610	0.91864	5	R
Keyboard Shortcuts	Ctrl+C to copy/ Ctrl+V to paste	41	4.073	1.2726	5	R
Pasting Special Types	using a dialog box to paste complex items using specific attributes or mathematical functions	41	3.683	1.23367	3	D
Custom Formatting	change display within a cell: floating point, currency, text, date	41	4.244	1.11311	5	R
Text to Columns	separate contents of a cell using the data menu, transposing column to row	41	3.293	1.22971	3	D
Conditional Formatting	using a dialog box to self-create a formula rule for formatting of specific cells, often used when built-in formatting isn't enough	41	3.488	1.24744	3	D
Importing data	import data from another source	41	3.780	1.40556	5	R
Absolute/Relative Cell Ref	\$A\$1	41	3.829	1.33982	5	R
Named Ranges	name cells using the name box at left end of formula bar	41	3.049	1.64243	3	LR
Linking to another worksheet	=[Filename.xlsx]Sheetname!CellReference	41	4.073	1.19143	5	R
Array formula	=function[(stored array)(operator){array constant}]	41	2.463	1.55077	3	LD
INDEX and MATCH	=INDEX (array, row number); =MATCH (lookup value, lookup array, match type)	41	2.463	1.41594	3	D
Graphs & Charts	using the chart group	41	3.683	1.5238	5	R
Boolean Statements	AND OR	41	3.000	1.34164	3	D
Encryption	working with the protect workbook menu	41	2.951	1.64243	3	LD
Password Protect	passwords to open, view, modify	41	3.244	1.62451	3	LR
Excel Macros	self-created functions to perform specific tasks	41	2.707	1.64687	3	LD
Vlookup	=vlookup(Cell reference, array, column index, [True/False])	41	3.390	1.49797	3	D
Pivot Table	data summarization tool for large amount of data	40	3.450	1.66333	3	LR

Logic Formula	=if (logical_test, value_if_true, [value_if_false]	41	3.439	1.30478	3	3	D
Boolean Statements	Exclusive or, not equal	41	2.707	1.52059	3	3	D
Linking to external data	external to the workbook using the workbook connections dialog box in the get external data group	41	2.951	1.58037	3	3	D
<i>Panel C: Students</i>							
Basic Math Functions	Count, sum, average, max, min...	35	4.829	0.568	5	5	R
Find and/or Replace	Using a dialog box to locate cells to locate cells	35	4.429	0.917	5	5	R
Filter, Sort data	feature to rearrange or extract data in cells extract data in cells	35	4.257	1.197	5	5	R
Keyboard Shortcuts	Ctrl+C to copy/ Ctrl+V to paste	35	4.143	1.309	5	5	R
Pasting Special Types	using a dialog box to paste complex items using specific attributes or mathematical functions	35	3.971	1.317	5	5	R
Custom Formatting	change display within a cell: floating point, currency, text, date	35	4.314	1.183	5	5	R
Text to Columns	separate contents of a cell using the data menu, transposing column to row	35	3.514	1.222	3	3	D
Conditional Formatting	using a dialog box to self-create a formula rule for formatting of specific cells, often used when built-in formatting isn't enough	35	3.457	1.197	3	3	D
Importing data	import data from another source	35	3.857	1.216	3	5	LR
Absolute/Relative Cell Ref	\$A\$1	35	4.086	1.011	5	5	R
Named Ranges	name cells using the name box at left end of formula bar	35	3.514	1.314	3	3	D
Linking to another worksheet	=[Filename.xlsx]Sheetname!CellReference	35	3.914	1.121	3	5	LR
Array formula	=function[(stored array)(operator){array constant}]	35	2.543	1.462	3	3	D
INDEX and MATCH	=INDEX (array, row number); =MATCH (lookup value, lookup array, match type)	35	2.657	1.136	3	3	D
Graphs & Charts	using the chart group	35	3.686	1.451	3	5	LR
Boolean Statements	AND OR	35	3.057	1.235	3	3	D
Encryption	working with the protect workbook menu	35	2.543	1.291	3	3	D
Password Protect	passwords to open, view, modify	35	3.171	1.403	3	3	D
Excel Macros	self-created functions to perform specific tasks	35	2.600	1.355	3	3	D
Vlookup	=vlookup(Cell reference, array, column index, [True/False]	35	3.457	1.197	3	3	D
Pivot Table	data summarization tool for large amount of data	35	3.743	1.291	3	5	LR

Logic Formula	=if (logical_test, value_if_true, [value_if_false]	35	3.571	1.243	3	3	D
Boolean Statements	Exclusive or, not equal	35	2.657	1.327	3	3	D
Linking to external data	external to the workbook using the workbook connections dialog box in the get external data group	35	3.057	1.413	3	3	D

Bold Excel skills are identified as Required skills of interest for entry into the accounting profession by group.

Code R=Required Skills, LR=Likely Required, D=Desired Skills, LD=Likely Desired, N=Not Required Skills for Entry into the Accounting Profession

Table 3
Sort Order of Excel Skills by Mean

Excel Skill	Power User	New Hire	Students
Basic Math Functions	1	2	1
Find and/or Replace	2	6	2
Filter, Sort data	3	1	4
Keyboard Shortcuts	7	5	5
Pasting Special Types	4	9	7
Custom Formatting	5	3	3
Text to Columns	13	15	13
Conditional Formatting	19	11	15
Importing data	9	8	9
Absolute/Relative Cell Ref.	6	7	6
Named Ranges	17	17	14
Linking to another worksheet	8	4	8
Array formula	23	24	24
INDEX and MATCH	22	23	20
Graphs & Charts	16	10	11
Boolean Statements (& OR)	18	18	18
Encryption	20	20	23
Password Protect	14	16	17
Excel Macros	24	22	22
Vlookup	11	14	16
Pivot Table	10	12	10
Logic Formula	12	13	12
Linking to external data	21	21	21
Boolean Statements (exclusive or, not equal)	15	19	19

Table 4
Analysis of Differences Between Participant Groups
Panel A: Difference of Means

Power User to New Hire			Student to New Hire	
t Stat	P(T<=t) two-tail		t Stat	P(T<=t) two-tail
-2.259	0.029	**	0.386	0.701

Panel B: Paired Difference of Means

Power User to New Hire			Student to New Hire	
t Stat	P(T<=t) two-tail		t Stat	P(T<=t) two-tail
-4.803	0.000	***	1.791	0.087 *

Panel C: Difference of Skill Means (Sort)

	Power User to New Hire			Student to New Hire	
	t Stat	P(T<=t) two-tail		t Stat	P(T<=t) two-tail
Basic Mathematical Functions	1.468	0.147		1.218	0.227
Find and/or Replace	1.770	0.081	*	0.996	0.322
Filter, Sort data	-0.616	0.540		-1.695	0.094 *
Keyboard Shortcuts	-1.478	0.144		0.223	0.824
Pasting Special Types	0.241	0.810		0.807	0.422
Custom Formatting	-1.647	0.104		0.354	0.724
Text to Columns	-0.780	0.438		0.595	0.553
Conditional Formatting	-3.985	0.000	***	-0.498	0.620
Importing data	-1.589	0.116		0.238	0.813
Absolute/Relative Cell Reference	-0.570	0.571		0.922	0.360
Named Ranges	-1.961	0.054	*	1.066	0.290
Linking to another worksheet	-2.143	0.036	**	-0.618	0.539
Array formula	-3.657	0.001	***	-0.084	0.933
INDEX and MATCH	-3.645	0.001	***	0.485	0.630
Working with Graphs & Charts	-3.374	0.001	***	0.301	0.866
Boolean Statements (AND OR)	-4.082	0.000	***	-0.169	0.866
Encryption	-2.916	0.005	***	-1.191	0.238
Password Protect	-0.975	0.333		-0.185	0.854
Excel Macros (setup and use)	-1.895	0.064	*	-0.149	0.882
Vlookup	-0.079	0.937		0.195	0.846
Pivot Table	-0.242	0.810		0.838	0.405
Logic Formula	-1.113	0.270		0.437	0.663
Boolean Statements (exclusive or, not equal)	-0.973	0.334		-0.133	0.895
Linking to external data	-0.713	0.478		0.000	1.000

***Significant at the 1% level, **Significant at the 5% level, *Significant at the 10% level

	Mean	Medium	Mode	Code	Sort
<i>Panel D: Difference Between Professionals</i>					
<i>Power Users</i>					
Find and/or Replace	4.625	5	5	R	2
Conditional Formatting	2.355	3	3	D	19
Named Ranges	2.438	3	3	D	17
Linking to another worksheet	3.375	3	3	D	8
Array formula	1.323	1	1	N	23
INDEX and MATCH	1.438	1	1	N	22
Graphs & Charts	2.625	3	3	D	16
Boolean Statements	1.813	1	1	N	18
Encryption	1.938	1	1	N	20
Excel Macros	0.719	0	0	N	24
<i>New Hire</i>					
Find and/or Replace	4.073	5	5	R	6
Conditional Formatting	3.488	3	3	D	11
Named Ranges	3.049	3	5	LR	17
Linking to another worksheet	4.073	5	5	R	4
Array formula	2.463	3	1	LD	24
INDEX and MATCH	2.463	3	3	D	23
Graphs & Charts	3.683	5	5	R	10
Boolean Statements	3.000	3	3	D	18
Encryption	2.951	3	1	LD	20
Excel Macros	2.707	3	1	LD	22

Appendix B: Mr. Excel Training Session

MrExcel – Bill Jelen is Coming
Morning and Afternoon sessions or ALL Day

Morning Session Registration - Breakfast 7:30 AM – 8:00 AM
POWER EXCEL SEMINAR 8:00 AM – 11:30 AM

CPE HOURS 4

You use Excel 40 hours a week, but do you really know how to unleash the power of Excel? Learn cool secrets and tricks lurking on the Data menu. Learn the ins and outs of Pivot Tables (from the guy who wrote the book on pivot tables!). Create slick charts in a single button click. Add thousands of subtotals in seconds. Don't be tortured by bad data any longer. See new features such as Power Pivot and Excel for the iPad. Jelen promises, "If you use Excel 20 hours per week, you will save 50 hours each year by attending this seminar!".

Book: *Power Excel with MrExcel – 567 Excel Mysteries Solved*

Afternoon session Registration and Lunch 11:30 AM – 12:30 PM

ADVANCED DATA ANALYSIS 12:30 PM – 4:00 PM
CPE HOURS 4

This class will go into more details about pivot tables. Learn how to take poorly formatted data and convert it to data suitable for pivot tables. Use VLOOKUP to match two lists. Understand new tools such as Power Pivot, Power View and Power Map. See how to use Pivot Tables for frequency distributions, true Top 10 reports, pareto analyses. Learn several ways to find duplicates or a unique list of values. Create stratifications, look for outliers, and pull random samples.

Speaker Biography:

Bill Jelen is the host of MrExcel.com and the author of 43 books about Microsoft Excel including Excel Gurus Gone Wild, Pivot Table Data Crunching, and Power Pivot Alchemy. He has made over 80 guest appearances on TV's Call for Help with Leo Laporte and was voted guest of the year on the Computer America radio show. He writes the Excel column for Strategic Finance magazine and is a contributing editor to CFO Magazine. He has produced over 1800 episodes of his daily video podcast Learn Excel from MrExcel. Bill will entertain you while showing you the powerful tricks in Excel. Before founding MrExcel.com in 1998, Jelen spent twelve years "in the trenches", as a financial analyst for the accounting, finance, marketing, and operations departments of a publicly held company. Since then, his company automates Excel reports for hundreds of clients around the world. The website answers over 30,000 questions a year – for free – for readers all over the world. Jelen joins us from Akron, Ohio

*Participants will receive one of Bill Jelen's books at each session.

See books at: <http://www.mrexcel.com/store/index.php>

<http://www.mrexcel.com/>