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# Competencies and tools of higher education graphic communications programs

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## Abstract

In this study, I sought to identify skills, content knowledge, and tools needed in higher education graphic communications programs. Currently a lack of research on the topic of graphic communications competencies exists. The industry is also experiencing a widening scope as well as rapid advancements in technology. The research study utilized a modified Delphi Technique as its method and included participants consisting of full-time graphic communications educators and industry professionals located in the southeast United States. One goal of the study was to gain a consensus among experts regarding what students are expected to know when entering the industry. The purpose of the research was to utilize what experts find to be the most important skills, content knowledge, and tools as a framework for developing and evaluating current higher education graphic communications curriculum. Participants of the study overwhelmingly identified soft skills as being the most needed skills, while software applications were identified as the most needed tools. The results of the project will allow educators to determine whether the current curriculum is preparing students to enter the field.

**Keywords:** curriculum, employment, evaluation, soft skills, software, tools

## 1. Introduction

In the year 2012, I conducted a research study on the Identification of 21<sup>st</sup> Century Skills, Content Knowledge, and Tools Needed in a Successful University-level Graphic Design Program (Bridges, 2016). At that time, I served as the sole graphic design professor in a small liberal arts university. The program lacked the number of students to qualify for accreditation by the national accrediting body; therefore, my role was to determine whether my students were receiving the necessary skills to be successful in the graphic design industry. I successfully conducted a study utilizing educators and industry professionals as participants, which identified competencies and tools most needed in higher education graphic design programs. The information I obtained in my research study proved to be valuable in the evaluation and continued development of the program's current graphic design curriculum. The results also led to new course offerings as well as modifications to the focus of some existing courses. At the conclusion of the study, I determined that similar types of studies would also be useful in other higher education disciplines, especially those where educators and industry professionals may differ in terms of expectations of students entering the

workforce. Today, as a graphic communications educator at a large public university, I have the same desire to ensure that students are being adequately prepared with the graphic communications skills and content knowledge areas needed to be successful.

Due to rapid technological advancements and the wide range of services offered, the graphic communications industry now encompasses much more than simply printing services (Print and Graphic Scholarship Foundation, 2015). According to the Introduction to Print and Graphics Scholarship Foundation (2015), "Companies in the business have expanded services to include creative design, retail display design, e-commerce, web page design and hosting, mailing, fulfillment, and a host of services that provide horizontal marketing well beyond the core printing model." With that in mind, one must wonder if current higher education graphic communications programs are adequately preparing students with the skills and content knowledge to enter a workforce undergoing such a tremendous industry shift. In addition, as technology continues to evolve, expectations may have also changed regarding what tools (hardware and software) students should be proficient in. These questions led

to the present research study. The results of the study will aid educators in the development and evaluation of graphic communications curriculum based on what participants find to be most important. The study utilized a modified Delphi Technique to examine views from experts in the graphic communications field including educators and industry professionals in order to gain a consensus. My research sought to answer the following questions: 1) What are the skills and content knowledge areas most needed in higher education graphic communication programs as identified by experts? 2) What are the tools most needed in higher education graphic communication programs as identified by experts?

### 1.1 Previous research

There is a dearth of recent research on graphic communications competencies. This lack of research could be due to insufficient survey research in general, survey length causing participants to drop out or leave surveys incomplete, low participant rates, and challenges related to the identification of participants, particularly industry professionals. Smith (2014, p. 3) sought to identify “what impact will technical and business process trends in the graphic communications industry have on the required competencies of its future personnel”. Among others, the research questions Smith sought to answer included identifying technical skills and soft skills needed for future personnel over the next 10 years. Participants in the study included graphic communications industry professionals throughout the United States. Smith (2014) found that industry professionals showed a clear preference for soft skills over technical skills. Some desired soft skills included attitude, good communication, teamwork, good work ethic, listening skills, problem solving, project management, and the ability to adapt and be flexible. Smith (2014) recommended that future researchers include studies utilizing other participants such as graduates and educators from graphic communications programs. Finally, she recommended educators use the results as a starting point for discussion with industry professionals regarding the status of related educational programs. Building on this work, my study requested input from both educators and industry professionals in order to reach a consensus regarding the most needed competencies for students when entering the graphic communications workforce.

## 2. Methods

The Rand Corporation first introduced the traditional Delphi research method in the 1950’s (Goodman, 1987). Since its development, the Delphi has been useful in gathering a consensus among experts regarding future

trends. Yousuf (2007, p. 1) defined the Delphi technique as a “group process involving an interaction between the researcher and a group of identified experts on a specified topic, usually through a series of questionnaires. The method has been used in several disciplines including education, health care, engineering, information systems, and transportation, to name a few (Rowe and Wright, 1999). The Delphi is particularly useful in educational research. In his article *Use of Delphi Methods in Higher Education*, Judd (1972) discussed the ways in which the Delphi research method can be useful. Delphi’s benefits include identification of educational goals and objectives, curriculum planning and development, and assessment and evaluation.

The traditional Delphi technique is a qualitative research method generally consisting of seven rounds of questioning (Andrews and Allen, 2002). However, based on previous research, the method appears to be relatively flexible in terms of how the process is conducted. Thus, there have been several modifications to the Delphi method over the years (Riggs, 1983). Many of those modifications incorporate a mixed methods approach, where both quantitative and qualitative components are collected.

My research study utilized a mixed method modified Delphi technique as proposed by Haughey (2010). Haughey’s model consists of seven steps, beginning with the selection of a facilitator, which in most cases is the researcher. The second and third steps include the identification of a panel of experts willing to participate in the research as well as the identification of the research problem. Step four is to begin to gather the opinions of the participants, most often by a questionnaire. Once the initial questionnaire is completed, the researcher collates the data, eliminating outliers, in order to begin to gain a consensus. The fifth recommended step is to create the second-round questionnaire, based on results from the first. The second round is, again, distributed to participants and results are collated and summarized. Step six is to create and distribute the third questionnaire. The final round questionnaire, step seven, is intended to sharpen focus on the particular areas participants agreed on.

### 2.1 Participants

The Delphi method requires careful selection of experts in order to participate in a study (Stitt-Gohdes and Crews, 2004). Gibbs, Graves, and Bernas (2001) identified specific criteria regarding the selection of participants for a Delphi study. The criteria include participants who had previously published research in that area in the past five years, industry professionals currently employed in the specific area of interest, and educators teaching in the area of interest.

In addition to careful selection of experts, sample size is also important in the successful completion of a Delphi study. Based on previous research, Delphi studies have been conducted with as few as 15 participants and as many as 60. Obviously, the latter is more desirable.

My study requested participation from approximately 300 experts located throughout the southeastern United States. I utilized independent data collection to locate full-time educators currently teaching in 2-year and 4-year graphic communication programs. For industry professionals, I used an up-to-date intern employer database from my current teaching institution. All experts were sent an email invitation with an attached informed consent requesting their participation in the study. Of the 300 requested, 13 educators and 21 industry professionals committed to the research project, an acceptable number of participants ( $n$ ) for a Delphi study. Table 1 shows the response rates from each round of questioning. It should be noted that rounds three and four were conducted during the COVID-19 pandemic, which could have contributed to the lower response rates.

*Table 1: Participant response rates from the four rounds of questionnaires ( $n = 34$ )*

Questionnaire	Responses	Response rate
Round one	33	97 %
Round two	33	97 %
Round three	31	91 %
Round four	28	82 %

## 2.2 Procedures

For my current study, I developed the first-round questionnaire based on the results of a previous research study (Smith, 2014). According to Stitt-Gohdes and Crews (2004, paragraph 27), the Delphi is intended to give experts the “opportunity for initial feedback, collation of feedback, and distribution of collated feedback back to participants for further review.” Therefore, I opted to use the graphic communications technical and soft skills identified by Smith (2014) as an initial starting point for the round one questionnaire. The decision was made to combine soft skills and technical skills into the round one questionnaire in order to stay true to the modified Delphi technique being used to conduct the study.

The first-round questionnaire consisted of a web-based questionnaire created using the Qualtrics software package. The questionnaire was distributed to participants via email link. Round one requested participants to rate each competency using a Likert scale ranging from one to seven, one being extremely

undesirable and seven being extremely desirable. Participants also had the option to leave positive or negative comments related to each competency. The final two questions of the round-one questionnaire prompted participants to list additional skills or content knowledge areas not appearing on the questionnaire, and to list required tools (hardware, software, other devices) needed in higher education graphic communications programs. Round two was based on results from the first round and, again, asked participants to rank competencies on a scale from one to seven. Experts were also asked to list additional competencies and tools not appearing on the questionnaire. In order to move participants to a consensus, the round three questionnaire was completely quantitative and prompted participants to rank from one to seven each previously identified competency based on results from round two. Finally, round four prompted experts to rank the top twenty skills and content knowledge areas and the top twenty tools needed in higher education graphic communications programs. Round three was intended to identify the importance of each competency and tool, while round four was designed to obtain a clearer consensus among experts. Descriptive statistics, specifically mean and standard deviation, were used to analyze the quantitative data and coding was used to analyze the qualitative data.

## 3. Results

### 3.1 Round one results

The ranking of the most needed competences in graphic communications is shown in Table 2.

Statements with the highest mean scores, or those closest to seven, are considered most important.

The five statements receiving the highest mean scores were critical thinking skills, teamwork, business ethics, customer service skills, and supervisory techniques such as managing people and systems. Some expert comments related to critical thinking included “...this is essential across all technology, methods, and time” and “...absolutely necessary no matter what career a student aims to work in.” Teamwork comments provided by experts included “Understanding that there are multiple segments within the production process and how each segment impacts the final outcome is key. It takes a team to get to the finish line” and “When people go into the workforce, they have to be able to work in groups. If they cannot do that, it doesn’t matter what their skills are.” Comments related to business ethics included “...critical for long-term success” and “Ethics are very important because they can raise a company up or they can bring it down. These kinds of

Table 2: Round one descriptive statistics for the most needed graphic communications competencies ( $n = 33$ )

Competency	Mean score	Std. deviation
1. Critical thinking skills	6.85	0.43
2. Teamwork	6.85	0.43
3. Business ethics	6.64	0.59
4. Customer service skills	6.30	0.97
5. Supervisory techniques such as managing people and systems	6.06	0.81
6. Project management concepts and software	6.00	1.10
7. Spot color and process builds	5.85	1.26
8. Color management	5.85	1.08
9. Job estimating, planning, and scheduling	5.79	1.20
10. Variable data marketing	5.75	1.12
11. Quality control systems and devices	5.73	1.58
12. Trends in digital communication	5.73	1.14
13. Sales in graphic communications	5.58	1.23
14. Plant organization, management, and workflow	5.52	1.54
15. Printing industry standards such as SWOP, GRACoL, and G7	5.33	1.59
16. Social media marketing	5.30	1.22
17. Publishing for mobile devices	5.15	1.26
18. Understanding the concept of imposition	5.03	1.67
19. Content management and repurposing	5.03	1.27
20. Interactive PDF's	5.03	1.40
21. Computer programming	5.03	1.70
22. Performing imposition with software applications	4.91	1.33
23. Product fulfillment – understand the logistics and physical distribution	4.84	1.58
24. PURL's, QR codes, and email blasts	4.48	1.52
25. Binding – understand the terminology and processes that are used	4.48	1.67
26. History of printing	3.88	1.63

ethics are not taught in the home. So we have to prepare students for the real world.” Comments regarding customer service skills were “...sell yourself and sell the product” and “We routinely train for soft skills. Graduates are not using salutations, closings in emails. They often send shortened replies that look like texts and avoid calling clients directly.” Finally, comments related to the fifth highest-ranking skill, supervisory techniques, included “Everyone should have an insight how to manage people, positive and negative feedback, conflict resolution, performance reviews” and “We are not educating operators, we are educating higher level employees. These skills are very needed.” Interestingly, all of the top five competencies are considered to be soft skills. The lowest-ranking competency was the history of printing, which is considered a content knowledge area. Comments related to the history of printing included “history gives perspective to the current trends and helps students identify their historical reference and repurposing” and “Good to know. It creates appreciation for what we do. In the end, it is probably not going to get someone a job though.”

Round one requested participants to list any additional competencies not appearing on the questionnaire. As a result, experts added 33 new statements. Participants

were also given the opportunity to provide feedback regarding the wording of statements, therefore some statements were modified to provide clarification for the round two questionnaire. For example, color management changed to color management – including creating curves and profiles. All statements receiving a mean score of at least 4.0 or better were included in the round two questionnaire. This affected only one statement, the history of printing. However, based on comments from participants, the history of printing was modified to “basic knowledge of the history of printing,” thus the modified statement was included in the subsequent round. Most statements, specifically those that ranked at or near the top, had standard deviations close to 1.0, indicating a normal distribution. In addition, round one prompted participants to list all tools and equipment needed in higher education graphic communications programs. Experts listed a total of 28 tools.

### 3.2 Round two results

Statements with the highest mean scores, or those closest to seven, are considered most important.

Statements with mean scores below 4.0 were not included in the subsequent round.

*Table 3: Round two descriptive statistics for the most needed graphic communications competencies (n = 33)*

<b>Competency</b>	<b>Mean score</b>	<b>Std. deviation</b>
1. Critical thinking skills	6.79	0.48
2. Problem solving and analytical skills	6.72	0.58
3. Teamwork	6.62	0.55
4. Communication skills – oral, written (including technical writing) and business	6.62	0.55
5. Business and personal ethics	6.52	0.68
6. Adaptability and flexibility	6.52	0.72
7. Organization skills	6.14	0.82
8. Spot color and process builds for design and/or production	6.11	0.94
9. Customer service skills	6.10	0.99
10. Prepress and printing workflow	6.03	1.03
11. Knowledge of trends in digital communication	6.03	0.72
12. Presentation skills	5.97	0.93
13. Digital literacy skills	5.97	1.10
14. Networking skills	5.97	1.10
15. Leadership skills and supervisory techniques such as managing people, systems, and supply chains	5.90	0.71
16. Quality control systems and devices for color and production	5.76	1.07
17. Knowledge of brand communications and brand security related to printing	5.68	1.04
18. Knowledge of inkjet hybrid printing technology	5.66	1.35
19. Basic knowledge of job estimating, planning, and scheduling	5.62	1.00
20. Knowledge of design principles	5.59	1.54
21. Packaging and package (structure) design	5.55	1.10
22. Color management – including creating curves and profiles	5.52	1.22
23. Ability to develop and tell a story	5.48	1.52
24. Business administration skills	5.45	1.00
25. Preflighting skills	5.45	1.54
26. Research and data analysis skills	5.41	1.07
27. Knowledge of safety skills	5.41	1.47
28. Project management concepts and software	5.38	1.30
29. Sales in graphic communications	5.34	1.15
30. Plant organization, management, workflow, and facility planning	5.31	1.25
31. Graphic design skills	5.31	1.46
32. Basic knowledge and understanding of printing industry standards such as SWOP, GRACoL, and G7	5.28	1.65
33. File naming/versioning skills	5.28	1.55
34. Variable data printing process and application	5.17	1.37
35. Content management and repurposing	5.14	1.36
36. User experience and interface design	5.11	1.32
37. Variable data marketing (promoting and selling products or services)	5.10	1.35
38. Basic knowledge of social media marketing	5.10	1.37
39. Machine optimization and calibration	5.10	1.63
40. Basic knowledge of PURL's, QR codes, and email blasts	5.07	1.11
41. Product fulfillment – understand the logistics and physical distribution	5.03	1.83
42. Publishing for mobile devices	5.03	1.61
43. Information technology skills	5.03	1.00
44. Interactive PDF's	5.00	1.14
45. Knowledge of offset printing technology	4.97	1.56
46. Web design skills	4.93	1.72
47. Basic knowledge of computer programming – HTML and CSS coding	4.90	1.30
48. Understanding and performing imposition with software applications	4.89	1.17
49. Knowledge of advanced screening and platemaking technologies	4.79	1.27
50. Digital photography skills	4.66	1.51
51. Binding – understand the terminology and processes that are used	4.62	1.45
52. Six Sigma/Lean practices	4.59	1.45

Table 3 – continued

Competency	Mean score	Std. deviation
53. Videography and video production skills	4.41	1.69
54. Cyber security knowledge	4.41	1.75
55. Anti-counterfeiting technology	4.41	1.47
56. Basic knowledge of the history of printing	4.24	1.30
57. Custom ink mixing	4.18	1.67
58. Animation and motion graphics	4.14	1.74
59. Advanced knowledge of computer programming – C++, Python, etc.	3.52	1.61

Due to the large number of statements included in the round two questionnaire (Table 3), the statements were divided into categories consisting of content knowledge areas, soft skills, and technical skills. Content knowledge refers to an understanding of those areas at the core of the discipline, including metacognition, empathy, holding a perspective, application, interpretation, and explanation (Davis, 2010). According to Rego (2017, p. 11) soft skills “are intangible, nontechnical and are the personal character traits or qualities you need to succeed in any profession”. Technical skills refer to “knowledge or training that you have gained through any life experience, including in your career or education” (indeed.com, 2020).

The highest-ranking statements from round two are considered to be soft skills, which include critical thinking skills, problem solving and analytical skills, teamwork, communication skills, and business and personal ethics. Two of the five statements were newly added based on comments from round two, problem solving and analytical skills and communication skills. Comments provided by experts related to problem solving and analytical skills were “essential” and “...this is critical for success.” Some comments related to communication included “...this is something our college grads have difficulty with” and “It is shocking how many technical types avoid sending an email to a client because they lack confidence in their written communication skills. Employers are blaming social media and texting on poor writing skills but it’s really a coach-able issue.” The lowest ranking competency, advanced knowledge of computer programming, was a newly added statement. Some comments related to this competency included “role specific,” “this is outside of our industry,” and “these jobs most often go to computer science or computer programming grads.” All statements receiving a mean score of 4.0 or better were included in the round three questionnaire. Only one statement, advanced knowledge of computer programming, received a mean score below 4.0, therefore it was not included in the round three questionnaire. It is interesting to note that with change in wording regarding the history of printing, its mean score increased to 4.14 in round two. As with round one, most competencies had a standard deviation at or close to 1.0, which

indicated a normal distribution. As with the round one questionnaire, participants were given the opportunity to provide positive and negative comments related to each statement as well as add any new statements not appearing on the questionnaire.

Table 4: Round two results for the most needed graphic communications tools with percentage of participants selecting tool/equipment (n = 33)

Tool/equipment	Percentage
1. Adobe Illustrator	85 %
2. Adobe Photoshop	82 %
3. Apple Computers	70 %
4. Adobe InDesign	70 %
5. Email tools (Outlook, Gmail)	67 %
6. Microsoft Excel	64 %
7. RIP systems	64 %
8. Color measurement tools	64 %
9. Digital printing press (roll and sheet fed)	64 %
10. All Adobe software	61 %
11. Wide format printing press (roll and sheet fed)	61 %
12. Project management tools	61 %
13. Online management and communication tools (Slack)	58 %
14. Esko	55 %
15. Packaging design prototyping software	55 %
16. Variable data printing software	52 %
17. Cameras with HD video capability	48 %
18. Cutting tables	48 %
19. DSLR cameras and accessories	45 %
20. MIS software (Management Information Systems)	42 %
21. CRM tools (Customer Relationship Management)	39 %
22. Photo studio equipment (lighting, backdrops, light meter)	39 %
23. Imposition software	39 %
24. Sales tool experience (Salesforce)	36 %
25. Flexography printing press	36 %
26. Social media tools	36 %
27. Content Management System software (Wordpress, etc.)	36 %
28. Basic code editing software (Brackets, Text Wrangler, Sublime, etc.)	36 %

Round two requested participants to select from a list, generated based on feedback from round one, of the most needed graphic communications tools (Table 4). Software applications dominated the most top-ranking tools, with Adobe Illustrator and Photoshop ranking number one and two. The five lowest ranking tools were selected by 36 % of participants and included sales tool experience, flexography printing press, social media tools, content management system software, and basic code editing software. Participants were given the opportunity to list any additional tools and equipment not appearing on the current list. Five additional tools were added.

### 3.3 Round three results

Statements with the highest mean scores, or those closest to seven, are considered most important.

Statements with mean scores below 4.0 were not included in the subsequent round.

Round three, again, requested that participants rank statements based on a scale from one to seven, with seven being the highest. Participants were given the opportunity to leave positive and negative comments related to each statement, however no new statements could be added in this round. The results of round three questionnaire are shown in Table 5. This is consistent with the purpose of the Delphi method, which is to encourage a consensus among experts regarding the most needed competencies and tools. Critical thinking skills were, again, the highest-ranking competency in round three. This was followed by problem solving and analytical skills, adaptability and flexibility, business and personal ethics, and communication skills. Adaptability and flexibility replaced teamwork in the top five highest ranking statements. However, teamwork did come in at number six. The lowest ranking statements were anti-counterfeiting technology, basic knowledge of the history of printing, and custom ink mixing. The latter two had mean scores below 4.0, thus they were not included in the subsequent round.

*Table 5: Round three descriptive statistics for the most needed graphic communications competencies (n = 31)*

Competency	Mean score	Std. deviation
1. Critical thinking skills	6.76	0.51
2. Problem solving and analytical skills	6.72	0.54
3. Adaptability and flexibility	6.56	0.73
4. Business and personal ethics	6.56	0.63
5. Communication skills – oral, written (including technical writing) and business	6.56	0.49
6. Teamwork	6.44	0.62
7. Current digital literacy skills (ability to find, evaluate, communicate, and share online content)	6.20	0.69
8. Emotional Intelligence (managing people objectively and respectfully)	6.04	1.25
9. Knowledge of trends in digital communication	6.00	0.73
10. Organization skills	5.96	1.00
11. Customer service skills	5.88	0.91
12. Networking skills	5.84	0.95
13. Presentation skills	5.76	0.99
14. Prepress and printing workflow	5.64	1.45
15. Leadership skills and supervisory techniques such as managing people, systems, and supply chains	5.60	1.01
16. Spot color and process builds for design and/or production	5.58	1.11
17. Packaging and package (structure) design	5.56	1.37
18. Ability to develop and tell a story	5.56	1.40
19. Knowledge of inkjet hybrid printing technology	5.56	1.47
20. Knowledge of design principles	5.52	1.24
21. Research and data analysis skills	5.52	1.54
22. Business administration skills	5.40	0.79
23. File naming/versioning skills	5.38	1.40
24. Quality control systems and devices for color and production	5.36	1.19
25. Basic knowledge of job estimating, planning, and scheduling	5.36	1.01
26. Knowledge of brand communications and brand security related to printing	5.36	1.04
27. Knowledge of safety skills	5.36	1.40
28. Basic knowledge of social media marketing and the ability to stay current with practices and trends	5.32	1.27
29. Project management concepts and software	5.32	1.26

Tble 5 – continued

Competency	Mean score	Std. deviation
30. Graphic design skills	5.32	1.57
31. Variable data printing process and application	5.20	1.06
32. Preflighting skills	5.16	1.61
33. Color management – including creating curves and profiles	5.13	1.19
34. Publishing for mobile devices, including but not limited to mobile websites, apps, social media, videos	5.12	1.40
35. Content management and repurposing	5.08	1.21
36. Variable data marketing (promoting and selling products or services)	5.00	1.31
37. Knowledge of user experience and interface design	5.00	1.06
38. Basic knowledge and understanding of printing industry standards such as SWOP, GRACoL, and G7	4.84	1.60
39. Web design skills	4.84	1.48
40. Information technology skills	4.80	1.58
41. Machine optimization and calibration	4.80	1.70
42. Product fulfillment – understand the logistics and physical distribution	4.76	1.56
43. Knowledge of offset printing technology	4.76	1.39
44. Plant organization, management, and workflow	4.72	1.33
45. Sales in graphic communications	4.68	1.22
46. Interactive PDF's	4.64	1.38
47. Basic knowledge of computer programming – HTML and CSS coding	4.60	1.55
48. Digital photography skills	4.60	1.37
49. Videography and video production skills	4.60	1.62
50. Basic knowledge of PURL's, QR codes, and email blasts	4.56	1.36
51. Six Sigma/Lean practices	4.56	1.71
52. Cyber security knowledge	4.48	1.73
53. Understanding and performing imposition	4.42	1.66
54. Binding – understand the terminology and processes that are used	4.32	1.69
55. Understanding and performing imposition with software applications	4.32	1.49
56. Knowledge of advanced screening and platemaking technologies	4.32	1.42
57. Animation and motion graphics	4.32	1.41
58. Anti-counterfeiting technology	4.04	1.88
59. Basic knowledge of the history of printing	3.92	1.46
60. Custom ink mixing	3.72	1.61

As with previous rounds, most standard deviations remained near or below 1.0.

Table 6: Round three results for the most needed graphic communications tools (n = 31)

Tool/equipment*	Percentage**
1. Platemaking devices	39 %
2. 3D printers	32 %
3. Screen printing presses	29 %
4. Lightroom	29 %
5. 3D visualization software (zBrush, Cinema 4D)	23 %

\*Only newly added tools were included in this round.

\*\*Percentage of participants selecting tool/equipment.

In round three, it was determined that rather than giving participants the full list of tools and equipment again, only newly added tools would be included (Table 6).

The highest-ranking tool was platemaking devices, with 39 % of participants selecting it. None of the newly added tools are considered the most important as all came in below 50 %. Participants were not given the opportunity in this round to list additional tools.

### 3.4 Round four results

The final round requested participants to rank the top twenty competencies, thus statements with mean scores closest to one are considered most important.

In order to gain a clearer understanding regarding the most needed graphic communications competencies and tools, round four differed from previous rounds in that it requested participants rank the top twenty competencies in order of importance (Table 7). Participants were given a list of the top twenty statements from round three. There were 21 statements on the list



*Table 7: Round four mean results for the top twenty most needed graphic communications competencies (n = 28)*

Competency	Mean score
1. Critical thinking skills	3.82
2. Communication skills – oral, written (including technical writing) and business	4.79
3. Teamwork	5.61
4. Problem solving and analytical thinking skills	6.11
5. Business and personal ethics	8.11
6. Organization skills	8.29
7. Adaptability and flexibility	8.50
8. Customer service skills	9.64
9. Emotional intelligence (managing people objectively and respectfully)	9.68
10. Leadership skills and supervisory techniques such as managing people, systems, and supply chains	9.86
11. Research and data analysis skills	11.50
12. Spot color and process builds for design and/or production	11.93
13. Presentation skills	12.11
14. Knowledge of design principles	13.75
15. Knowledge of trends in digital communication	13.96
16. Prepress and printing workflow	14.25
17. Ability to develop and tell a story	14.32
18. Packaging and package (structure) design	15.11
19. Networking skills	15.29
20. Current digital literacy skills (ability to find, evaluate, communicate, and share online content)	15.89
21. Knowledge of inkjet hybrid printing technology	18.50

because two statements had equal mean scores. It was determined that results could best be interpreted by showing mean scores rather than frequencies thus, those statements with mean scores closest to 1.0 are considered most important. In round four the top five competencies remained relatively the same however, the order of importance shifted once again, as with previous rounds. Critical thinking skills remained at the top with a mean score of 3.82. It was followed by communication skills, which came in at number two for the first time.

Teamwork went back up in round four and was considered by experts to be the third most important graphic communications competency followed by problem solving and analytical skills and business and personal ethics. It should be noted that of the 11 soft skills listed in round three, only one, business administration skills, was not selected to be included in the top 20 most needed competencies. Knowledge of inkjet hybrid printing technology was the lowest ranking competency in round four.

Round four also requested participants to rank the top 20 most needed tools in graphic communications higher education programs, thus tools with mean scores closest to one are considered most important (Table 8). As with the top 20 competencies, mean scores were used to best interpret the results. Adobe Illustrator remained at the top as the most needed tool followed by Microsoft Excel, Adobe Photoshop, all Adobe soft-

ware, and Adobe InDesign. All top five tools are software applications. The lowest ranking tools were cutting tables and cameras with HD video capability.

*Table 8: Round four mean results for the top twenty most needed graphic communications tools (n = 28)*

Tool/equipment	Mean score
1. Adobe Illustrator	5.39
2. Microsoft Excel	6.46
3. Adobe Photoshop	6.68
4. Email tools (Outlook, Gmail)	6.71
5. All Adobe software	7.57
6. Adobe InDesign	8.71
7. Esko	8.86
8. Online management and communication tools (such as Slack)	9.25
9. Apple computers	9.89
10. Project management tools	10.64
11. Color measurement tools	10.75
12. RIP systems	11.46
13. Packaging design prototyping	11.54
14. Digital printing press (roll and sheet fed)	12.32
15. MIS software (Management Information Systems)	12.57
16. Variable data printing software	13.11
17. Wide format printing press (roll and sheet fed)	13.61
18. DSLR cameras and accessories	14.01
19. Cutting tables	14.64
20. Cameras with HD video capability	15.79

#### 4. Discussion

This study addressed the following research questions: 1) What are the skills and content knowledge areas most needed in higher education graphic communication programs as identified by experts? 2) What are the tools most needed in higher education graphic communication programs as identified by experts? Based on the results of the data collected, out of the 21 top ranking skills and content knowledge areas, three statements are considered to be content knowledge areas; those are: 1) Current digital literacy skills, 2) Knowledge of trends in digital communication, and 3) Knowledge of design principles. Six statements are technical skills: 1) Emotional intelligence, 2) Research and data analysis skills, 3) Spot color and process builds for design and/or production, 4) Prepress and printing workflow, 5) Packaging and package (structure) design, and 6) Knowledge of inkjet hybrid printing technology. The remaining twelve statements are soft skills: 1) Critical thinking skills, 2) Communication skills, 3) Teamwork, 4) Problem solving and analytical thinking skills, 5) Business and personal ethics, 6) Organization skills, 7) Adaptability and flexibility, 8) Customer service skills, 9) Leadership skills and supervisory techniques, 10) Presentation skills, 11) Ability to develop and tell a story, and 12) Networking skills. Soft skills were not only in the majority in terms of most needed skills, but were also consistently the highest ranking skills in all of the rounds of questioning. Regarding research question 2, the most needed tools, many of the tools and equipment identified by experts are software applications and/or digital-based tools. Software applications were among the highest-ranking tools. Some hardware and equipment also ranked in the top 20 most needed tools however, they were ranked closer to the bottom.

The main findings of this study were consistent with results from a previous study conducted by Smith (2014). As previously mentioned, Smith found that industry professionals showed a clear preference for soft skills over technical skills. Experts in the Smith's (2014) study identified attitude, good communication, teamwork, good work ethic, listening skills, problem solving, project management, and the ability to adapt and be flexible as the most needed soft skills for students entering the graphic communications industry. Five out of eight soft skills identified in Smith's study were also identified in this study.

##### 4.1 Limitations/delimitations

One notable limitation of this current study relates to the Delphi method itself. The traditional Delphi study is very time intensive due to the sheer number of rounds of questioning (Powell, 2003). However, utilizing a modified approach with fewer rounds helps to

expedite the process, as well as provides participants with an existing questionnaire in round one rather than requesting they generate the list themselves. As previously mentioned, low participant rates are a limitation of Delphi studies. In Smith's (2014) study, low participation was also an issue. Smith (2014) questioned whether this may be isolated to graphic communications particularly, or if participants are simply already overloaded with other information. Exploring low participant rates in the field of graphic communications would be an area worthy of future research. In this study, participant rates declined as the project progressed, which is a common issue in Delphi studies.

Other limitations relate to quantitative and qualitative studies in general, such as protecting participant anonymity, obtaining appropriate permissions, and avoiding researcher bias. Careful consideration was given in order to avoid these potential issues. Finally, limitations related to the data collection instrument can also be a concern. Web-based questionnaires, specifically, can encounter issues including low response rates, emails being sent to junk folders, and other technology issues such as web pages timing out, etc. Delimitations of the study include limiting the participant location to the southeast and narrowing the participant group to only full-time educators in higher education programs and full-time industry professionals currently working in the graphic communications field.

##### 4.2 Future research

It would be beneficial to conduct this study in other geographic locations as well as in other graphic communications-related markets. For example, would the results of this study be consistent in other regions of the United States and in other areas of the world? This would be important, not because all higher education programs need to have the same program offerings, but rather because of the synergy that exists among academics and industry. Consistency in findings ensures that expectations from both organizations align with each other leading to better relationships and, more importantly, a better prepared workforce. This research could also be applicable in other markets aside from academics. For example, it would be interesting to note whether the results of this study would be similar if conducted in a large flexography packaging company or in a large information technology center.

One of the important aspects of the project was to encourage participants, both educators and industry professionals, to arrive at a consensus regarding the most needed competencies and tools, however, separating the two participant groups and then comparing the results could also yield some important findings. As mentioned previously, conducting the study with

more participants would also provide additional data, potentially giving the research more statistical significance and validity. In addition, this study could be conducted using a different research method, such as a case study where more qualitative data can be collected. Nonetheless, it will be essential to repeat this research frequently because industry practices and expectations will continue to evolve and new technology will be developed.

### 4.3 Significance & practical application

The purpose of this study was to identify the most needed skills, content knowledge areas, and tools needed in higher education graphic communications programs. Changing trends in technology as well as a lack of research on the topic were the driving factors regarding the need for this study. As educators, it is important that we are providing students with the knowledge and skills to be productive graphic communications industry professionals. It is also vitally important that educators and current industry professionals have similar expectations regarding what students need to know. In addition, as technology continues to evolve and new equipment and capabilities emerge, higher education graphic communications programs should evaluate the current curriculum as well as tools and equipment to ensure that they are up-to-date, in-line with industry expectations, and most importantly, meeting the needs of the students.

The results of this study can provide higher education educators with a framework for evaluating the existing curriculum, especially for those programs that are not overseen by an accrediting body. The most obvious means for doing so would be to conduct a program evaluation. For those institutions with current graphic communications programs, a summative evaluation would be most appropriate. Grayson (2011) proposed an evaluation comprised of seven steps: identify the context of the program being studied; define the program's theory; identify all stakeholders; explain the purpose of the evaluation; identify evaluative questions and criteria; locate, collect, and analyze the data; and finally report findings. The findings from this study would be applicable in step five of the process, identifying questions and criteria. For example, evaluating which particular courses emphasize critical thinking and assessing how current course assignments and projects measure students' ability to critically think through a problem.

This research can also serve as a checklist of sorts for inventorying current tools and equipment that are being used to teach students specific skills, and determining if some are lacking or simply obsolete. For example, it was interesting to note that several types of

printing presses were not identified as being essential tools. Screen printing presses and flexography printing processes were two of the lowest-ranking tools identified, and offset printing was not identified at all. Also, platemaking devices scored quite low. This indicates that the industry continues to shift away from some of the traditional types of hands-on presses and production. However, digital printing presses and wide format presses scored in the top 20 most needed tools. These findings can, again, be applicable in evaluating course content and determining how and if particular print production processes should be taught and what equipment should be used. This would also give faculty the opportunity to identify how to integrate new types of tools, specifically those that are software-based, into existing courses or possibly creating new courses to aid in the instruction of these tools.

Finally, this study revealed that educators and industry professionals overwhelmingly placed the most importance on soft skills. This leads to the question "Can soft skills be taught?" Currently there is a wide range of educational research regarding soft skills. Researchers argue that soft skills can in fact be taught. Shuman, Besterfield-Sacre, and McGourty (2005) argue that skills such as, communication and ethics can easily be incorporated into a variety of projects. They also point out that many colleges and universities offer entire courses on the subjects. Rego (2017) stated that oftentimes students who communicate effectively also work well with a team. It can be assumed then that if communication skills can be taught, teamwork can as well. Professionalism is another soft skill that can be incorporated into courses by educators when he or she exhibits those qualities in the classroom by "...taking responsibility, being accountable, having integrity, and presenting an overall positive image" (Rego, 2017, p. 11). It is evident that the inclusion of soft skills into the graphic communications curriculum is not only possible, but essential in the success of students in the field. The challenge and duty of educators is to determine how best to do that. It is imperative that educators be innovative, creative, and purposeful in the creation of course content and assessment in order to ensure that students are not only building on the technical skills and content knowledge areas the industry requires, but more importantly, the soft skills that experts have deemed vital for students entering the workforce.

## 5. Conclusions

The results of this research will add to the existing body of research on the topic of graphic communications competencies, and the conclusions drawn from this study align with previous research. This study, along with the study conducted by Smith (2014), found

that experts overwhelmingly determined that soft skills are the most needed graphic communications competencies. In addition, this research revealed that the majority of most needed tools are software applications or digital-based tools. The results from this study provide higher education graphic communications programs with an instrument to evaluate current curriculum offerings as well as determine which tools and equipment may be obsolete and/or what new tools may now be necessary. It is the obligation and respon-

sibility of graphic communications educators to apply these findings in order to ensure that students are being adequately prepared to enter the industry, and are also prepared to adapt to the continuously evolving technological advancements inherent to the graphic communications field. In closing, the importance of this study can be summarized by a request for participation response I received from an industry participant stating, “We are very much in need of a qualified pipeline of full-time employees in this field.”

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