Development of a Model and Instrument to Measure the Competency Levels of Graphic Design Graduates: The Research Methods

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ABSTRACT: *This paper aims to illustrate a systematic procedure in developing a model and measurement instrument to measure the competency levels of graphic design graduates. A review of literature indicated that the development of a competency model and instrument for a specific job or profession begins with identifying competency constructs and items through observation, literature review, document analysis, and interviewing. The methodological process described in this paper is furthered by means of modified Delphi Technique to gain consensus from a panel of experts and survey questionnaire to test the validity and reliability the competency instrument. Both qualitative and quantitative approaches are used in this process.*
KEYWORDS: *Competency Model, Measurement Instrument, Competency Assessment, Graphic Design Graduates, Modified Delphi Technique*

I.   INTRODUCTION

There is a drastic change in graphic design practice in the last decade. The activities, workflows, and production methods of design have been changed by the increasingly sophisticated technological, social, cultural, environmental, and economic factors (American Institute of Graphic Design (AIGA) & National Schools of Art and Design (NASAD), 2010), as well as divergence in people's preferences and behaviors(AIGA, 2015; International Council of Communication Design (ICOGRADA), 2011). Consequently, the scope and content of work of graphic designers have expanded and become more complex (Dziobczenski & Person, 2017; Harland, 2016). Aside from focusing on "the making of things and beautiful things" (AIGA, 2015), contemporary graphic designers are required to possess a new set of competencies to effectively response to a wide range of new job roles and demands (Adu, 2015).

The concept of competency has been used in human resource management practice to recruit, select, train, develop and appraise individuals in modern society (Ennis, 2008; Rodriguez, Patel, Bright, Gregory, & Gowing, 2002). Competencies are fundamental personal attributes that drive effective job performance (Boyatzis, 1982; McClelland, 1973). Generally, competencies include knowledge, skills, self-concepts and values, traits, and motives (Spencer & Spencer, 1993). They can be applied in various work situations (Moore, Cheng, & Dainty, 2002) and endure for some time (McClelland, 1973). In educational practice, competencies are general statements that represent the knowledge, skills and abilities, values, and personal traits that students are required to master upon the completion of a programme (Hartel & Foegeding, 2004).

Design educators and industry professionals are always concerned with the issue of graphic design graduates' competencies. However, the graduates' quality is not up to a standard required by employers in design industry (Adu, 2015; Heller, 2005; McCoy, 1997). There seems to exist a discrepancy between what are taught at university and what are required to perform in design practice (Cheung, 2016; Hsieh, Guan, & Wu, 2010). The misalignment between curriculum design and delivery of graphic design education and the expanded scope of graphic designers' work is believed to be the key factor that has led to this discrepancy (AIGA & NASAD, 2010; Davis, 2015; Marks, 2015). Technical production skills are still being placed as the key emphasis in graphic design education to prepare graduates for entry-level employment (Frascara, 1998; Lim,

2015; McCoy, 1990). From previous studies (e.g., Adu, 2015; Cheung, 2016; Dziobczenski & Person, 2017; Dziobczenski, Person, & Meriläinen, 2018), it is learned that employers in design industry expect graduates to be competent, well-prepared, multi-skilled, and dedicated. However, currently, there is no easy and effective way to determine the competency levels of graphic design graduates. Therefore, this paper aims to describe the systematic procedures in developing a competency model and measurement instrument to assess the identified competencies.

II. LITERATURE REVIEW

2.1 Identification of Competencies for Specific Profession or Job

Thorough preliminary works need to be done in the identification of the most significant competencies for a specific profession or job. It is crucially important to collect views from different stakeholders while identifying the competencies (Parry, 1996). Parry (1996) listed 12 guidelines to be considered in the process of identifying key competencies, which are:

1. Keep the competencies broad and generic.
2. Avoid stating competencies that should be possessed by all professions.
3. Establish competency item that can be behaviorally observed and measured.
4. Illustrate each competency item with behavioral examples.
5. Use familiar language.
6. Keep it concise.
7. Describe each competency item in detailed to avoid confusion.
8. Emphasize on future demands.
9. Identify desired outcome before identifying the required competency.
10. Determine different levels of competency.
11. Eliminate personal traits.
12. Classify related competencies under broad headings.

Campion et al. (2011) suggested a number of good exercises to follow, such as examining the context of the organization, connecting competencies with organizational goals, examining future job demands, and employing rigorous job analysis techniques. Job analysis is a set of methodical steps specifically used to identify and develop competencies (Anastasi, & Urbina, 1997) to ensure superior organizational performance (Siddique, 2004). The recommended job analysis techniques include: direct observations, interviews with experts, focus group discussions, brainstorming, literature review, survey, and so forth (Campion et al., 2011; Chung & Wu, 2011; Suhairom, Musta'amal, Amin, & Johari, 2014). Chung and Wu (2011) noted that several factors such as the purpose of the study, budget, and time play decisive role in determining which particular technique to be used while identifying the competencies needed to perform a job successfully.

2.2 Development and Importance of Competency Model

A competency model can be defined as "a descriptive tool that identifies the skills, knowledge, personal characteristics, and behaviors needed to effectively perform a role in the organization and help the business meet its strategic objectives" (Lucia & Lepsinger, 1999, p. 5). According to Lucia and Lepsinger (1999), there are two options to develop competency models. The first is a 'build-from-the-ground' option that requires rigorous interviews and observations. Even though this option can establish meaningful competencies for a specific job, a large amount of time and resource are needed. The second is an 'off-the-shelf' option that based on existing competency theories or models. This option allows the researchers to utilize existing validated model in order to reduce a great amount of time and resource. However, it may not be able to capture the uniqueness of a specific job area. Lucia and Lepsinger (1999) mentioned that for a model to be used effectively, the competencies listed in the model must 'make sense' to those who perform the job, and it must be demonstrated by the superior performers in the job.

In human resource management practice, competency models can be used for various purposes. They can be used for the recruiting and selecting new employees, evaluating training programs, developing job descriptions and training programs, retaining incumbent employees, developing and managing employees' career paths, making meaningful managerial decisions, and supporting organizational change efforts (Campion et al., 2011; Ennis, 2008; Vazirani, 2010). Le Deist and Winterton (2005) highlighted that a competency model is critical for "integrating education and training, aligning both with the needs of the labor market and promoting mobility for individuals (vertical as in career progression, lateral as in movement between sectors and spatial as in geographically), especially for workers faced with job insecurity" (p. 28). The value of competency models is that a 'whole-person' assessment (Rodriguez et al., 2002) can be developed to appraise if an

individual acquires the essential competencies of a specific job or profession (Ennis, 2008). In the workplace, a competency model offers individuals with a set of required standards to guide their performance and behaviors. By means of the same competency model, the employer can be better informed on which attributes of the employees are associated with superior performance (Suhairom et al., 2014).

In educational practice, a competency model can serve as a practical guide to help educators and programme administrators in planning, designing, developing, delivering, and evaluating curricular in order to meet the industry's standards (Ennis, 2008). The competencies contained in the model provide observable and measurable statements illustrating the knowledge, skills, abilities, behaviors, values, and traits that students are expected to equip when they complete their study (Hartel & Foegeding, 2004).

2.2 Development and Importance of Competency Measurement Instrument

Since competency is a critical aspect to determine an employee's performance in the workplace, competency-based assessment has gained increasing popularity in recent years. Competency-based assessment can be defined as:

> *"assessment of a person's competence [competency] against prescribed standards of performance. Thus, if a profession has established a set of, say, entry level competency standards, then these detail the standards of performance required of all new entrants to that profession. Competency-based assessment is the process of determining whether a candidate meets the prescribed standards of performance, i.e. whether they demonstrate professional competence [competency]."*

(Gonczi, Hager, & Athanasou, 1993, p. 5)

A well-developed competency-based assessment can bring numerous benefits to a profession. As noted by (Van der Merwe, 2002), competency-based assessment can be used for selecting and developing superior employees. Aside from the professions, Suhairom, Musta'amal, Amin, and Johari (2014) stressed that the development of an effective competency-based assessment system is also highly beneficial to the whole community. Such system permits assessors to make judgments if an individual achieves the criteria pre-determined in the competency standards of a specific job or profession based on collected 'evidence' (Gonczi, 1994). The quality and quantity of the evidence must be adequately collected for assessors to make sound judgments about the competency levels of an individual (Gonczi, 1994) because competencies, sometimes, can hardly be observed directly (Gonczi, Hager, & Athanasou, 1993). Potgieter and Van der Merwe (2002)pointed out that competency-based assessment is perceived to have higher levels of inherent fairness in evaluating the performance an individual as it places more emphasis on behaviors and actual job outputs rather than personality or other cultural factors.

Nevertheless, previous studies offer little evidence on the existence of an effective competency measurement tool for new entrants to graphic design profession. To the best knowledge of the authors of this paper, there is no indication in the literature on the existing instrument of competency assessment that can be identified. Therefore, this paper aims to describe the systematic procedures followed in developing a competency model and instrument to measure the identified competencies of graphic design graduates. Such procedures seek to answer the following research questions:
1. What is the competency model for graphic design graduates?
2. What is the instrument to measure the competency levels of graphic design graduates?

III. DISCUSSION ON METHODOLOGY USED

3.1 Research Design

Mixed method research design is employed to answer each research question addressed. The strengths of this approach is that it considers various standpoints and perspectives by integrating both qualitative and quantitative forms of research (Creswell, 2012). In other words, several data collection and analysis methods can be used to investigate complex an issue or phenomenon (Brannen, 2005; Creswell & Plano Clark, 2011; Johnson, Onwuegbuzie, & Turner, 2007). This approach can assist the researcher in discovering what happened and also how it happened as well (Creswell, 2012).

More specifically, two-phase sequential exploratory design is employed where it starts with qualitative data collection and analysis with a small sample of individuals, follows up with quantitative data collection and analysis by using a larger sample, and ultimately comes out with the final interpretation or conclusion (Johnson et al., 2007). Creswell and Plano Clark (2011) highlighted that sequential exploratory design is particularly useful for developing and testing an instrument when one is not available. By utilizing qualitative method in the first phase, it is believed that the views from experts on the competencies required by graphic design graduates

can be more effectively obtain. **Figure 1** illustrates the research operational framework of the proposed methodology.
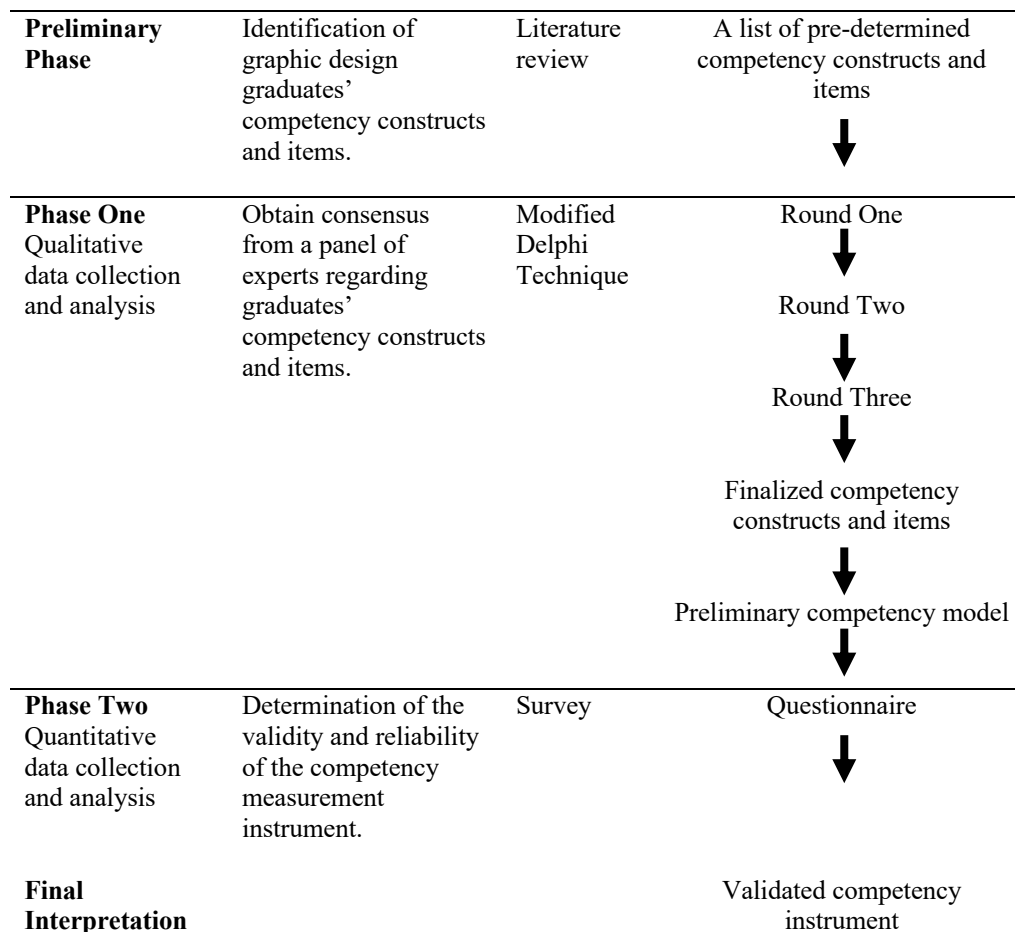
Preliminary Phase	Identification of graphic design graduates' competency constructs and items.	Literature review	A list of pre-determined competency constructs and items
Phase One Qualitative data collection and analysis	Obtain consensus from a panel of experts regarding graduates' competency constructs and items.	Modified Delphi Technique	Round One ↓ Round Two ↓ Round Three ↓ Finalized competency constructs and items ↓ Preliminary competency model
Phase Two Quantitative data collection and analysis	Determination of the validity and reliability of the competency measurement instrument.	Survey	Questionnaire ↓
Final Interpretation			Validated competency instrument

Figure 1 Research Operational Framework

3.1.1 Preliminary Phase: Literature Review

The purpose of this phase is to identify the competency constructs and items from existing literature. The review of the literature will cover issues and topics including essential job demands and requirements as new entrants to graphic design profession and detailed examples of competency related behaviors. The identified competency constructs and items will be classified into four categories as described below:

1. Cognitive competencies: Essential knowledge, understanding, and information that must be demonstrated by superior performers in job-related situations.
2. Functional competencies: Capability to effectively perform job-related tasks and activities using available technologies or tools that must be demonstrated by high performers.
3. Social competencies: Social or personal behaviors, attitudes, and values that must be displayed by superior performers in job-related situations.
4. Meta-competencies: Generic and overarching 'soft-qualities' that can support the acquisition and development of other competencies.

The identified competency constructs and items will be used to develop a questionnaire. As pointed out by McClelland (1973), rigorous preliminary works must be done in order to develop a good instrument for competency measurement. Radhakrishna (2007) noted that the questionnaire must be developed systematically to reduce measurement errors in the data collection process. The development of questionnaire is guided by the steps outlined by Radhakrishna (2007), which are:

1. Background study: Identify and explore research purposes, objectives, questions, sampling strategy, and methodological procedures.
2. Questionnaire conceptualization: Identify constructs and establish items for each construct.

3. Questionnaire development: Write items, design the questionnaire layout and format, choose suitable scale of measurement, and suggest appropriate data analysis approaches to answer research questions addressed by the study.
4. Validity and reliability establishment: Carry out validity and reliability tests to ensure the accuracy or precision of the new measurement instrument.

3.1.2 Phase One: Modified Delphi Technique

In this phase, the topic of graduates' competencies for effective work performance in graphic design profession will be qualitatively explored. More specifically, this qualitative approach will employ modified Delphi Technique. Habibi, Sarafrazi, and Izadyar (2014) stated that Delphi Technique is helpful in making qualitative decisions when it is used for the exploration of the nature or fundamental elements of a phenomenon. This phase aims to gain consensus and validation from a small number of experts in graphic design field regarding the competency constructs and items to be used in the measurement instrument.

Qualified experts must be selected carefully in a Delphi study (Avella, 2016; Ogbeifun, Agwa-Ejon, Mbohwa, & Pretorius, 2016). This is because the selected experts directly affect the validity and quality of the results generated (Hsu & Sandford, 2007). Content validity can be assured if they are truly the representatives of the area of knowledge under study (Goodman, 1987). The experts of the Delphi process are categorized in three groups: design educators, industry professionals, and design policy makers. They are selected by means of non-probability purposive sampling technique (Cohen, Manion, & Morrison, 2000). Creswell (2012) described purposive sampling as a qualitative sampling strategy where individuals are selected intentionally based on their ability to provide required data. The decision to select the experts is made based on their professional and educational experiences and knowledge in relation to graphic design. The plan in to recruit 50 experts to take part in the first phase.

Delphi studies utilize a series of questionnaires as primary instruments for data collection (Dalkey, & Helmer, 1963; Hasson, Keeney, & McKenna, 2000; McKenna, 1994). According to Stitt-Gohdes and Crews (2004), different from traditional survey research, the Delphi rounds allow "initial feedback, collation of feedback, and distribution of collated feedback to participants for further review" (p. 62). In this phase, modified Delphi Technique is conducted over a series of three rounds to achieve its intended purpose.

In Round One of the Delphi questionnaire, all experts are requested rank a list of pre-determined competency items based on their degree of importance. They are those observable 'behavioral indicators' that must be demonstrated by graduates in design practice. They are categorized under specific constructs in the questionnaire. Additionally, the experts are also given the opportunity to provide feedback on the items and constructs and to suggest additional competencies that should be included in the following round. Based on the feedback from the experts, an amended list of competency items and constructs is developed as the Delphi Round Two. Again, the experts are asked to rank the items and provide feedback on the constructs. The findings are analyzed, consolidated, and used to develop the Delphi Round Three. During Round Three, the Delphi panel is 'only' requested to rank the competency items based on their degree of importance. By the end of Round Three, the final level of consensus is calculated, constructs are finalized, and items are screened. A final list of competency constructs and items is produced. The finalized constructs are used to build a preliminary competency model.

All questionnaires are designed through SurveyMonkey, a popular online survey development cloud-based software in order to reach the participating experts more efficiently and effectively. Each questionnaire will be administered for a pilot study to test the reliability of the instrument. **Table 1** provides a summary of the format used in Delphi questionnaires.

Table 1 The Delphi Questionnaires Format Summary

Delphi Round	Questionnaire's Sections and Question Type
Round One	1. Demographic questions
	2. 5-point Likert scale with comment option
	3. A set of open-ended questions for participants to suggest additional competencies
Round Two	1. 5-point Likert scale with comment option
	2. A set of open-ended questions for participants to suggest additional competencies
Round Three	1. 5-point Likert scale

3.1.3 Phase Two: Survey Questionnaire

Following analysis of the modified Delphi outcomes, in the second phase, another set of online survey questionnaire is designed and constructed to collect quantitative data with a larger sample. This phase aims to

determine the validity and reliability of the competency measurement instrument. This survey instrument comprises of two parts. Part One consists of demographic questions relate to the survey participants, such as the current employment information, number of years in current position, current position title, years of graphic design industry experience, academic qualification, age, and gender. Part Two consists of a list of items that used to measure their competency levels. These items are categorized according to specific competency constructs. The participants are asked to examine the items closely and self-evaluate their competency levels based on a 5-point Likert, where:

1 = Strongly incompetent
2 = Incompetent
3 = Moderately competent
4 = Competent
5 = Strongly competent

The target population for the survey questionnaire are new entrants to graphic design profession, i.e., junior graphic designers. They are selected by means of simple random sampling technique. According to Muijs (2004), technique select sample randomly from the population, thereby everyone in the population has exactly the equal opportunity of being included in the sample. Cohen, Manion, and Morrison (2000) mentioned that the selected sample should possess subjects with characteristics similar to the population as a whole. The selected junior graphic designers must acquire bachelor's degree majoring in Visual Communication Design, Advertising Design or Digital and Interactive Design and must be in the first two years of professional work in the area of branding and identity design, corporate communication design, publication and editorial design, illustration, information design, interactive or experience design, motion graphics, packaging design, and promotional and advertising design.

The sample size is determined by referring to the previous studies (e.g., Omran, Subhe, & Suleiman, 2017; Phan & Deo, 2008; Vaughan, 2016) that applied the same statistical analysis method. Specifically, in order to provide sufficient statistical power for data analysis, 200 junior graphic designers are selected to participate as respondents in the survey questionnaire. This sample size is also recommended by Myers, Ahn, and Jin (2011).

3.2 Data Analysis

In the Delphi phase, descriptive statistics are used to organize, analyze, and summarize the demographic and current employment information of participating experts, including gender, age, number of years in current position, current position title, total years of graphic design industry or education experience, and academic qualification. In order to present and describe these data effectively, frequency and percentage tables are used. In addition, measures of central tendency or average provides a set of important information to describe and analyze the collected data. In the Delphi phase, means and standard deviations of the collected data are calculated. These descriptive statistics are generated by using the Statistical Package for the Social Sciences (SPSS). The collected written insights and comments of the experts in the Delphi Round One and Two will be analyzed by means of thematic coding technique. The identified themes will be added in the Delphi Round Two and Round Three questionnaire.

Consensus of opinion is an underlying principle of the Delphi (Dalkey & Helmer, 1963; Hasson et al., 2000; Stitt-Gohdes & Crews, 2004; Thangaratinam & Redman, 2005). The consensus principles suggested by Schmidt (1997) is adapted in this phase. He offered an effective principle to follow when it comes to determine the degree of consensus among raters. The Kendall's coefficient of concordance (Kendall's W) value ranges from 0 to 1, with 0 indicates no consensus and 1 indicates complete consensus between lists. A W value of 0.7 or greater indicates strong agreement; 0.5 indicates moderate agreement; and 0.3 or smaller indicates weak agreement. The Kendall's W value is calculated by using SPSS at the end of each Delphi round to determine the degree of consensus among raters. The competency items are screened based on the means of the Round Three when a strong consensus is achieved. According to Habibi et al. (2014), if 5-point scale is used, criteria with means lower than four are removed.

For the quantitative data, confirmatory factor analysis (CFA) will be conducted on all established items to assess how well they 'fit' to their respective competency constructs. Specifically, it aims to determine the validity and reliability of the competency measurement instrument (Alarcón & Sánchez, 2015; Cohen, Swerdlik, & Sturman, 2013). Various validity tests (convergent validity, construct validity, discriminant validity) and reliability tests (internal reliability, composite reliability, and average variance extracted) will be conducted to validate the proposed instrument for competency assessment.

Analysis of Moment Structures (AMOS) software is used to test the validity and reliability of the competency measurement model in the second phase. As stated by Awang (2013), AMOS is a powerful statistical analysis software that is able to analyze the inter-relationships among the key constructs effectively, efficiently, and accurately.

IV. CONCLUSION

In short, this paper depicts a methodological process involved in developing a model and instrument for assessing the competency levels of graphic design graduates. In terms of methodological contribution, the refined and expanded statistical procedure described in this paper is not yet used in similar studies. It is hoped that the improved statistical procedure will contribute to the existing body of knowledge.

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