

Thesis Development Guide for Doctoral Students

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Abstract—Postgraduate research leading to a successful doctoral degree is arduous, often leading to a loss of self-esteem, money, time, effort and opportunity. Postgraduate students require tools to guide them during the development and writing of a doctoral thesis report. The article discusses a thesis development guide (TDG) developed to facilitate the writing of a thesis report in a systematic and structured manner. Based on a critical review of literature and a Delphi Technique, six components were identified and validated by professors as basic components to include in a thesis. In addition, both the professors and doctoral students recruited from various universities tested the TDG on a thesis report to its suitability in guiding students. The TDG attached to the paper now may be used in the teaching of research methodology where students assess a completed thesis, and in doing so comprehend the logical linkage of the required components. In addition, it can also be used to guide doctoral students as they develop each component of a thesis. Essentially, the TDG guides students in checking the quality of six components especially in terms of existence, completeness, accuracy, appropriateness, communication and presentation style. Though TDG was developed in a construction and project management environment, it has a potential for a wider application in other doctoral programmes, especially those which follow a deductive research approach. Lastly, TDG is not intended to be panacea of all challenges of doctoral students but a complementing tool to tame the unwieldy nature of thesis development.

Keywords—thesis, dissertation, postgraduate research, doctoral degree, supervision, doctoral student

INTRODUCTION

A postgraduate research degree, achieved through the development and writing of a successful thesis (or dissertation as referred to in some academic jurisdiction), focuses on original research that contributes to theoretical knowledge and/or practice. In the processes, it is an avenue for increasing the professional competence of graduates. For a thesis to be successful and satisfy examiners, several ingredients must be in place including a good supervisory regime, a supportive academic environment and a motivated postgraduate student with requisite research skills (Golding, Sharmini & Lazarovitch, 2014; Spronken-Smith, Cameron & Quigg, 2018). However, this process has always remained a major challenge for postgraduate students where they must make the shift from consuming and analyzing knowledge to producing it (Lovitts, 2005; McPherson, et al., 2018; Jones, 2013). It happens to be one of the key reasons why students burn out, often take long to complete their degrees or why some drop out of doctoral programmes (Pyhälto, et al., 2023; Lovitts &

Nelson, 2000; Smallwood, 2004). Postgraduate students are often bewildered by a process that requires meticulous structuring and articulation to logically link various parts of a thesis report. This challenge has provoked the academic research community in developing various tools to tame the thesis writing process. Based on that premise, the objective of this article is to describe and discuss the development, validation and application of a tool referred to as a thesis development guide (TDG) which is presented in Appendix A. The TDG is an attempt by the authors to provide a tool that facilitates postgraduate students in writing an effective thesis report in a structured manner. By identifying key thesis components which must be articulated in the report, the TDG attempts to tame the unwieldy nature of the thesis writing process through a systematic and logical approach that links research inquiry to findings. The tool is meant to guide research studies based on a deductive approach where a researcher starts with a theory, a generalization or hypothesis and then affirms or tests it through data collection and analysis (Saunders, Lewis & Thornhill, 2016). The article is divided into six major sections, including the introduction. The second section provides a brief overview of components of a thesis based on a critical review of literature to contextualise the TDG and thesis report. The third section describes the research approach used in the study while the fourth section discusses how the TDG was actually developed and validated. The fifth section discusses the application of the tool in the thesis development process while the sixth section concludes the article.

LITERATURE REVIEW

For a thesis report to be successful during the examination process, it requires a systematic and meticulous articulation of the conceptualised research inquiry. A quality report is defined by the existence, completeness, accuracy and relevance of the thread of inquiry. This must be communicated in a structured manner that logically presents the research inquiry in terms of its theoretical basis, design, results, findings and their implication to theory and practice (Holbrook, et al., 2004; Mullins & Kiley, 2002).

This section provides a brief overview of the basic components of a quality thesis, synthesized from a variety of sources that included academic articles, books, university research manuals and examiners' reports. It must be noted that the prescription of thesis components is varied, however, the discussion focuses on the common themes that cut across the reviewed content.

Furthermore, the grouping of contents is also varied, for example, some sources (e.g. MSU, 2010; QU, 2016; SHSTU, 2021; UB, 2018) divide a thesis into three parts, the “front matter, thesis body and back matter”. However, a fourth component that cuts across all the three, namely “communication and presentation style” has been recognized by various sources (e.g. Perry, 1998; Day & Gastel, 2006). The discussion of the four follows beginning with the latter.

A. The Communication and Presentation Style

The quality of communication of a research narrative is key to the success of a thesis during the examination process. It is achieved by a conscientious and systematic effort to link the contents within the various parts of a thesis and create a logically flowing research argument. This requires a well-designed hierarchy of headings that increases the thesis readability. A ‘line of sight’ must meticulously and logically link all research components to achieve the research aim. Furthermore, each requires stating its and how it is structured. Each chapter requires a summary is needed but for the first chapter a synopsis of the rest of chapters of the thesis is an additional requirement.

Furthermore, it is often desirous, where appropriate, to summarise ideas, concepts and data using illustrations in form of tables, figures or equations. However, when used, illustrations require numbering, captioning, describing and referencing (if adopted or adapted) in the thesis narrative (MSU, 2010). To be useful, illustrations must be clear, well labelled, contained on one page and not overcrowded.

Furthermore, a thesis report requires a professional appearance that is driven by diligent and consistent usage of acceptable formats, for example, consistent margins, spacing, text alignments, font type and size (Perelman, Paradis & Barret, 1998; QU, 2016). In a nut shell, effective communication and presentation plays a pivotal role in articulating research ideas, free of grammatical and typographic errors (Mullins and Kiley 2002).

B. The Front Matter

Front matter items include a cover page, ethical statement, dedication, acknowledgement, abstract, keywords, content page and a list of abbreviations (SHSTU, 2021; QU, 2016; UB, 2018). The format of most of these items is normally prescribed in university manuals.

Challenges often arise from the formulation of a thesis title and abstract, yet they form the first impression of a thesis report. Scholars (e.g. Gustavii, 2008; Tullu, 2019) noted that a thesis title must indicate the gist of the research, should avoid acronyms or abbreviations, must be concise, clear and yet informative to evoke the interest of examiners. Some authors (e.g. Dewan & Gupta, 2016; Tullu, 2019) have recommended a

length of between 12-20 words i.e. the title should not be too long to submerge the reader into oblivion and not too short to leave the reader wondering what the research is all about.

On the other hand, an abstract must be a brief outline of the research inquiry, written after completing all the thesis chapters. It should, however, be a self-contained communication, original, with no new ideas and hence no references included with a recommended length between 200-350 words (Hairston & Keene, 2003; Brown, 2019). Key elements of an abstract include the context of the research especially its importance in the field of research; research gap and question; research approach used, key findings and their implications to the discipline (Tullu, 2019; Day & Gastel, 2006).

Lastly, four to six words key words should be identified. These together with the abstract form an essential element in the indexing of a thesis to increase the propensity of its academic visibility (Rodrigues, 2013).

C. The Back Matter

The back matter consists of a list references from the citations made in the thesis narrative and compiled according to a prescribed referencing style (Hartley & Betts, 2009). In addition, appendices may be attached to the report, in form of detailed pieces of information related to the research which may distract the flow of a thesis if placed in the thesis body (e.g. data collection protocol, maps or data sheets, etc.). However, they must be numbered, captioned and referred to in the thesis body, at least once.

D. The Thesis Body

The thesis body (or “main matter”) provides a thread of inquiry starting with problem formulation and ending with a conclusion and recommendations. Each part has a specific purpose which binds the research logic. A challenge that postgraduate students often encounter is that most research books discuss various components of a thesis in isolation and in a generic manner, yet a thesis is an integrated academic and specific piece of work. Furthermore, a thesis requires to diligently present, describe, discuss or justify the thesis items making up each chapter (Rudestam & Newton, 2014; Thomas, 2009; Lovitts, 2005). Unfortunately, there is no agreement on how many chapters a thesis should have, for example, a study by Brailsford (2018) noted variations of five to eight chapters in the thesis reports studied. “Review of Literature”, for example, may be divided into more than one chapter just as “Results” and “Discussion of Findings” may be one or two separate chapters (e.g. Hon and Kurt, 2008). Whatever number of chapters, there are five distinct parts of a thesis (for reasons stated above, the term chapter is avoided) namely introduction; review of literature; methodology; results and findings; and conclusion and recommendation, as illustrated in Figure 1. The next sub-sections discuss the purpose of each part.

Logical thread of inquiry

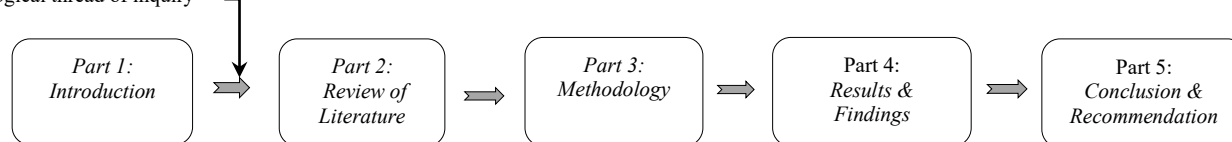


Figure 1: The five basic parts of a thesis body

(i) Part 1: The Introduction

The introduction (sometimes referred to as “Background and Problem Framing”) provides the context of the research topic, especially its importance to the discipline, followed by a critical review of the current state of knowledge to ensure that the topic has not been already researched on and hence a repeat. The review leads to the identification of the knowledge gap and hence the motivation of the research (Farrell, 2011; Paltridgen & Starfield, 2007). In the midst of this discussion, key operational terms must be defined (especially those embedded in the research title) so that the context in which they are used in the research is clearly known (Creswell (2003). The context of research culminates into a definitive and succinct research problem statement.

Flowing from the background, several components of the research study may be defined to guide the inquiry starting with an overarching statement, namely the research aim (which is sometimes also referred to as a research goal, purpose, question or overall objective). The aim is broken down into

measurable and achievable parts, the research objectives. For research studies with inclination that requires statistical analysis, an objective may further be divided into hypotheses or specific research questions as illustrated in Figure 2. In this case, three levels define the depth of inquiry in a top-down manner such that, when data is collected, analyzed and interpreted, findings are drawn in a bottom-up manner (Ssegawa and Rwelamila, 2009).

Subsequent to defining the hierarchy of inquiry the scope of study should also be defined. The scope of inquiry defines the boundaries for which the results are applicable, for example, in terms of time, geography, demographic groups, organisations, etc. Sometimes it may be useful to reinforce the definition with an exclusion statement e.g. this study does not include projects implemented by the private sector....” Furthermore, the thesis should indicate the significance of findings and should be aligned to the research gap (Swales and Feak, 1994; Perry, 1998; Hoy, 2008).

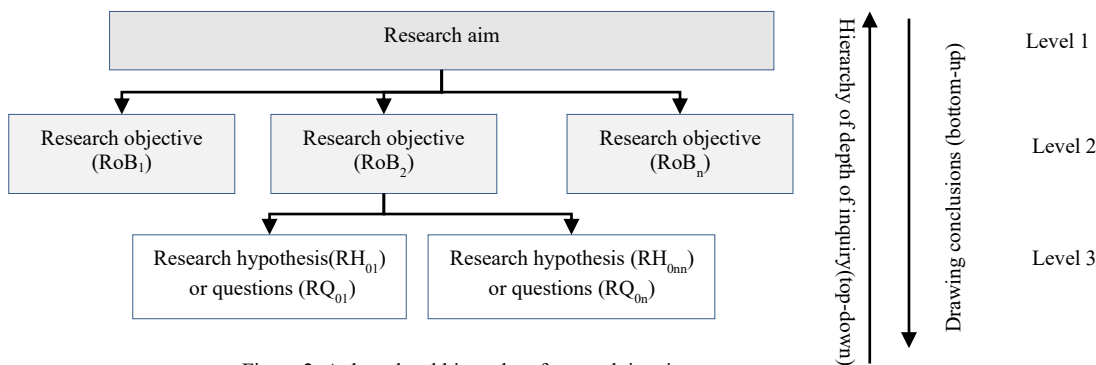


Figure 2: A three-level hierarchy of research inquiry

The research aim is an overarching statement that encapsulates the overall research intention, and this must be aligned to the research title. At level two, the research aim is broken down into research objectives while at the third level, and as case may be, each objective may be further broken down into hypotheses or specific research questions (in a top-down manner). The breakdown of objectives must be such that the scope and depth of inquiry leads to the achievement of the research aim (see Figure 2, right). Hence the hierarchy of the depth of inquiry is a ‘vertical alignment’, that allows the drawing of conclusions from findings at bottom to the top levels to achieve the research aim in a bottom-up manner.

(ii) Part 2: Review of Literature

Review of literature is carried for many purposes in a thesis including, for example, to provide a research problem context, justifying a methodology and contextualising findings with previous studies. However, a dedicated review forms a critical part of a thesis, in that, it provides a theoretical and conceptual framework on which the research inquiry is premised (Maier, 2013). The theoretical framework should be relevant, accurate, comprehensive and a contemporary understanding of the theory on which the research problem is domiciled (Golding, Sharmini & Lazarovitch, 2014). There must an adequate coverage of relevant, authoritative and contemporary literature and an articulation of concepts and arguments arising thereof, in a logical and structured manner. It requires an analytical and a synthesized interpretation of sources to draw useful insights and not a mere regurgitation of what is read.

The presentation should be well structured and logically flowing. Unfortunately, this feat cannot be prescribed here due to the uniqueness of each research topic. However, it suffices to say the use of tools like literature review matrix and mind mapping can be helpful in organizing and taming the unwieldy nature of literature review (Goldman & Schmalz, 2004; Machado & Carvalho, 2020).

Furthermore, the review should culminate in the formulation of a conceptual framework, that specifies constructs and variables for which data is collected to achieve the posited research objectives and aim (Miles, Huberman & Saldana, 2014).

(iii) Part 3: Research methodology

The research methodology chapter implores describing and justifying, in practical terms, how the research aim, and objectives are achieved (Saunders, Lewis & Thornhill, 2016). During literature review, it is advisable to have a critical eye, that discerns the objectives formulated by other researchers, how they were investigated and the findings arising thereof. Often this helps in getting tips of how to approach and justify the research design.

One of the tools that students may use to galvanize their thoughts and decisions to achieve each research objective set is the research design matrix (RDM) illustrated in Table 1. RDM summarizes the research design by indicating how each objective is achieved in terms of the required data and its source; study population and sampling design; method of data collection and analysis including tools used; quality and

ethical management issues (Choguill, 2005; Burns & Bush, 2014). While the RDM provides a design summary, a full narrative is required for each item.

Importantly, the narrative should include a description of the design of the data collection instrument and especially how it achieves each objective. The instrument must be attached to the report as an appendix and referenced at least once in the narrative. The other crucial aspect worth describing in this part

TABLE 1: RESEARCH DESIGN MATRIX

| 1: Research objectives (RoB) | 2: Data required & source | 3: Population & sampling | 4: Data collection design & admin. | 5: Data Analysis & tools | 6: Quality management | 7: Ethics management |
|------------------------------|---------------------------|--------------------------|------------------------------------|--------------------------|-----------------------|----------------------|
| RoB ₁ | | | | | | |
| RoB ₂ | | | | | | |
| | | | | | | |
| RoB _n | | | | | | |

Source: adapted from Choguill (2005)

(iv) Part 4: Results and Findings

As already alluded to, prior to the writing of results and findings, the task of data collection and analysis are performed off-thesis report. It suffices to note that these are key tasks for a successful thesis and if they are not performed effectively, the thesis will turn into a “garbage in garbage out” scenario. Furthermore, a conscientious effort is needed to present, interpret the results and communicate the findings. Presentation of a result may take the form of a narrative, table, figure (charts or photos) or a combination of both. Taking a simple example, for a research in the construction industry, data was collected on a field called “gender” and analyzed. After analysis, results were 70% and 30% of male and female, respectively. This is “narrative presentation” but we could also present the results in form of a table or pie chart (but of course referring to them in the narrative). The interpretation could be that “the industry is male dominated”. In this case, the result is the outcome of an analysis while the finding is the interpretation of the result by the researcher. The process of interpreting results must be done in an insightful manner because mere listing of results puts off examiners who seek a critical analysis and appraisal of findings, how they connect with previous studies encountered during literature review and how useful conclusions are drawn including their implication on theory and practice (Golding et al., 2014; Holbrook et al., 2004). Golding et al. (2014) cautions students to avoid a pitfall of exaggerating and misrepresenting findings that go beyond what the results support. Furthermore, there is a choice to make as to whether this part of the thesis is one chapter or is divided into two chapters namely “results” and “discussion of findings”. Whatever the division, the basic elements remain the same.

In terms of presenting results, the first section of this part should provide a profile of the sample of research subjects from which data was collected (e.g. projects, stakeholders, managers, project organisations, etc.). The description is part of the quality assurance regime meant to affirm that data was collected from relevant and credible sources and hence valid.

The second section deals with the presentation of results. The suggestion is to structure the presentation of results based on each objective. Within each objective, and where appropriate, the results of the associated hypothesis or specific research

of the thesis, is how data is analyzed. The analysis could take any form of, or a combination of, for example, content (thematic) analysis, descriptive, inferential or predictive analysis. The most important aspect is that the analysis must match the data being analyzed as well as being able to achieve the objective in question. It is also important to state the tool of analysis being used (e.g. SPSS, Excel software, etc.).

questions could also be discussed (see Figure 2). Whether the objective is divided into hypotheses or not, the resultant finding should be stated and discussed.

The third section is the “discussion of findings” which integrates all findings of each objective culminating in a conclusion that indicates achievement of the research aim (see Figure 2) as the ultimate outcome of the study. The discussion synthesizes results into an insightful finding to indicate how the knowledge gap has been filled. Equally important, the results contextualize the contemporary domain of theory and/or practice of the discipline (e.g. project management) by linking the study findings to those from previous studies. The last of part of the “discussion of findings” provides the implication of the delimitation and limitation of the study. Delimitation means the results are only true within the scope defined in the introductory part of the report. Furthermore, limitations also arise from the research strategy selected and how this cascaded to the research methods. In particular whether inferences can be made from the sample to the population (generalization) or not (Olesen et al 2013).

(v) Part 5: Conclusions and Recommendations

As last part of thesis, most of its content is drawn from the rest of the previous chapters, albeit in a summarized form. There should be at least three sections. First, the introduction which provides a brief journey of the research (Saunders, Lewis and Thornhill, 2016) by recapping the problem context, motivation of research and the approach used. The second section provides the overall finding aligned to the aim of the study. This is the briefly substantiated by the findings of each objective (see Figure 2). The third part provides two recommendations. The first (and where appropriate), how to bridge the gap(s) identified between theory/best practice and findings of each objective. This indicates the implication of the findings on theory, policy or practice. Second, recommendations must also indicate how the study could be improved or extended given its limitations and delimitation (Leedy & Ormrod 2015; Murray, 2006), respectively.

RESEARCH DESIGN

A three-phase approach was used to develop the TDG namely “author construction, professor validation and participant testing”. The first phase, “author construction”, was carried out by the authors through a synthesis of materials reviewed from literature, an analysis of 21 past examination reports for doctoral programmes in construction management and project management. The two sources facilitated identifying the critical components required for a typical thesis.

The second phase, “professor validation”, involved recruiting participants, who included ten professors (code named P1 to P10) and nine postgraduate students (code named S1 to S9) of which six were introduced by the professors. All participants were purposively selected based on their willingness to participate in the study and being involved in the construction management and project management doctoral programmes in their universities. This was to provide a consistent perspective of various research aspects. The professors had several years

of experience in supervising and examining thesis reports while the postgraduate students were in the final stage of their doctoral degrees as shown in Table 2. Given the experience of the professors in thesis supervision and examination processes and the students being at an advanced stage in their thesis, it was felt that both groups would provide valuable insights to the development of the TDG. To reach some form of consensus on the contents of TDG, a Delphi technique was used (Rowe & Wright, 1999; Skulmoski, Hartman & Krahn, 2007). The professors reviewed, modified and agreed on the draft contents, assessment and grading schemes that had been constructed in phase one by the authors. For each component of the TDG, a draft proposal was sent to the professors by e-mail and they would send back their responses. Depending on the item, two to four Delphi iterations were necessary to reach consensus. Additionally, virtual meetings were also held with professors to clarify some issues, for example, why they wished to add, delete or modify a component.

TABLE 2: PROFILE OF PARTICIPANT

| Participants | Domicile of Professors & Doctoral Students | Supervision experience (yrs.) | | Students supervised (No.) | | Thesis examined (No.) | |
|---------------------------|--|-------------------------------|----|---------------------------|----|-----------------------|----|
| Professors (P1-P10) | Europe =3; Africa=4; Australia=1; Canada=1 and USA=1 | <5 | 0 | <10 | 0 | <10 | 0 |
| | | 5-10 | 2 | 10-20 | 3 | 10-20 | 4 |
| | | >10 | 8 | >20 | 7 | >20 | 6 |
| | | Total | 10 | Total | 10 | Total | 10 |
| Doctoral students (S1-S9) | Europe =2; Africa=3; Australia=1; Canada=1 and USA=2 | Final stage of their thesis | | | | | |

The third phase, “participant testing”, involved downloading, six construction management and project management theses from the internet. Out of these, one report was randomly selected for assessment. To ensure anonymity of the report and hence potential bias, the information relating to the author, supervisor and university was removed and replaced with pseudo-names. The thesis report and the TDG were both e-mailed to the professors and students. During this stage students’ participation was considered useful to the study to understand how they comprehend the contents and the assessment schemes of the TDG. The “participant testing” phase also allowed further modifications.

THE ACTUAL TDG DEVELOPMENT PHASES

This section discusses the actual implementation of the two phases, “professor validation and participant testing” through which the TDG was actually constructed.

A. Professor Validation Phase

This phase required constructing four aspects of the TDG namely components, associated items, item assessment scheme and component weights, as discussed next

(i) Components and associated items

The first draft version of TDG was nine pages and consisted of four components “front matter, thesis body, back matter; communication and presentation style”. The professors considered the TDG too long as one professor (P5) noted “...students may lose focus while being engrossed in too much detail”. The professors then agreed to combine the “front matter, back matter, communication and presentation style” into one component referred to as “Documentation”. They

further agreed to leave the thesis body with the “five standard parts” identified earlier as one professor (P9) noted “... should users wish to break the parts into more chapters; supervisors will guide students as to how to adapt the TDG to suit their context...”. This resulted in the TDG being a six component tool shown in Table 3.

TABLE 3: TDG components, items, score and weights

| Component | No. of items | Maximum Score (MS) | Weight (W) |
|------------------------------------|--------------|--------------------|------------|
| 1. Documentation (A) | A1-A10 | 50 | 15% |
| 2. Introduction (B) | B1-B8 | 40 | 15% |
| 3. Literature(C) | C1-C4 | 25 | 15% |
| 4. Methodology(D) | D1-D7 | 35 | 20% |
| 5. Results & Findings (E) | E1-E5 | 30 | 20% |
| 6. Conclusion & Recommendation (F) | F1-F5 | 15 | 15% |
| Total | | | 100% |

The next task was to agree on the items that make up each of the six components. This required sometimes, up to six iterations and protracted discussions to come to a consensus, for example, some participants were concerned with some “repetitive” items, such, the assessment of the introduction and summary for each chapter. Often consensus was arrived at, for example, professor (P4) noted “...the two items are necessary for inclusion in the assessment to send a signal to students of the importance of an introduction and a summary of a chapter as a professional necessity for technical writing...” Finally the number of items agreed for each component is as shown in Table 3, column2.

(ii) Item assessment scheme

Twelve assessment rubrics identified from various sources (e.g. CSU, 2004; KU, 2012; WU, 2018; AUT, 2021; UB,

2018; PU, 2020) comprising of quantitative, qualitative or a combination of both were presented to professors to select an appropriate one. In the Delphi iterations and discussions, professors agreed that to guide students, the rubric should have both a quantitative and qualitative element. The reason put forward was best captured by one professor (P6) "...this combination provides two dimensions ...the score attempts to provide a quantitative assessment while the descriptive label provides feedback on the quality of an item being assessed in terms of existence, relevancy, novelty, logic, completeness, accuracy or correct interpretation ..."

Some of the quantitative rubrics presented had a minimum of score (S) of "1 or 0" and a maximum of score of "4, 5 or 10". Professors were then requested to agree on both thresholds. After a couple of Delphi iterations, they agreed on 5 as a maximum score as one professor (P3) noted "...it provides a good level of spread to measure the quality of an item ... a maximum of 4 may be too narrow while 10 may be too wide and hence may foster increased subjectivity". As for the

minimum score, they agreed on one (1) as one professor (P8) noted "...to facilitate calculate of the total score ...zero will distort the computations ...".

Furthermore, qualitative descriptors were given to the professors to decide and Table 4 provides some examples. The best guiding comments came from professor (P1) "... the descriptor should not be too long and tailored to specific items .it should also indicate the quality level and provide feedback if an item is missing, irrelevant, etc..." The descriptor set in the last row of Table 4 was selected. The choices made meant that the agreed assessment rubric ranged from 5: *Item exists & includes all key elements* to 1: *Item is missing or irrelevant*. However, it should be noted that items C2 (*theoretical framework*) and E3 (*presentation of results and findings*) were given weights of 2 each to signify their perceived importance by the professors (see Appendix 1) Therefore, based on this rubric the maximum scores (MS) for each component is shown in Table 3, column 2.

TABLE 4: EXAMPLES OF QUALITATIVE ASSESSMENT RUBRICS

| | | | | |
|--|--|---|---|--|
| ✓ Very Poor | Poor | Good | Very Good | Excellent |
| ✓ Does not meet expectations | Barely meets expectations | Meets expectations | Is above expectations | Supersedes expectations |
| ✓ Item is <u>missing</u> or irrelevant | Item exists, but <u>missing</u> key elements | Item exists & includes <u>some</u> of the expected key elements | Item exists & includes <u>most</u> of the expected elements | Item exists & includes <u>all</u> key elements |

Sources: CSU (2004); KU (2012); AUT (2018); UB (2018); Purdue (2020); WU (2018).

(iii) Component weight scheme

Professors were asked to decide whether components are of equal or unequal weight. The first Delphi iteration produced six suggestions, with some participants suggesting equal weights while others indicating that Results and Findings (E) should have a higher weight than all the other components as one professor (P4) noted "...because it is the gist of a thesis". Finally, it was agreed that Methodology (D) and Results and Findings (E), are critical to a thesis and hence should be weighted at 20% each, while the rest were weighted at 15% each. In case any of five parts of a thesis body is divided into more than one chapter (e.g. literature review), participants suggested that the weight should be divided among the created chapters. Therefore, Weights (W) were agreed as per Table 4.

(iv) Grading and Feedback Scheme

The final task of the professor validation phase was to agree on a grading scheme that provides an assessment of the overall level of quality of a thesis. Since no thesis is perfect, feedback by examiners is necessary to improve the quality of a report. This is premised on the fact that the role of examiners, is not only to make judgements about the quality of a thesis, but also to provide constructive feedback for improving a thesis (Golding et al., 2014; Johnston, 1997).

Professors were presented with examples of grading and feedback schemes some of which are shown in Table 5. Most universities use grading schemes which are quantitative, qualitative or a combination of both . For those that use a quantitative system, a pass mark is often needed, which varies among universities, for example, pass marks between 50% and

60% were noted in literature (e.g. KU, 2012). Agreement was reached to use a grading scheme in Table 5 (a), and (d).

It must be appreciated that, though the TDG is for thesis development by embedding it with an example of a grading and feedback scheme, provides a holistic picture to student to link thesis development and the examination process.

TABLE 5: GRADING AND FEEDBACK SCHEMES

| (a) Quantitative | (b) Symbol | (c) Label | (d) Feedback on level of correction |
|---------------------|---------------|--------------|--|
| Above 85% | A | Excellent | Very minor corrections to be certified by supervisor |
| 65-84.9% | B | Very Good | Minor corrections to be certified by one examiner |
| 55-64.9% | C | Pass | Major corrections to be certified by all examiners |
| 45-54.9% | D | Repeat | Failed but may repeat the topic and resubmit |
| Below 44.9% | E | Fail | Major failure and exclude from programme |

B. Participant Testing

After the construction of the TDG, it was put to test in the validation phase. This was carried out by both groups of participants (professors and students) who assessed a down loaded thesis report from the internet. Table 6 shows an extract of the assessment of "Item A4 (Abstract) from the Documentation (A) component" of the TDG. The maximum score is 5 and Student (S9) rated the item with a score (S) of 3. The student justified the score by noting "...while the elements exists ... it is too long" which could be good feedback.

TABLE 6: EXAMPLE OF AN ASSESSMENT OF AN ITEM BY STUDENT (S9)

| Item Expectation | Max. | Justification | Score |
|---|------|--|-------|
| A4: Abstract - context and importance of problem; aim of the research; research approach; key findings and their implications, and recommendations (length of about ±500 words) | 5 | Exists, has the required elements but is too long at 1001 words in lengths | 3 |

Table 7 shows that to arrive at the total weighted percentage (TWP) at the bottom of the table, all scores (S) of each component are added up then divided by the maximum score (MS) to get component ratio (Z), which is then multiplied by

the weight (W) to obtain the weighted percentage score (W*Z) for each component. Furthermore, all the weighted percentage score (W*Z) for each component (A to F) are added together to get the TWP.

TABLE 7: COMPUTATION OF TOTAL WEIGHT PERCENTAGE BY STUDENT (S9)

| Component | Actual score (S) | Maximum score (MS) | Ratio (Z) = (S/MS) | Weight (W) | Weighted Percentage (WP) =(W*Z) |
|---------------------------------|------------------|--------------------|--------------------|------------|---------------------------------|
| Documentation (A) | 31 | 50 | 0.62 | 15% | 9.3% |
| Introduction (B) | 22 | 40 | 0.55 | 15% | 8.3% |
| Literature(C) | 17 | 25 | 0.68 | 15% | 10.2% |
| Methodology(D) | 14 | 35 | 0.40 | 20% | 8.0% |
| Results & Findings (E) | 13 | 30 | 0.43 | 20% | 8.7% |
| Conclusion & Recommendation (F) | 9 | 15 | 0.60 | 15% | 9.0% |
| Total Weighted Percentage (TWP) | | | | | 53.5% |

After collating the TWP from all participants, the results were compiled and sorted in descending order as shown in Table 8. Though the intention was not to compare the grading among the two groups, it was not surprising that the students graded the report higher than the professors. Perhaps, due to the expertise and experience of the professors, the scores varied between the two groups as the average TWP was 51.0% and 59.0% for professors and students, respectively. What was also interesting was that in using TDG the spread of scores was reduced to a narrow range of within 10% (i.e. 6.1% and 9.7%, for professors and students, respectively). However, it was also noted that most universities use two or three examiners including conducting a viva where a student orally defends the thesis.

black box” and hence the reason for recommending a grading and feedback mechanism with both quantitative and qualitative elements.

TDG APPLICATION

Since the final development of TDG in 2019, it has been used by the authors in two of their respective universities as follows. First, in teaching research methodology class, where on completing the teaching of each of the six components, the doctoral students are given a past thesis report to assess the quality based on the TDG. For example, if the students complete the “Introduction”, they are then asked to submit an assessment report individually or in groups”. This exercise is meant to acclimatize them with the TDG contents and its application. Following the report assessment, two students who awarded the lowest and highest total weighted percentage (TWP) scores are requested to make a presentation of their assessment, justifying their TWP scores. After the presentation by the two students, the entire class would then discuss the merits of the two submissions. On many occasions, the two students provided a reasoned critique on the contents of the report as they justified the scores awarded. Furthermore, the plenary discussions of the entire class generated constructive debates centering on the students’ understanding regarding the quality of documentation, the appropriateness of the research process, presentation of results and findings and the application of theory and practice of construction or project management. The authors believe that the discussion increased the level comprehension of both the research inquiry as well as construction or project management but more importantly what is required to produce a quality thesis report.

Second, part of application is when doctoral students embark on their research journey, the authors have used the TDG as supervision tool. The TDG pinpoints the basic components and associated items required for each chapter including documentation and thus avoids issues like omissions.

TABLE 8: TWP OF ALL PARTICIPANTS

| # | Professors | | Students | |
|--------------|------------|-------|----------|-------|
| | # | TWP | # | TWP |
| P1 | | 53.7% | S1 | 63.2% |
| P2 | | 53.3% | S2 | 62.9% |
| P3 | | 53.1% | S3 | 62.3% |
| P4 | | 52.8% | S4 | 61.6% |
| P5 | | 52.2% | S5 | 60.2% |
| P6 | | 51.4% | S6 | 59.1% |
| P7 | | 49.5% | S7 | 54.5% |
| P8 | | 48.7% | S8 | 54.1% |
| P9 | | 48.2% | S9 | 53.5% |
| P10 | | 47.6% | | |
| Average TWP | | 51.0% | | 59.0% |
| Range of TWP | | 6.1% | | 9.7% |

In reference to the grading and feedback scheme, which was agreed on in Table 5 and using the average TWP of the professors of 51.0%, the thesis report would have a feedback as “failed but may repeat the topic and resubmit” (Table 5d) . Where this is not tied to a quantitative score, examiners would simply indicate the extent of the ‘corrections’ required for a thesis which one professor (P7) termed as an “examiners’

Third, students also reported using the tool as a checklist for each chapter before submitting to supervisors. Lastly, in some instances, students have reported forming 'peer-assessment' groups to review one another's chapter or reports thus conforming to the concept of community of learners as identified by Rogoff (2014).

CONCLUSION

Thesis development is a major challenge that students experience during their doctoral studies. This article has presented the TDG as a tool that has a potential to increase the quality of thesis in terms of content, presentation and communication style before submission for examination. It was motivated by a number of aspects chief among them was the examiners complains that include, for example, omissions of key thesis items; lack of a structured and logical flow of items which often creates repetitions or inconsistencies; poor presentation of results and formulation of conclusions and recommendations.

With the TDG, students have the option of using the tool to check their work with supervisors during or at the end of the entire report but prior to submission for examination to avoid "major correction or outright rejection". Supervisors have a role to play in increasing the uptake of TDG by introducing it in the research methodology course. In advocating the TDG, authors are aware that it is not a panacea of the challenges faced by postgraduate students neither does it offer all the fine details of a thesis, for example, it does not provide guidance on the various methods of data collection or analysis and presentation. Rather it is a complementing tool for the thesis development process on which a bigger picture may be built. Lastly, though TDG has been developed in a construction and project management programme environment, it has potential to be applied to similar doctoral programmes, especially those using a deductive approach.

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Appendix 1: Thesis Development Guide (TDG)

Rate the quality the items for each component of a thesis, A to F, based on the scale provided below:

1: Item is missing or irrelevant; 2: Item exists, but missing key elements; 3: Item exists & includes some of the expected key elements; 4: Item exists & includes most of the expected elements; 5: Item exists & includes all key elements

| Component A - Documentation | | | |
|---|------------|---|-------------|
| Expectation | Max | Justification | Actual |
| A1: Cover page -university prescription suffices but often includes research title; name of degree, department, university name & logo, student (& supervisor) name; date of submission. | 5 | Poor cover page design (cluttered); only year provided with no month | 4 |
| A2: Title- informative, clear, of appropriate length (about ±15 words) | 5 | Length is appropriate but title gives no research direction nor scope or domicile of investigation | 2 |
| A3: Acknowledgement, dedication (optional) and statement of originality | 5 | All exist | 5 |
| A4: Abstract - context and importance of problem; aim of the research; research approach; key findings and their implications, and recommendations (length of about ±500 words) | 5 | Exists, has the required elements but is too long at 1001 words in length | 3 |
| A5: Content page- list of chapters/sections and page numbers; list of figures/tables/appendices and their page numbers; and list of abbreviations | 5 | Exists and adequate | 5 |
| A6: Formatting- professional presentation encompassing appropriate and consistent font type and size, pagination, margins, line spacing; chapter starting on a new page; consistent, structured and hierarchical headings/sub-headings. | 5 | Appropriate except inconsistencies exist in spacing (e.g. page 32), fonts sizes, margins and use of indenting | 4 |
| A7: Illustrations- figures/ tables/equations are numbered, captioned, appropriately annotated and referred to in text; and sources acknowledged. | 5 | No illustrations used where it is critical to summarise a concept (e.g. section 2.2.2); where illustrations exist, references are often presented after (e.g. Table 1) or not at all (e.g. Table 2,3,4 etc. and Figure 1) and not even numbered and captioned | 2 |
| A8: Referencing - consistent use of recommended referencing style; no missing citations or references; are adequate, current, authoritative and relevant | 5 | No references given for factual statements (e.g. in section 2.2.2); poor reference for own work (e.g. 'researcher, 2015') | 2 |
| A9: Key appendices-attached to report, numbered, captioned and referenced in report narrative (e.g. data protocols) | 5 | Not numbered, captioned and referred to in the text | 2 |
| A10: Quality of communication - structured and logical flow of material between sentences, paragraphs, free of grammatical and typographic errors; | 5 | Poor structuring of sub-headings and numbering; So many grammatical errors; in many sections the report is still in the future tense (proposal) as opposed to past tense (report). | 2 |
| Total | 50 | | 31 |
| Weighted | 15% | | 9.3% |
| Component B- Introduction | | | |
| Expectation | Max | Justification | Actual |
| B1: Introduction- purpose of document and chapter and its structure provided | 5 | Chapter structure exists but no purpose of the document or chapter | 3 |
| B2: Problem context - importance of topic, key terms defined, motivation and knowledge gap. | 5 | Context of the problem not clear; My understanding is scope changes affect the project triangle and not the other way around; Study site is not described e.g. what are the projects about? Listing key operational terms does not make the document flow (embedding in the narrative would be better). | 2 |
| B3: Problem statement – succinct statement of the problem and aligned to the knowledge gap and context | 5 | The problem in not clearly defined and it seems constructs in the relationship have been reversed (see B2). This causes a serious flaw in the research | 2 |
| B4: Research aim- overarching statement of inquiry aligned to the knowledge gap and research title | 5 | Exists and aligned to the title | 5 |
| B5: Research objectives/hypothesis/questions- SMART (relevant) statements that a break- down the aim | 5 | Objectives (especially 2 & 3) seem not aligned to aim of research; research questions simply duplicate the research objectives – hence not value-adding | 2 |
| B6: Scope - Delimitation or boundaries of research and are commensurate with a doctoral level | 5 | Exists and adequate | 5 |
| B7: Significance of research- research significance i.e. contribution of outcomes to theory/practice with specific beneficiaries and aligned to the knowledge gap | 5 | Researcher has a justification for the study, but it is not well articulated in terms of how the findings will contribute to knowledge/practice and for whom | 2 |
| B8: Chapter summary - key issues in the chapter summarised; and a synopsis of the rest of the chapters provided. | 5 | No summary and synopsis of chapters provided | 1 |
| Total | 40 | | 22 |
| Weighted | 15% | | 8.3% |

| Component C: Review of Literature | | | |
|--|------------|--|--------------|
| Expectation | Max | Justification | Actual |
| C1: Introduction- purpose of chapter and its structure provided | 5 | Structure provided but not the purpose | 3 |
| C2: Theoretical framework (body) - development of a well-structured, logical and relevant theoretical framework that provides a critical analysis and synthesis of issues from quality sources that are current, authoritative, accurate, balanced and relevant to the research topic. | 5x2 =10 | Concepts are linked well especially how scope is related to the iron triangle (despite the wrong reversal of logic in the problem statement; also identifies scope management challenges | 6 |
| C3: Conceptual framework –identifies constructs, parameters or variables and how they are related to provide the necessary data to achieve stated objectives and aim | 5 | Is provided but poorly addresses the research aim and issues discussed | 3 |
| C4: Chapter summary - key issues are well summarized and a linkage to the next chapter provided | 5 | Exists and adequate | 5 |
| Total | 25 | | 17 |
| Weighted | 15% | | 10.2% |
| Component D: Methodology | | | |
| Expectation | Max | Justification | Actual |
| D1: Introduction- purpose and major contents of chapter stated | 5 | Structure provided but no purpose; no recap to contextualise the gist of inquiry. | 3 |
| D2: Research strategy - suitability of research strategy (qualitative or quantitative) to solve the research problem justified | 5 | No overarching strategy stated | 2 |
| D3: Population and sampling – type of data required and its source leading to identification of the study population including a justification of the sampling method | 5 | Type of data not stated; sampling method exists but not well articulated in terms subject selection | 2 |
| D4: Data collecting method- description of the design of research tools (attached as an appendix;) and how they achieve each objective including data collection procedures | 5 | No linkage of data collection to objectives; no justification of the methods; tool attached | 2 |
| D5: Data analysis- description of data analysis techniques and tools (e.g. SPSS, Excel or CAQDAS) for each objective | 5 | No linkage of analysis to data collected and hence objectives; a lot of the discussion is theoretical not indicating the practicality of what done; no tools mentioned | 3 |
| D6: Quality and ethical issues -discussion of management of key quality issue (i.e. credibility, reliability and validity) and how ethical issues are handled | 5 | Piloting was used for validity, no mention of ethical issues | 2 |
| D7: Chapter summary -key issues summarized and a linkage to the next chapter provided | 5 | Does not exist | 1 |
| Total | 35 | | 14 |
| Weighted | 20% | | 8.0% |
| Component E: Results and Discussion of Findings | | | |
| Expectation | Max | Justification | Actual |
| E1: Introduction- purpose and major contents of chapter provided | 5 | Structure provided but not the purpose of the chapter | 3 |
| E2: Profile of subjects- a description of the sample provided to confirm credibility and validity | 5 | Profile of study subjects (e.g. experience) not provided to confirm their ability to provide useful data | 3 |
| E3: Presentation of results and findings – results presented and interpreted and findings discussed but structured around objectives/hypothesis and where appropriate contrasted in the universe of previous studies; the overall findings addresses the research aim (question) | 5x2 =10 | Due to the mismatch in the objectives the results poorly relate to the inquiry | 5 |
| E4: Limitation- limitation arising from scope, research design and/or research operational issues how they affect the quality of results | 5 | Does not exist | 1 |
| E5: Chapter summary - key issues summarized and a linkage to the next chapter provided | 5 | Does not exist | 1 |
| Total | 30 | | 13 |
| Weighted | 20% | | 8.7% |
| Component F: Conclusion and Recommendations | | | |
| Expectation | Max | Justification | Actual |
| F1: Introduction- purpose of chapter stated; research journey recounted and structure of chapter provided | 5 | Research journey not provided and the context of the research; chapter structure provided | 2 |
| F2: Conclusion- Overall finding (aim) stated; substantiated by findings of each objective; and the implication on theory and practice discussed | 5 | Duplication of conclusion and no reference to research aim /objectives | 4 |
| F3: Recommendations – if the findings identify gaps in theory or practice, recommendations should state how to bridge the gaps and in addition how limitations could be overcome in future studies | 5 | Recommendations structured around beneficiaries/stakeholders instead of the gaps identified in the findings; no improvement to a future study mentioned | 3 |
| Total | 15 | | 9 |
| Weighted | 15% | | 9.0% |