

# Towards increasing supervision capacity: The pyramid cohort supervision model

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## ABSTRACT

Supervision capacity is under pressure since the increase in the number of postgraduate students has not been met with a corresponding increase in competent supervisors. To meet this demand, lecturers without any supervision experience have had to start supervising. Therefore the need is not only for increasing student supervision; staff members need experiential supervision training. This paper describes the design, implementation and first evaluation of the pyramid cohort supervision model (PCSM) for honours students. PCSM increases supervision capacity while supporting novice supervisors through research-based scaffolding interventions that integrate technology into the supervision process. Design Science research was used to develop the model and it was implemented with a group of honours students at the University of South Africa. The contribution is an innovative supervision model based on the principles of co-operative learning, conversational theory and scaffolding. This paper should be of interest to lecturers and researchers dealing with the challenge of providing quality supervision to large numbers of students while mentoring novice supervisors.

## Categories and Subject Descriptors

K.3.1 [Computers and Education]: Computer Uses in Education -Collaborative learning

## General Terms

Supervision model, postgraduate, scaffolding

## Keywords

Supervision model, cohort, scaffolding

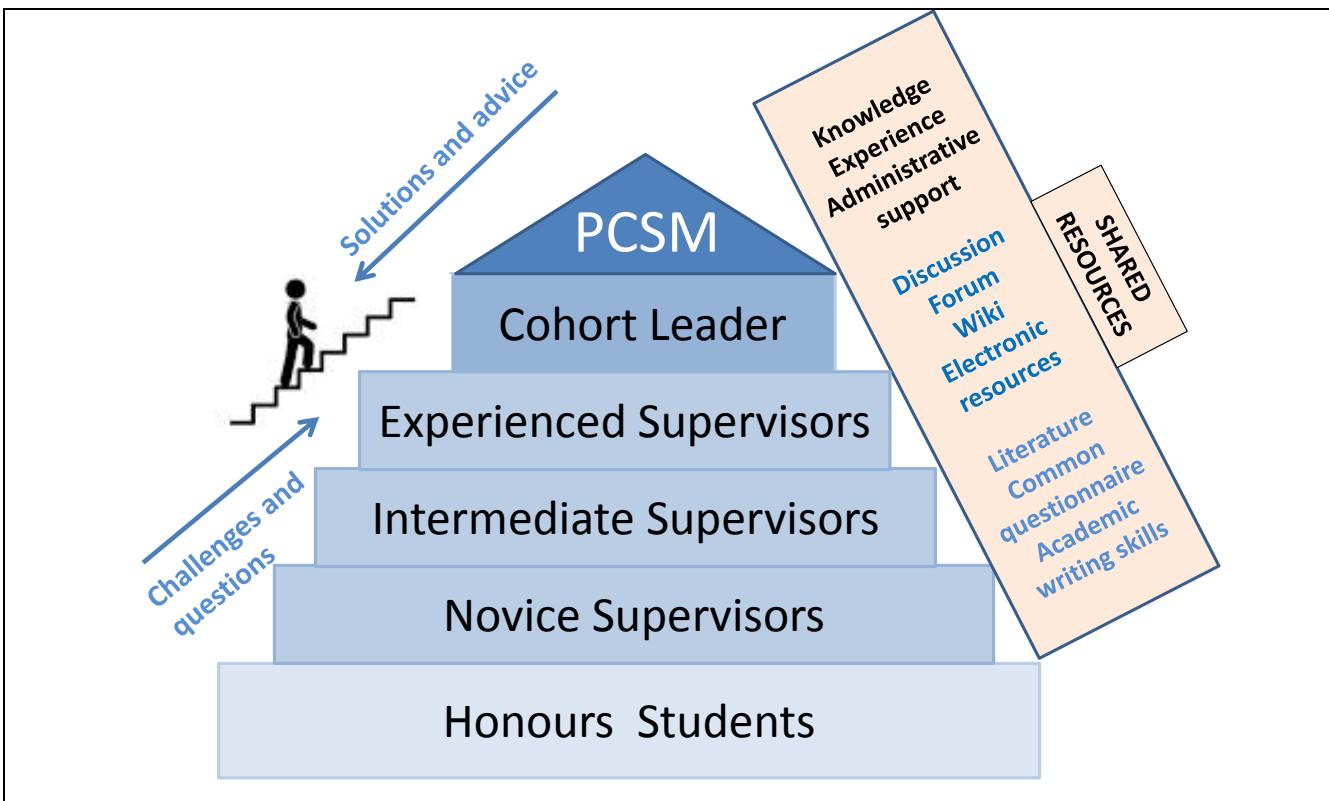
## 1. INTRODUCTION

The changes in the expectations of work and higher educational environments challenge traditional approaches to postgraduate supervision [24]. Universities are under pressure because of the growing number of students doing research and the increased emphasis on completion rates [2; 18]. This is even more

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applicable to the University of South Africa since open distance learning (ODL) is aimed at 'bridging the time, geographical, economic, social, educational and communication distance between student and institution, student and academics, student and courseware and student and peers' [20] page 2. In the context of minimal contact teaching, ODL focuses on removing barriers to accessing learning, flexible means of providing learning, student-centricity, student support, and constructing learning programs aimed at helping students to succeed. The 'open' concept has led to drastically increased student numbers without proportionally increased supervision capacity [5; 21]. The dual challenge of increasing supervision capacity for students and mentoring for supervisors is not unique to UNISA. The realities of the South African society lead to the admittance of student cohorts who vary in preparedness for post graduate study with those from disadvantaged areas and schools lacking training and experience in writing logically and correctly [16]. This places additional pressure on supervisors to provide the necessary interventions the students need to meet the exit standards of a postgraduate qualification. Addressing the lack of supervision capacity by increasing the number of supervisors is not a sufficient resolution. Novice supervisors need mentoring to gain supervision skills and the confidence to function independently [14]. Postgraduate supervision challenges relate to the student, the context, i.e. distance learning and the supervision model, i.e. solo supervision, co-supervision or cohort supervision. The supervision model has been identified as an important factor impacting postgraduate students' progress [2; 4]. The purpose of the paper is to report on an honours' supervision model designed to increase capacity while providing support to the students and mentoring for novice supervisors. We experientially developed and tested the pyramid cohort supervision model (PCSM) for supervising honours students in Computing. The collaboration principles and scaffolding is based on literature as explained in Section 2. The supervision capacity gains of the PCSM are depicted in Figure 1 which shows how knowledge and experience is leveraged. The Cohort leader is at the apex, followed by the group of experienced supervisors as the second layer, then the larger number of intermediate and novice supervisors, and the even larger number of student cohorts at the bottom of the pyramid. The scaffolding steps (discussed in Section 3) allow the challenges and questions to be passed upwards until resolved, while solutions and advice move downwards. The shared resources are depicted on the right of Figure 1. Methodologically, the development of the pyramid supervision model fitted the design-science paradigm, a paradigm which seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artefacts [8].



**Figure 1:** An overview of the Pyramid Cohort Supervision Model

## 2. LITERATURE REVIEW

Supervision arrangements differ in the nature and focus of the structured activities. This includes the choice of supervision model, i.e. solo, joint or cohort supervision [15]; the degree to which candidates have opportunities to collaborate and interact regarding their work, and differences in the nature of knowledge and knowledge generation in the disciplines [1].

The literature review provides a brief overview of cohort supervision (as basis for PCSM) in Section 2.1. In Section 2.2 we review some learning principles relevant to this study and in Section 2.3 we present a summary of the issues prioritized for inclusion in the PCSM.

### 2.1 Cohort supervision

In essence, cohort supervision refers to the practice where one or more lecturers supervise groups of students [6; 14]. Cohort supervision was originally developed as an alternative to the traditional Apprentice Master Model, in response to concerns about completion rates and the quality of research supervision [3]. This implies that cohort supervision is not a new phenomenon and that the main purpose was not to increase supervision capacity but rather to improve supervision quality.

Joint supervision is a means of ensuring adequate student support [15]. Van Heerden and Le Roux [22] attributed the following additional benefits to cohort supervision: peer-support, networking, shared resources, motivation and creating responsibility. Cohort supervision has known challenges to be considered such as students working at different paces, time inefficiency and additional organizational requirements [21]. Backhouse [1] found that individual (solo) supervision dominates in South Africa doctoral supervision practice. Four patterns of practice were identified: individualist, networked, loose cohort and the small team [1]. These classifications are

based on the different levels of support provided to the students and result in different levels of dependency. PCSM is designed to build on the strengths of cohort supervision while mitigating the challenges through providing opportunities for individual phases where students (and supervisors) can work at their own pace and develop scholarly independence. The next section will review the learning principles that underlie the PCSM.

### 2.2 Learning principles

The learning principles relevant to postgraduate cohort supervision are inherent to the theory of constructivist learning, namely constructivist learning as an active process which is social and creates meaning based on individual and shared experiences [17]. This is augmented by co-operative learning which assumes a positive interdependence between group members (students) while retaining individual accountability. Positive interdependence means the group process is structured in such a way that when one member of a group benefits, the other group member also benefits. If one member fails to do his or her part, the group suffers the consequences. As such each participant experiences an element of social pressure [10].

Learning is an active process; by nature social and most likely to occur when learners share ideas, inquire, and problem solve together; students must have opportunities to make sense of new knowledge and create meaning for themselves based on individual and shared experiences within a group formation [19]. Focusing on social interaction as the basis of student learning in Higher Education, Laurillard [9] developed a cybernetic model in which dialogue between supervisor (tutor) and student is central to learning. The so called *conversational model*, includes the following components: discussion at the level of ‘descriptions’, extrinsic feedback to clarify learners ideas; interaction to achieve goals, getting intrinsic feedback and adaptation of actions in the light of discussion. These components are fundamental to scaffolding since the term

*scaffolding* refers to learning support based on social constructivist models of learning [11]. Murtagh and Webster [13] propose scaffolding feedback as a mechanism to positively impact on students' ability to engage in self-regulated learning and academic achievement. Given the reality that many South African postgraduate students are not adequately prepared [16], scaffolding is an important mechanism in this context both for students and novice supervisors.

### 2.3 Guidelines

Considering the known challenges of cohort supervision (as mentioned in Section 2.1) and the learning theories that could help to address these challenges (as discussed in Section 2.2) the pyramid model proposed here incorporates active processes (through group assignments) and allows for individual meaning making (through individual assignments) from the individual's own and shared experiences as explained in Section 3.

The PCSM aligns the process of teaching, learning and assessment. The following three tenets are fundamental to the PCSM:

- (1) Co-operative learning principles: positive interdependence and individual accountability [10] fostered through social interaction on the Forum, Wiki and the use of social media in the groups.
- (2) Conversational model: This is based on (a) Description (theory) i.e. research methodologies and subject content, (b) Action (practice) i.e. group projects on literature review and questionnaire design, and (c) Internal interaction in the student (student reflection on feedback & description) i.e. using feedback to reflect on their efforts and then create the individual project.
- (3) Scaffolding: regular, detailed and informative feedback. With the PCSM students are scaffolded to move through their zone of proximal development [23]. Murtagh and Webster [13] mention three Stages of Scaffolding as depicted in Table 1.

**Table 1: Mapping scaffolding to the PCSM**

Scaffolding Stages [13]	Pyramid Cohort Model
<b>Stage 1:</b> Orientation: communication and expectation	Learning intentions were shared via Newsletters which provide the aims, objectives, project plan and due dates. Assessment criteria were shared with students to provide a clear understanding of the goals and how to achieve them.
<b>Stage 2:</b> Involving learners in self-evaluation and providing feedback.	Students were arranged in four groups (Learning sets). Murtagh and Webster provided each learning set (group) with a different focus. Our cohorts all worked on the same questions but could choose different teaching contexts, i.e. primary, school or work integrated learning. Similar to Murtagh and Webster [13] our groups worked on a focus area and then presented findings to the bigger group.
<b>Stage 3:</b> Being confident	Students were divided into smaller groups. This would allow individuals

that every student can improve and considering self-esteem	the opportunity to communicate and share ideas and take a more active part. In the PCSM students progressed towards individual projects where they could develop their own abilities and confidence.
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McLoughlin [11] describes a range of scaffolding practices that range from information access through to collaborative inquiry. The PCM provides eight of the nine different levels of scaffolding including *Orientation* and *communication of expectation* as set in the tutorial letter, *coaching* as done via the Wiki, *eliciting articulation* as promoted by the group assignment, *task support* in designing the questionnaire, *expert regulation* in the detail feedback on assignments, *conceptual scaffolding* in marking the group and initial assignments and providing detail and overview evaluation, *procedural scaffolding* in structuring the research design and timelines and *strategic scaffolding* providing clear, concise research questions that are designed to provide the necessary and sufficient data for addressing the main question.

## 3. RESEARCH DESIGN

### 3.1 Design science paradigm

The development of the pyramid cohort supervision model fits the design-science paradigm. Design science research (DSR) is an embodiment of three interwoven cycles of activities (namely the Relevance, Design and Rigor Cycles) [7]. It begins with a relevance cycle of literature review and context analysis to develop a conceptual framework for the research. The second cycle, design and development, is an iterative design, development and formative evaluation of an artefact or intervention. The third cycle is a rigor/theory building cycle that targets generation of design principles. The cyclic procedure, however, is not always linear, and overlapping as well as going backward and forward between the cycles is not uncommon. This article covers the first two DSR cycles. The literature was covered in Section 2 and the design is explained in Section 3.3. The results are presented in Section 4 towards an initial evaluation of the usefulness of the PCSM.

### 3.2 Context

The PCSM was developed for a project module in the Honours program within the School of Computing at the University of South Africa. The pre-requisite was a research methods module which provided an introduction to research methodology in Information Systems and Computer Science. This project was one of 12 honours projects available, we had four lecturers and accepted 13 students. Each supervisor (group leader) was supposed to have 3 students. The Cohort supervisor (Cohort leader) is not supposed to supervise any students directly but did so for this first iteration of the study to accommodate more of the students interested in enrolling for the project.

### 3.3 PCSM components

Based on the principles of co-operative learning (COL), scaffolding and social interaction (SI) as mentioned in Section 2 the PCSM processes are now explained and related back to the principles as depicted in Table 2. Note that COL, Scaffolding and SI principles apply to the students as well as the supervisors since the supervisors also interact with each other in discussing evaluations and feedback. During Stage 1 students and supervisors are organized and oriented based on newsletters and interventions by the Cohort leader (Action 1). The students then

do the group projects and receive feedback (Action 2). Action 3 requires students to collaborate on designing a questionnaire

based on literature and the resources provided on the Wiki.

**Table 2: Pyramid Cohort Supervision model**

STAGE 1	ACTIONS
1. Orientation Set learning objectives, organisation and resource sharing on Wiki. (COL & SI)	Students are organised in groups. A lecturer is assigned to each group as the group supervisor. The group members are connected online, resources are provided on a Wiki. The students can be geographically dispersed and the use of social media is encouraged to foster communication. Students do and submit their literature review as a group project.
2. Feedback on group project	Group supervisors assess their group's assignment and discuss the findings. Based on that discussion the cohort supervisor prepares a meta-review to be sent to students together with the individual review from their group supervisor.
STAGE 2	ACTIONS
3. Research Design supported (COL & SI)	Group project: Students design and submit the questionnaire using the feedback provided and resources placed on the Wiki.
4. Common questionnaire provided (COL & SI)	Cohort supervisor and group supervisors interact to compile a common questionnaire (CQ) of fixed response questions to be sent to all students.
STAGE 3	ACTIONS
5. Interviews conducted individually	Students to do interviews using the CQ and a set of open-ended questions.
6. Common dataset provided	Group supervisors collate responses to produce the common dataset.
7. Draft Report submitted	Individual student reports.
8. Final feedback: individual and meta-review	Group supervisors mark the first report and provide feedback. Evaluation discussion between Group and Cohort supervisors, individual feedback and meta-review.
9. Final Report and evaluation	Final report updated according to the specific feedback and meta-review. Submission of student-evaluation and supervisor-evaluation questionnaires.

The rationale was that students should have the opportunity to engage with the literature to formulate questions and also with questionnaire design guidelines. On the other hand, designing a questionnaire requires knowledge and experience beyond what can realistically be expected from honours students under the time constraints. Therefore it was decided to provide students with a model questionnaire, referred to as the common questionnaire (CQ). The Cohort supervisor and group supervisors interacted to compare, evaluate and select the most appropriate response items, those were structured and formatted to compile the CQ of fixed response items (Action 4). Once student received the CQ the individual part of the process started. Students had to decide on a teaching context, i.e. school, university or other educational or training context, i.e. corporate training where they would do the interviews on mobile technology usage. They executed the interviews using the CQ as well as their own open-ended questionnaire formulated for the specific context (Action 5). The informed consent forms for ethical clearance were provided as part of the Common Questionnaire.

Students were supposed to do a minimum of five interviews using the CQ and a set of open-ended questions which they compiled individually. They were required to submit their responses to the open-ended questionnaire (withholding responses to their open ended questions) by a given date. We

planned for 65 (5x13) responses but there were 70 responses due to the fact that some students captured more than the required minimum number of responses. The responses were collated and checked for format validity. Rows with too many missing responses or irregular responses were removed to improve the quality of the data set. The cleaned, common data set was sent to all students (Action 6) to analyze and write their reports. This first report (Action 7) was based on the data from the common dataset and their individual open-ended questions. The group supervisors marked the individual reports and provided marks and feedback. The Cohort supervisor evaluated four of the reports and then drafted a meta-review of common issues that needed attention and also clarified objectives and guidelines where it seemed that students were unsure, i.e. the number of references required and the inclusion of the questionnaires (Action 8).

The capacity advantage of the PCSM is that the number of cohorts may be increased with a lessened impact on the Cohort Supervisor. As noted, the Cohort supervisor acted as a group supervisor as well. This was considered useful for monitoring the group supervisors experience in this initial study but it is counterproductive in economizing supervision capacity since the Cohort leader has a strategic and leadership role and should be focused on the planning and evaluation.

## 4. RESULTS AND FINDINGS

### 4.1 Group Leaders (supervisors)

The group leaders included two novice supervisors, one who had never supervised before and the other had limited supervision experience. The third supervisor had supervised honours and masters students to completion before. The Group Leaders were approached to give their thoughts on the PCSM supervision in terms of the effectiveness and efficiency of the model, the support provided to novice supervisors and the contribution to their personal development as a supervisor. The three respondents were generally positive about the model's effectiveness and efficiency as can be observed from the following comments:

- “Every action of mine as a novice supervisor was edited which helped me learn and grow.”, and “It was a time efficient approach that allowed one to make use of the collective knowledge and wisdom in the group.”
- “It was efficient because the load was shared amongst the supervisors.”
- “Tasks were broken up into smaller manageable tasks.”
- “Every time students submitted their work, the team of supervisors convened for a meeting to discuss on how to standardize the evaluation of the students.”

Regarding personal development the following comments were captured:

- “One learns how to work in teams.”
- “I felt protected being in a group.”
- “The supervision model was structured and SMART (specific, measurable, attainable, realistic and time bound).”

More general comments included the following:

“Teaching implies the transfer of knowledge and it is therefore logical that the availability of a larger shared pool of knowledge

will result in an improved teaching experience.”, and “It was very effective in that each stage of research was approached and finished separately. The next stage could only begin when the preceding stage has been completed.”

### 4.2 Students

#### 4.2.1 Demographics

Of the ten student respondents, one was between the ages of 20 to 25 years, two was between the ages of 25 to 30 years and seven were 30+ years. There was an equal distribution of male and female respondents. Of the ten respondents, one's home language was Afrikaans, four English, one Northern Sotho, one Tswana and the others were Oshikwanyama (Namibian), French, Tigrigna and Amharic, Xhosa and Tshivenda.

#### 4.2.2 Results

Students generally received high marks for the group projects while the individual marks showed more variation (see Table 3). Assignment 1 (Ass1) mark included four tasks: the literature review, the initial questionnaire, the data capturing and the initial report which contributed equally. Ass2 was the supervisors' mark for the final report. The final mark was made up of two components, the Ass1 mark which contributed 30% and the [Ass2 mark+External's mark]/2 which contributed 70%. The external examiner provided in-depth comments and complained about the student's use of referencing as being poor, incomplete and inconsistent. He stated that there were lengthy pieces of text that were left unreferenced and recommended workshops for students to correct this behavior. He lamented about the students' writing skills, arguing that it was poor, with grammatical and syntactical errors. He suggested the use of accredited language practitioners to ‘clean up the text’. His final comments on the group projects were the following: “The group research project generated mixed success. Some of the students embedded it seamlessly into their texts while others lost the plot in a big way.” The projects were all put through Turnitin and a high similarity with the group project was found (some as high as 40%). When that was removed the projects were all within acceptable limits.

**Table 3: Students marks for the module**

<b>Group</b>	<b>Task1</b>	<b>Tas2</b>	<b>Task3</b>	<b>Task4</b>	<b>Ass1</b>	<b>Ass2</b>	<b>External</b>	<b>Final</b>
1	80	90	100	63	79.2	60	56	64.36
1	80	90	100	54	75.6	70	69	71.33
1	80	90	100	58	77.2	75	75	75.66
1	60	90	100	62	74.8	50	37	52.89
2	90	86	100	76	85.6	83	86	84.83
2	90	86	100	55	77.2	68	43	62.01
2	90	86	100	48	74.4	52	62	62.22
3	70	90	100	54	73.6	70	56	66.18
3	70	90	100	56	74.4	59	56	62.57
3	70	90	100	46	70.4	50	45	54.37
4	80	90	100	83	87.2	69	41	64.66
4	80	90	100	86	88.4	74	38	65.72
4	80	90	100	24	63.6	77	59	66.68
<b>AVG</b>	<b>78.5</b>	<b>89.1</b>	<b>100.0</b>	<b>58.8</b>	<b>77.0</b>	<b>65.9</b>	<b>55.6</b>	<b>65.7</b>

#### 4.2.3 Student survey

Students were requested to evaluate the course and the following feedback was obtained from the ten responses received. Respondents were asked whether they found the Literature Study (Task 1) structured as a group effort useful. 30% found it very useful while 70% said it was useful. Respondents were then asked to motivate their answer. The following insights were extracted from the student's comments on their experience of the model.

It allowed them to cover the subject as team members and also to research a particular area in more detail. They enjoyed the collaboration, it presented opportunities to interact with other students and have meaningful discussion around what needs to be done. They found it an ideal way of sharing ideas while one student mentioned that the group was able to gather more information of better quality within a less time.

Another respondent said that it was a challenge working in a virtual group. Communication was not as good and inputs differed. However he felt that it improved his communication skills and he was able to see things differently. Another respondent said that there were different approaches to the topic, different understandings but discussing various ideas helped him to understand the topic even better.

Respondents were asked whether they found the Questionnaire (Task 2) done as a group effort useful or would they have preferred to design the questionnaire individually. 30% of the respondents said that it was definitely useful, 50% said yes it was useful and one respondent said it was not useful. Various motivations were given but the following central issues emerged:

Students found it useful to try and make a case why certain questions should be included and others not. Another added that the open-ended questions were great as the members got to refine the questionnaire individually. Another stated that working in a group on designing the questionnaire enriched the content of the questionnaire and added value; another said that it encouraged innovation.

Respondents were asked whether they found the standard questionnaire (common questionnaire) provision useful. 70% of respondents thought it was very useful while 20% responded with 'useful'. One respondent didn't have an opinion on the matter.

The following comments were captured in relation to the usefulness of the questionnaire:

"The common questionnaire helped get a broader perspective on the data, it improved the quality of results, there was standardization, it made it easier to collect a lot of data within limited time from around the country, it helped to analyze the same data set with different methods and interpretations, it gave a balanced structure that encompassed most of the areas needed for research to have meaning."

One respondent stated that some questions were fine but that some confused her during analysis. She complained that they were not given a chance to comment on the final questionnaire, saying that they should have been given an opportunity to raise any concerns about the common questionnaire.

Respondents were asked whether they found it challenging to provide open-ended questions. 20% of respondents found it definitely challenging, 10% found it slightly challenging, 30% answered neither and 40% said it was Easy.

Comments on the open-ended questions included the following:

- The open ended questions were instrumental in bringing the unknown to the researcher.
- The open-ended questions provided more insight.
- Narrowing the open ended question to five was challenging and one respondent battled to distinguish what was addressed in the questionnaires so as not to duplicate other areas.
- It was challenging in that respondents needed to elaborate and not just agree or disagree. “

Respondents were then asked whether they needed more support in the different phases of Research. They were also requested to write down at least one suggestion on the kind of support that was needed.

For the Literature Analysis Phase, 30% of the respondents said yes they definitely needed more support, 30% said possibly and 40% said they probably did not need more support. Respondents had the following suggestions on the kind of support that was needed or provided.

One respondent stated that his group leader was very helpful at all times and responded to e-mails quickly. Another suggested that clarity should be given to students as to whether they can analyse the information from other sources or just take important information from those sources. One respondent suggested that as part of the pre-requisite module, *Literature analysis* should be emphasized and highlighted as key to any research that is to be done. He had a challenge in not understanding why the literature analysis mattered and how it feeds into any research process. Another suggested that a guideline should be provided on what is expected in literature analysis.

One respondent stated that the most challenging part was to read an article and identify its relevance to the topic, stating: "Sometimes I find a paper related to the topic but only realise that the information is relevant after reading half way through the article". Another respondent stated that he struggled with how much of literature he had to go through and how to incorporate it into his research, without just copying and pasting, but for it to have meaning and blend. He would have loved support in this. Regarding the questionnaire design phase, 20% said that they possibly would need more support, 20% were unsure, 40% said that they probably not need more support and 20% said definitely no more support required. Respondents had the following mixed responses on the support that was needed for this phase. "I've never been exposed to analysis and needed more support there." Another said: "Some questions had too many options that made analysis difficult". One respondent thought the task was fairly easy to complete and no support was required, another said designing the questionnaire in a 5 point Likert scale had made it easier.

Regarding the *Quantitative phase* (Statistical analysis), 50% said that they definitely needed more support, 40% said possibly, and 10% required no more support. Respondents experienced difficulty as one articulated: "The group had difficulty with this". But also: "Although the lecturers were quite helpful via e-mail once we asked then questions about how to calculate the data." "Adequate information and tools were provided for this purpose and I found them useful and adequate."

There were more comments related to the statistical analysis:

- “I think extra examples in line with our research would have helped since most students do not have a statistical background and didn’t know anything about fancy calculations and statistical data.”
- “Most students can perform basic statistical analysis but there should be a form of scaffolding provided for complex statistical analysis”.
- “Statistical analysis needs to be provided, either the university provides a statistician for student to compile all the data and the analysis is done for them as some of us are not majoring in stats, hence we would use very basic statistics in analyzing the data.”

Regarding the qualitative (Open-ended questions) analysis phase. 40% said that they definitely needed more support, 10% said probably, 20% were unsure, 20% said probably not and only 10% said definitely no more support. Respondents had the following suggestions on the kind of support that was needed or provided for this phase: “This was relatively easier than the Quantitative analysis, I was able to easily draw conclusions from my open-ended questions results” and “Simple interview type questions” and “I understood my respondent answers.” But also: “The challenge with this is that it is highly dependent on me and what my objectives are, that will determine my open ended questions, I do not see how anyone could assist me with the vision of my research. So I don’t see how additional support could assist in this area.”

Respondents suggested that students should be provided with a general method to perform the analysis, that a brief guideline should be provided and that there should have been supervision to review the open-ended question and comments before they used it.

The positive comments made from respondents were that they found it workable, another respondent said, “The final report content guideline page was very useful. I had confusion to differentiate between a research proposal and the final report. I wish it can be detailed in the assignment guideline document”. Another stated: “Writing an academic report is different from writing just any other report at times I was not sure if I was off tangent, or if I had too little data and information, but perhaps this could be achieved through continuous efforts on my part as I believe it is a skill that can be acquired over time and not just over one or two reports, however I do believe that I got a solid foundation in this course.”

#### 4.2.4 Summary of results

Considering the supervisors positive responses (see 4.1), the PCSM succeeded in making supervision more effective and efficient and also providing support towards personal growth. A possible limitation is that no negative responses were recorded. Therefore, investigating the power relations within the supervision structure is an important issue for further research.

Considering the project students, the comments show that students needed more guidance in statistical analysis and report writing than anticipated. Furthermore, there were no guidelines on how much of the group project students could reuse and overuse could raise plagiarism issues. This was an oversight to be addressed in the next round.

The correct marking standard is another matter to be debated. Strict marking at the beginning of a group project may have negative consequences since students may become demotivated and give up very early. Marking with leniency was seen as motivating, it encouraged growth and the desire to perform

better, to make other group members proud and built self-confidence. This could be seen in the quality improvement from their first effort to their last submission. PCSM provides structure to ensure timely and detailed feedback to both students and supervisors that focuses on ‘learning’ rather than praise (in line with the scaffolding objectives set by Murtagh and Webster [13]). More detailed guidelines could be useful as doing a research project requires some tacit knowledge that supervisors are not always aware of and therefore do not articulate. This is a work in progress but the initial results confirm that the PCSM increases supervision capacity while providing mentoring to students.

## 5. CONCLUSION

The supervision model proposed manages trade-offs between optimal supervision support and capacity limitations using a pyramid structure where the challenges are passed up from the students via student groups, novice supervisors etc. until the applicable solution was found so that the knowledge and experience of fewer people at the top moved down to reach everyone on the lower levels. The further advantage is that students and novice supervisors do have the opportunity to respond and share their knowledge also using different ICT technologies so that the Cohort leader does not deal with all the questions. To mediate the problems associated with cohort supervision the process was highly structured from an organizational perspective but allowed for different modes of working. Those supervision modes included *individualist*, *networked* and *small team*. This applied to the students as well as the supervisors.

*Joint supervision* of postgraduate students is a well-known and documented practice, i.e. the work of Murray and Eley [12]. *Collaborative research groups* have also been investigated and documented over a long time, i.e. the study of Pole [15]. Whisker and Robinson [25] studied the student-supervisor relationship and highlighted the need for institutional and community support and the development of effective strategies that could lead to ownership, empowerment and emotional resilience. PCSM is a hierarchical model which combines the concept of collaborative research groups with cohort supervision and scaffolding.

The hierarchical supervision model is not new, neither is the collaborative research, cohort supervision or scaffolding concepts mentioned but the integration and application in honours supervision is novel. Besides the much needed attention to honours students’s research needs this paper’s contribution lies in aligning the process of student supervision with supervisor mentoring.

The theoretical contribution is a cohort supervision model based on accepted learning principles. The practical contribution is the provision of a model for organizing supervision to improve capacity while providing support to students and hands-on mentoring to novice supervisors. Based on the supervisors feedback and the fact that all four of the initial supervisors are continuing with the project (and one new supervisor is joining) the PCSM is deemed useful. Given the PQM level 8 (honours students) a simple research design was chosen but with some adjustment to the research design this model could be used for masters and doctoral students. The fact that all students are investigating the same research problem may be limiting but the use of different application contexts and the addition of open-ended questions mitigate this limitation. Honours projects typically have a time-span of a

year, therefore the differences in students' pace is less divergent when organizing the cohort and therefore that would have to be tested on masters and doctoral levels. More research is needed to test the PCSM model for scalability.

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