Exploring Computer Science PhD students' opinions and attitudes toward academic supervision in a private Higher Educational Institution in Kazakhstan

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in

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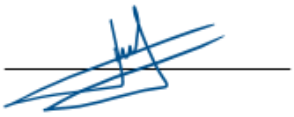

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October 2019

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This letter now confirms that your research project entitled: "**Exploring Computer Science PhD students' opinions and attitudes toward academic supervision in a private Higher Educational Institution in Kazakhstan**" has been approved by the Graduate School of Education Ethics Committee of Nazarbayev University.

OR

The changes recommended by the reviewer have been addressed and the proposed study now complies with all of the requirements of Nazarbayev University.

You may proceed with contacting your preferred research site and commencing your participant recruitment strategy.

Yours sincerely

Ali Ait Si Mhamed

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Abstract

Development of Higher Education Institution (HEI) system plays one of the main roles in diversifying a country's economy and directly impacts the national innovation system (OECD, 2017). The highest university degree is considered Doctor of Philosophy (PhD) which is achieved by candidates with the help of academic supervision, that plays a significant role in timely completion of the study (Bair, 2004; Lee 2008, Anna, 2016). In Kazakhstan, 66% of all PhD student's dropout the study (OECD, 2017), many reasons contribute to that. Required seven scientific publications with one that have to be published in international journal with impact factor above zero.

The research explores 50 PhD students' and 22 supervisors' attitudes toward academic supervision in Computer Sciences specialty at a private Almaty university, investigate their opinions regarding attributes of effective supervision, compare and find how attitudes and opinions differ based on the following variables: participants type, students' and supervisors' age, gender and supervisors' academic degree. A quantitative research design with descriptive frequency analysis is used to explore attitudes toward supervision and investigate elements of effective supervision. Cross tabulation, and One-Way ANOVA analyses were used to find significant differences between the above variables with attitudes toward supervision and attributes of effective supervision.

The findings of the study show that both category participants' attitude toward supervision and students' opinion on effective supervision attributes mostly related to supervisors' knowledge and skills in publishing in local and international journals. Additionally, students preferred to have supervisors who have common research interests with them. It was found that for supervisors, elements of good supervision are critical thinking,

facilitating students work independently, and presence of common interest with supervisee. The study mentions 16 significant differences between variables listed above and attributes toward supervision and elements of good supervision.

Keywords: PhD supervision, PhD students' attitudes, Academic supervisors' attitudes

Изучение мнения и отношения докторантов и научных руководителей по специальности компьютерные науки к академическому руководству в частном ВУЗе Казахстана

Абстракт

Развитие системы высшего учебного заведения (ВУЗа) играет одну из главных ролей в диверсификации экономики страны и напрямую влияет на национальную инновационную систему. Высшей университетской степенью считается доктор философских наук (PhD), которая достигается кандидатами с помощью академического руководства, что играет важную роль в своевременном завершении обучения. В Казахстане 66% всех докторантов бросают учебу, этому способствует множество причин. Например, требование касательно публикаций семи научных статьей, одна из которых должна быть опубликована в международном журнале с Импакт-фактором выше нуля.

Данное исследование изучает отношение докторантов и научних руководителей к научному руководству а так же мнение обеих сторон относительно атрибутов эффективного руководства, сравнивает и показывает различия в отношений и мнениях об эффективном научном руководстве на основе следующих переменных: тип участников, возраст студентов, пол и научная степень руководителя. В исследовании приняли участие 50 докторантов и 22 научных руководителей с частного алматинского ВУЗа. В исследовании применяется количественный метод с использованием "Descriptive frequency analysis" для того, чтобы показать отношение к научному руководству и мнение о хорошем научном руководстве. Кросс-табулирование и односторонний анализ ANOVA были использованы для выявления существенных

различий между вышеуказанными переменными с отношением к научному руководству и атрибутами эффективного научного руководства.

Результаты исследования показывают, что отношение к научному руководству у оба типа участников, и мнение об элементах эффективного руководства в основном связаны со знаниями и навыками руководителей касательно публикаций в местных и международных научных журналах. Кроме того, студенты предпочли иметь руководителей, которые имеют общие исследовательские интересы с ними. Выяснилось, что для руководителей элементы хорошего надзора — это развитие в докторантах критическое мышление, содействие самостоятельной работе PhD студентов и наличие общего интереса с руководителем. В исследовании выявлено 16 существенных различий между вышеперечисленными переменными, отношением к научному руководству, и элементами хорошего руководства.

Ключевые слова: научное руководство докторантов/PhD, отношение докторантов/PhD, отношение научных руководителей

Қазақстандағы жеке ЖОО-дағы компьютер ғылымдары мамандықтын докторанттардын және ғылыми жетекшілердін ғылыми жетекшілікке көзқарастарын зерттеу

Аңдатпа

Жоғары оқу орындарының (ЖОО) жүйесін дамыту ел экономикасын диверсификацияға апаратын басты қадамнын бірі болып табылады және ұлттық инновациялық жүйеге тікелей әсер етеді. Университеттің ең жоғарғы дәрежесі - философия ғылымдарының докторы (PhD) деп саналады, оны академиялық бақылау көмегімен докторанттар оқудың уақтылы аяқталуында маңызды рөл атқарады. Қазақстанда барлық докторанттардың оқуын тастап кетудің 66% құрайды, оған көптеген себептер бар. Әр докторант үш жыл ішінде жеті ғылыми басылым жариялау қажет, онын біреуі импакт-фактор нөлден жоғары халықаралық журналда болуы мәжбүр болып табылады.

Бұл зерттеуде докторанттар мен ғылыми жетекшілердің ғылыми көшбасшылыққа қатынасы және тиімді көшбасшылықтың атрибуттары туралы екі жақтың пікірлері зерттеліп, келесі айнымалылар негізінде тиімді ғылыми көшбасшылық туралы көзқарастар мен пікірлердің айырмашылықтары салыстырылады және көрсетілген: қатысушылардың түрі, студенттердің жасы, жетекшінің жынысы және академиялық дәрежесі . Зерттеуге Алматыдағы жеке университеттің 50 докторы мен 22 ғылыми кеңесшісі қатысты. Зерттеу жұмыста сандық әдіс қолданылуда. Кросс-табуляция және бір жол ANOVA қолданылып қатысушылардын арасында айтарлықтай айырмашылық белгілеу үшін қолданылады.

Зерттеу нәтижелері көрсеткендей, қатысушылардың екі түрі де ғылыми көшбасшылыққа қатысты және тиімді көшбасшылық элементтері туралы пікір негізінен

жергілікті және халықаралық ғылыми журналдардағы жарияланымдар туралы ғылыми жетекшілердің білімі мен дағдыларына байланысты. Сонымен қатар докторанттар өздерінің ғылыми қызығушылықтары бар жетекшілерді қалайды. Жетекшілер үшін жақсы бақылаудың элементтері докторанттардағы критикалық ойлауды дамыту, докторанттардың өзіндік жұмыстарын алға жылжыту және жетекшімен ортақ мүдде болуы болып табылады. Зерттеу жоғарыда көрсетілген айнымалылардың, ғылыми көшбасшылыққа деген көзқарастың және жақсы көшбасшылықтың арасындағы 16 маңызды айырмашылықты анықтады.

Түйін сөздер: докторанттар/PhD ғылыми жетекшілік, докторанттар/PhD қатынасы, ғылыми жетекшілердің қатынасы

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Chapter 1: Introduction

Kazakhstan is one of the developing countries with very rich natural resources (Richard, 2005) which seeks to become a part of club 30 developed countries by 2050, as it is the main goal in the country's strategic plan "Kazakhstan-2050" (Nazarbayev, 2012). The country has a dependency on natural resources and the recent period of market instability emphasized this issue and highlighted the necessity for economic diversification. The development of Higher Education Institution (HEI) system plays one of the main roles in diversifying the country's economy and directly impacts to the national innovation system (OECD, 2017).

PhD students have a high priority in HEI development. They start to do research and attract science Bachelor and Master students, and after graduation one part of them will become scientists and the other another faculty teaching staff. Most recent reasons that Master degree holders continue their education in PhD are career promotion, continuous development, and social status.

Kazakhstan is a post-Soviet country that exited from the USSR in 1991 (Klein, 2016) that had previously used the Soviet education system for HEIs until 2010, before joining the Bologna process. At that time Kazakhstan had preemption from Soviet education system and training for researchers was organized by two phases, Candidate of Science and Doctor of Science. In 2010, Kazakhstan joined the European Bologna Process and starting from 2011, changed the training for scientists to PhD (OECD, 2017). The Bologna Process consists of three cycles, Bachelor, Master, and Doctoral (PhD). Originally the Bologna Process had only two cycles, Bachelor and Master, and in 2003 Berlin Communiqué made the connection

between European Higher Education Area (EHEA) and European Research Area (ERA) (Anna, 2016; EHEA, 2016). The main objectives in the Bologna Process that were announced were adoption of academic degrees, credit system, students' and university staff mobility, quality assurance, and co-operation between institutions in training and research. As a part of the Bologna Process Kazakhstani HEIs have the ability to be well integrated with EHEA universities and conduct international research and exchange PhD students' and supervisors.

PhD student's enrollment in Kazakhstan is now based on a competitive basis. Candidates for PhD should be holders of a Master's degree with experience of work not less than one year. The process of enrollment consists of two parts, documents submission, and passing the profile exam at the university (Egov, 2020). Main documents that are required; Master diploma, Language certificate, and proposal. Starting from 2019, candidates should submit with their documents an international language certificate, like IELTS and TOEFL; a language exam that was provided by the Ministry of Education and Sciences (MoES) is now canceled (Kapital, 2019). Candidates can enroll by state grant or self-paid agreements. When a student becomes a PhD holder, he/she has to make an obligation to work for three years in Kazakhstan territory. Distribution of students is performed by the institution (Government of the Republic of Kazakhstan, 2018).

Doctoral study in Kazakhstan is aimed to train personnel for science, pedagogy, and professional development. After successful completion of 180 academic credits and an internship, publishing seven scientific papers, defending the dissertation/thesis, a participant is presented with a Doctor of Philosophy – PhD degree. Academic credits are divided into three categories; educational component (30% - 53 credits), scientific component (64% - 115 credits), and attestation (6% - 12 credits). Education component consists of subjects/courses

that a student takes in the university. In the scientific component, there is research work, writing and defending the dissertation, and the attestation portion consists of writing and defending the doctoral dissertation. PhD students have to complete pedagogical and scientific internships/practices. During the pedagogical practice it is possible to organize teaching classes for Bachelor and Masters students. Usually it lasts fifteen weeks/one semester and covers three credits. After completion of the practice students have to submit a report and defend it. Scientific internship is conducted with the help of an academic co-supervisor, usually at foreign institutions. During three years of the program students are expected to publish seven scientific works, one in an international journal with a cite score not less than 25%, three publications in recommended Kazakhstani scientific journals, and last three not specified. PhD dissertation is the scientific work of a student, which is an independent study with development of theoretical principles, that can be qualified as a new scientific achievement, or a scientific problem solution, or scientifically based technical, economic or technological solutions which makes a significant contribution in the development of the country's economy. Each dissertation requires verification for non-plagiarism which is carried out by the National Center for State Scientific and Technical Expertise. (MoES RK, 2018).

Scientific supervision is organized by two supervisors who are appointed by the Rectors' order on the basis of the decision of university's academic council. The main supervisor is usually from the same institution where the doctorate student is studying and the second – co-supervisor should be from a foreign country, except for Military and National Security studies. Supervision can be performed only by scholars who have doctorate, candidate to doctorate, or PhD degree. The main scientific supervisor is responsible for monitoring the student's academic performance, observe the process of student's individual

plan, and timely completion and submission of doctoral dissertation. The dissertation should be directed to satisfy national interests and priorities, governmental programs, and fundamental or applied scientific projects (MoES RK, 2018; Zakon Online, 2019).

After a successful dissertation defense to the dissertation committee of HEIs, the results are sent to the Ministry of Education and Science of the Kazakhstan Republic for expertise. If a student completes the theoretical part of the education component successfully, but did submit timely scientific papers based on the dissertation, he/she is allowed to postpone their defense for the next year for an additional fee (MoES RK, 2018; Zakon Online, 2019).

Problem Statement

In 2018, Kazakhstan had 5069 PhD students. The number dramatically increased in comparison with 2014, when only 2063 were studying. During the massification of postgraduate studies, there is a new challenge for universities, because while the number of students' grow, the faculty and staff required to do not keep pace (Anna, 2016). In Kazakhstan the problem is more acute. The faculty members in the country HEIs decreased from 40320 in 2014 to 38275 in 2018. There are only 17205 potential supervisors who holds Candidates/Doctors of Sciences and PhD, and those who can do this work is 46,5% out of all faculty members and only 589 of them holders of PhD, it is 1,54%. It can be one of the issues that explain why only 33% of students defended their dissertation and more than one third dropped out of their doctorate program (OECD, 2017). Supervisors who have a degree of Candidate of Sciences and Doctors of Sciences have preemption from Soviet system and they can face issues in publishing scientific papers in peer-reviewed international journals (Ministry of National Economy of the Republic of Kazakhstan Statistics committee, 2018; Zakon Online, 2019). Other supervisors are fresh PhD holders, who also have obstacles to

good supervision, like a limited time for supervision, managerial duties, or low motivation to supervise.

PhD students in all universities of the Kazakhstan, excluding one autonomous, have to produce seven scientific publications before being able defend their thesis. Three of them have to be published in journals recommended by Ministry of Education and Science (MoES) of Republic of Kazakhstan, one publication in peer-reviewed international journal that has nonzero impact factor by Journal Citation Reports (Claritive Analytics) or has to be published in Scopus Database with CiteScore percentile not less than 25. The other three publications are not specified in the MoES order (Zakon Online, 2019). According to the new rules from MoES, a doctoral student who has dropped out of studies must reimburse the funds spent on his/her studies.

The relationship between PhD students and academic supervisors plays a significant role in the timely completion of the study (Anna, 2016; Health, 2002; Henderson, 2018; Lee, How are doctoral students supervised? Concepts of doctoral research supervision, 2008) and prevent students from dropping out (Cullen D. J, 1994; Russel, 1993) . Generally, three types of supervision structures exist in academia, they are single supervisor per, main and co-supervisors, and committee in which more than two supervisors, where one is a chairman (Izah Mohd Tahir, 2012). In Kazakhstan second type of supervision is in use, one main supervisor from the university, and the second expected to be from abroad. Academic supervisor and co-supervisor are assigned to PhD students by a rector of a university and a scientific committee in two months after enrollment (Sagadiyev Yerlan, 2018). Students meet difficulties in effective collaboration with co-supervisors due to many reasons, such as

language barrier, disagreements between supervisor and co-supervisor, distant communication, and the time limit (OECD, 2017).

In Kazakhstan, more than ten percent (10%) of PhD students are studying in a specialty related to Computer Sciences, or Information Communication Technologies. In 2020, the Ministry of Education and Sciences allocated a government order for 275 PhD students (Egov, 2020). There is certain gap in research of Computer Sciences PhD supervision around the world in globe and in Kazakhstan.

Purpose of the study

The purpose of the study is to explore Computer Science PhD students' and supervisors' opinions and attitudes towards PhD supervision in a private university.

Research questions

1. What are attitudes of Computer Science PhD students and supervisors toward academic supervision?
2. What are elements of effective supervision based on students' and supervisors' opinions?
3. Are there any differences in attitudes of students and supervisors towards academic supervision and opinions on elements of effective supervision by participants types, year of students' education, supervisors' academic status, students' gender, and supervisors' gender?

Significance of the study

Due to that fact that the study is conducted in state and public universities of the country, it belongs to more than 99 percent of universities. The results of current empirical

study should be useful for HEIs professors who work as scientific PhD supervisors, PhD students, HEIs administration, leaders in Higher Education, especially Ministry of Education and Sciences employees who make important, strategic decisions related to PhD programs that affect singles student across the country. As a result, the study has to facilitate improvement of the situation with PhD students drop out rates, which is now beyond 70 percent and will make PhD programs unsustainable in the future.

Conceptual Framework

This part of literature review is going to describe the concepts of the study. Many scholars tried to conceptualize academic supervision (Antònia Darder, 2016).

Concept of Academic supervisors' roles

Brown (1988) found that in general, supervisor can play eleven roles; director, facilitator, adviser, teacher, guide, critic, freedom giver, supporter, friend, manager, and examiner. He found that academic supervisors and candidates had different attitude toward PhD supervision; supervisors mostly saw themselves as freedom givers, and critics, while candidates perceived supervisors as facilitators, and teachers. Lowest priority role was found for supervisors as a fiend, and for candidates as adviser.

Concept of Dynamic model for aligning supervisory style with research student development.

Gurr (2001) invented – "A dynamic model for aligning supervisory style with research student development" model in which he has supervisor's intervention dimensions; *direct* and *indirect*, and student's participation *active* and *passive*. It makes two by two matrix that shows

supervisor's style and student's autonomy. According to Gurr (2001) the effective supervisor is that one who easily switch between four modes.

Concept of Development of a dynamic conceptual model and its managerial implications

The next conceptualizer is Gatfield (2005), he designed *Development of a dynamic conceptual model and its managerial implications* in which there are two axes; support and structure with low and high level metrices in which two by two matrix with four main academic supervision styles are located; Laissez-faire (low structure, low support), Pastoral (low structure, high support), Directorial (high structure, low support), and Contractual (high structure, high support). The best is Directorial style, but it doesn't mean that with rest three styles scholar will not be doing supervision successfully. Supervisor can switch between styles depending on candidate level of knowledge, skills, and style of work.

Concept of five supervision approaches

One more concept represented by Lee (2008) regarding *five main supervision approaches*. They are: *Functional* – project management (organization of schedule, setting up goals, monitoring the process); *Enculturation* – student's integration to the academic society (social integration to academic world, creation of professional networking); *Critical thinking* – push student to question and analyze his/her work (answering for questions: why?, what?, and how?); *Emancipation* – student's development by education, coaching, and mentoring (this approach emphasizes student's autonomy); and *Relationship development* – emotional intelligence and flexibility (Lee, How are doctoral students supervised? Concepts of doctoral research supervision, 2008).

Same scholar made one more research regarding the effectiveness of *five main supervision approaches* in modern doctorate supervision, Lee (2018) found that the concept is still functioning for the demands of current researchers. A survey was performed for both, PhD candidates and academic supervisors. Most valuable for students regarding academic supervision was defined *Functional approach.* In *Functional approach* they demanded to have more managerial supervision, including: strategy, milestones, outcomes, and monitoring. Next after Functional comes by importance for students is *Critical thinking approach*. For academic supervisors' highest priority in supervision was defined as *Critical thinking* and then *Functional*. For both, candidates, and supervisors, lowest priority is *Enculturation approach* (Lee, 2018).

Academic supervisors described that the following issues in their processes: time management, both for candidates and supervisors, due to that fact that most of doctorate students above twenty-five, they have children, work, and study - in most cases the time is consuming by procrastination, the effect of multitasking and over-responsibility; lack of knowledge and skills in writing academic text and statistics for research; lack of self-motivation due to limited vision on the thesis project; diffusion in interest, greedy appetite to the thesis, perfectionism, and high fantasy for the thesis; relationship issues, students often face issues with many parties at the university, starting from canteen staff and till academic supervisor (Lee, 2018).

Roles of Academic Supervisor by ICVF

As a basis of the conceptual framework was used Integrated Competing Values Framework (ICVF) which was represented by (Vilkinas, An Exploratory Study of the Supervision of Ph.D./Research Students' Theses, 2008). The ICVF takes roots from the

business management framework Competing Values Framework (CVF) (Quinn, 1993). According to ICVF by Quinn (1993), the framework is representing two leadership dimensions in business management, they are; flexibility/stability, and internal/external. Two dimensions are organized in the way to create four divisions (expansion, maximization of output, consolidation, and human commitment) with eight roles (innovator, broker, producer, director, coordinator, monitor, facilitator, and mentor) of the leader. Vilkinas (2008) compares supervisor with business manager, both of them requires to have strong professional knowledge and skills, to be an expert in a field, and to be good supervisor/manager and leader. Vilkinas (2008) integrated following roles together, *facilitator* and *mentor* became *developer*, *coordinator* and *monitor* became *monitor* and *deliverer*, *producer* and *director* changed to *broker*, *innovator* and *broker* became *innovator*, and in the middle of the pie she putted new role which is called *integrator*. The illustration of ICVF framework by Vilkinas (2008) shown in Figure 1.

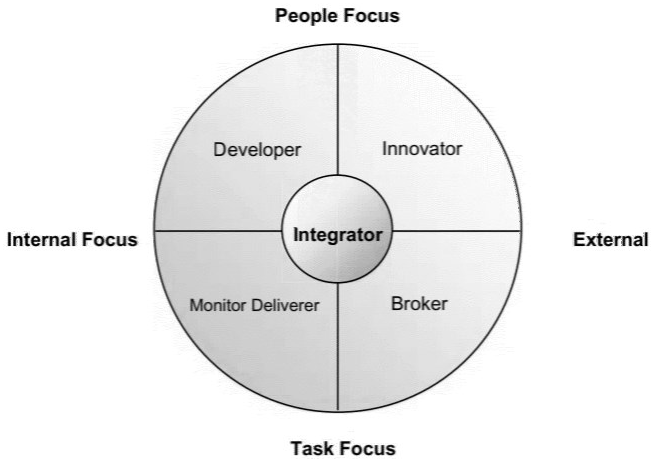

Figure 1 Integrated competing values framework. *(Vilkinas, 2008)*

Roles of Academic Supervisor by ICVF:

Developer is person who is responsible for establishment of a research team, he is involving student to be responsible for their work. When conflicts are happening between peers and co-supervisor, *developer* supervisor is solving issues. The developer is able to measure properly students research capability and has strong interpersonal skills. This role is very close to leadership skills, where supervisor looks like facilitator and mentor. In this role supervisor more, focused person development than the progress of the research.

Deliverer supervisor is busy by managing student's research project, setting outcomes, goals, and objectives for the student. Research schedule organized by *deliverer*. In this role supervisor feels responsibility to help student make scientific publications. Student's learning environment like room, hardware, software is a headache for *deliverer*.

Monitor is a role which is close to deliverer. In this role supervisor is monitoring all progress by set goals, objectives, outcomes, and schedule. Monitor measure the performance and give critical feedback.

Broker supervisor is busy by searching for research funding, stipends, and agreements with the industry. Also, he/she cares about student's professional networking that will help students to promote their projects and attract financing.

Innovator role is making supervisor to think creatively, use extraordinary approaches. In this role supervisors have very wide vision for the research project.

Integrator role uses experience from previous supervisions, provides critical observation of the situation in the university and changes. Reply to students according their needs, to each of them individually.

Chapter 2: Literature Review

Introduction

Before starting the research, it is better to understand how other scholars see the role of an academic supervisor, structures of PhD supervision, supervisors' and students' attitudes toward supervisors, and their expectations about effective supervision, also to provide information on how supervision has been conceptualized by different scholars recently.

Role of an academic supervisor in PhD studies

An academic supervisor is a key person in the life of graduate students that plays a significant role in students' successful and timely study completion (Bair, 2004; Ali, 2016; Anna, 2016; Lee, How are doctoral students supervised? Concepts of doctoral research supervision, 2008; Health, 2002; Henderson, 2018). Students trust supervisors and rely on them, and usually, supervisors are the main gatekeepers to the research world (Pyhältö, 2014). PhD student and supervisor relationship are defined as advising and mentorship. Advising usually stands for facilitating students to work on research tasks only, whereas mentorship is a more personal and intimate relationship (Jitka Lindén, 2013). A supervisor is responsible for counseling and navigating the student's research. The main liability for the research in PhD study is the student who has to be initiative and enthusiastic (Abiddin, 2007). In Kazakhstan a supervisor is responsible for monitoring student's academic performance, observing process of a student's individual plan, and timely completion and submission of a doctoral dissertation.

Common research interests of an academic supervisor and PhD student increase the quality of the interpersonal relationship between them. It provides, trust, freedom of communication, and empathy. It positively affects students' satisfaction and reduces chances for study drop out (E. van Rooij, 2019; Tim Mainhard, 2009; Ives, 2005). In addition to

common interests, a supervisor has to be well trained and professional enough to perform a good pedagogical approach for supervising PhD student (Belinda Crawford Seagram, 1998).

Academic supervisors not only impact to PhD students, they directly effect on all PhD education system. They spend much time to motivate, manage, and facilitate student's development to be able to submit scientific thesis under proper standards and on time (Tim Mainhard, 2009). Moreover, academic supervisor can impact not only positively to research and study, he/she can negatively effects to the study (Ives, 2005). Lack of supervision can impact on candidate in three ways: main study prolongation, drop out, and wellbeing of the candidate (Pyhältö, 2014).

Supervision structures

Generally, three types of supervision structures exist in academia, individual supervisor per student, main and co-supervisors, and a committee with more than two supervisors where one of them is a chairman (Izah Mohd Tahir, 2012; Cullen D. J, 1994).

Individual supervision classified with two divisions, research practice-oriented, and research relationship-oriented (Arvidsson, 2011). In research practice-oriented class, students are involved in common research project together with the supervising professor. Student works on the project within professor's team, in this method student has to have common interests with the supervisor and peers. The method allows a student to have interpersonal communication, learn from peers, and ask questions during weekly briefings, and be monitored by the team. It allows the doctoral candidate to remain in good shape, as part of the project depends on it. Supervisor must possess both leadership and management skills, by motivating student and controlling his/her progress and fit it with the team progress. Additionally, supervisor have to develop favorable team atmosphere.

Research relation-oriented class is focused on individual project of the candidate. Academic supervisor work separately from a team and supervisor. Arvidsson (2011) states that students who came from outsite the institution usually prefer to work with this kind of supervision, because there is ability to bring own topic, which can be interest from the company from where candidate works parallely. This kind of class can also be mixed with co-supervision model, where one main supervisor from a faculty and co-supervisor from the industry (Angelina Sundstrom, 2016).

Arvidsson (2011) found that research practice-oriented class of supervision perfomed more in hard sciences like computer sciences and medicine sciences, and research relation-riented most common for education and social sciences.

Main and co-supervision is the second type of supervision described by Cullen (1994) and Izah Mohd Tahir (2012). It this supervision type, candidate assigned with two supervisors. Usually, main supervisor from the studied institution and faculty, co-supervisor from different university, or from foreign country, in case if the student from the developing country this mode commonly used, and in some cases co-supervisor can be from the industry (Angelina Sundstrom, 2016).

In Kazakhstani universities this type of supervision is in use. Kazakhstani PhD supervisors assigned to student in two months after enrollment by the rector and university's science committee. Supervision has to be done at least by two consultants with academic degree Candidate/Doctor of Science/PhD, where one of them has to be from abroad – co-supervisor, they are responsible for; observance of academic discipline, implementation of PhD student individual plan, and timely submission of a dissertation (Sagadiyev Yerlan, 2018; Zakon Online, 2019). Topic of dissertation is selected and approved by university science

committee in the period of the first semester of doctoral study (Sagadiyev Yerlan, 2018; Zakon Online, 2019). Usually, main supervisor used by candidate to be involved into learning process at the institution, to be integrated to working atmosphere, to publish some scientific works in recommended by Kazakhstani MoES local journals and collaborate with other scientist during the scientific project from the Kazakhstani government. Co-supervisor mostly helpful in facilitation of publication in peer-reviewed international journals with impact factor above zero that is at the same time in the database of Journal Citation Reports (Claritive Analytics) or should be in the Scopus Database with the Cite Score above 25 percentiles. A Cite Score is a way of measuring impact of citing sources by comprehensive, transparent, free and current metrics (Scopus, 2020; Elsiever, 2020) . Due to that fact that co-supervisors located abroad it is difficult to work with them in a distance, that is why doctorate students have travel stipend to visit co-supervisor during a scientific internship which can be organized in 1-6 month/s range. Other communication with co-supervisor performed online, in distance, which bring other obstacles for already not an easy task of PhD student (Elizabeth Anne Erichsen, 2012).

More than two academic supervisors with the chairman is the third type of supervision reported by Cullen (1994) and Izah Mohd Tahir (2012). This type of supervision helps to issues related to personal misscommunication with one supervisor, like inethical communication, abusive supervision, opposite gender, and subjective judging.

Supervision in Computer Sciences

Computer Sciences is the field where trends are rapidly changed, it makes supervision in very difficult. (Taylor Estelle, 2015; Enoiu, 2019). One more problem is that motivation to study PhD in Computer Sciences is to on big demand due to financial motivation to work in

the industry bigger than in science (Moreno, 2013). Moreno (2013) found that motivation for PhD in Computer Sciences are following; academic career, professional development, employment opportunity, personal fulfillment whereas biggest motivation is academic career. Most students wanted to become PhD not because they wanted to make research, but because they would like to be teachers at the universities.

It is recommended for Computer Sciences students to meet with supervisor once in a week or once in a two weeks (Waaijer, 2016), and request for approval of defining the research topic, ask for organize the schedule, demand the critical feedback etc. (Hamalainen, 2006)

As mentioned before, co-supervision is one of the possible structures in supervision. In Computer Science disciplines uncommon to meet co-supervisors from another local or foreign institutions and from industry. Having co-supervisor from industry has advantages and disadvantages. Good side of this kind of supervision is that he/she can offer and navigate candidates with real problems from the industry, student have more chance to get real data for analysis, sometimes it is access for *big data*. Negative side of this kind of supervision is that co-supervisors usually do not follow some ethical requirements, especially related to gender inequality. Also, industrial co-supervisor is not following schedules due to changes in the work place. They perceive supervision like extra job. (Enoiu, 2019)

Ethical Issues with supervision

Due to supervision is long term project, supervisor and candidate whether they want it or not, they spend much time with each other (Kirsi Pyhältö, 2014; Schultz, 2020). Supervisors should match following ethical principals: respect for autonomy, avoiding harms, benefits others, being justice (Kitchener, 2000).

Harm is presented in supervision in the face of abuse, embezzlement of scientific work, and scientific slavery. Unethical supervisors can give unrelated works to the candidate by pushing psychologically and can make appropriation of his/her work to increase statistics of publications. The same happens with abusive supervision. In this kind of issue, committee supervision can help, where not only one supervisor makes decision. Beneficence, student's wellbeing is under the risk during their study if supervisor do not pay attention on their personal life. Many student fill pression from multiple sides, study, work, family at the same time. It directly effects to their wellbeing and health. If a supervisor is more in the role of director or critic by Brown (1988), or deliverer and monitor only by Vilkinas (2008) students may have issues with the rights to choose the research topic, set flexible deadlines according to candidate's capacity, be autonomous. Being Jusctice or Fidelity is a lack of candidate's contribution and respect from the academic supervisor site (Pyhältö, 2014).

Gurr (2001) in his study defined that students' attitude toward supervision where *accessibility, friendliness, empathy*. According to findings of (Izah Mohd Tahir, 2012), we can understand that students also saw their supervisors as *friendly, approachable* and *flexible* which is similar with (Gurr, 2001). Supervisors did not have much knowledge in research methods and skills in qualitative and quantitative software usage. Students were expecting from their supervisors to *"establish good and professional relationship with students and give support and guidance about the research process and the standards expected"* from them (Izah Mohd Tahir, 2012). Sinclair (2016) made survey for more than five thousand graduate students in Australia, *good* supervision with fast program completion results was associated with *hands-on* supervisors, who were directly connected with the research, and where able to give fast, critical feedbacks.

It is interesting that opinions about supervisors' role diverse by students and supervisors. George (1998) evaluated how differently students and supervisors associate the role of the academic supervisor. They saw their role mostly as *critic* and *freedom giver*, students' opinion about the role was on the first place as *facilitator* and on second *teacher*.

By understanding supervisors' and students' opinions and measuring attitudes toward academic supervision it is possible to match them with the ICVF framework analyze what kind of relationship between two parties, and define their activities. It will help to enhance academic supervision for PhD students to give more opportunity to finish theses, publish scientific papers, and timely completion of the program.

The reviewed literature shows that PhD students' supervision is very important and on demand for a research. Unfortunately for Kazakhstani higher education and fortunately for this study, none of research found according to graduate students' supervision.

Chapter 3: Methodology

Introduction

This chapter describes the research methodology that will help to explore PhD students' and academic supervisors' opinion and attitude towards academic supervision and compare them. This chapter will explain the research design, selected research method, research site, and sample of participants, data collection tools, data collection procedure, data collection analysis, and ethical issues.

Research Design

After identification of the purpose of the study and the research questions and then dividing Kazakhstani HEIs into main categories, it was decided to use a cross section analysis

within quantitative research methods to be able to explore Computer Sciences PhD students' and supervisors' opinion and attitudes towards PhD academic supervision in one private university with English language education.

There was choice between qualitative, quantitative, and mix-methods approaches for the research. Qualitative research is giving more in-depth understanding of the problem (Creswell, 2012) but at the same time is time consuming and not so flexible with scale and not for comparing and testing with the Vilkinas (2008) model, which I am using as a conceptual framework. There was also a variant of using both qualitative and quantitative (mixed-method) approach. I was planning to use mixed-methods sequential exploratory that has first quantitative and then qualitative approaches. But due to lack of time for both analysis it was decided to limit with quantitative methods to be able to finish the research on time.

Research site and Sample

Research site. Research is going to be conducted at a private university with top ten Computer Science alumni located in Almaty city. I have good relationships with university leadership and faculty administration, including the Graduate School program coordinator who will play the role of gatekeeper to directly negotiate with students, provide surveys, and secure information for data analysis.

Sample. In a Computer Sciences specialty of the university study 50 PhD students are supervised by 22 academic supervisors. Students are studying in three main courses and some of them are in extended courses, those who did not complete on time and most of them are waiting for the publishing of papers in international journals with impact factor above zero.

Data Collection Tools

Survey. As one of the modern and fast ways to conduct cross-sectional survey design (Creswell, 2012, p. 377) this study will use a web-based questionnaire to collect answers from participants (Creswell, 2012, p. 383.). The advantage of a survey/questionnaire is that it gives the ability to collect data from many participants without even interacting with them personally. Google form survey platform will be used as a tool of collecting quantitative data.

Survey questions are adopted from previous studies of Izah (2012), and Vilkinas (2008) which were conducted by foreign scholars and also explored PhD student's attitude toward academic supervision and was divided into three sections: 1) demographic profile of respondents, 2) characteristics of graduate students' supervisors and 3) students' opinion about effective supervisor's attributes. Questions were measured by using Likert-type scale format which consists of five levels 1 = "strongly disagree", 5 = "strongly agree" and between them 2, 3, 4 that equal to "disagree", "neutral" and "agree" respectively.

There will be three language variants of the survey, in Kazakh, Russian, and English. Kazakh is the official language in the country, Russian is much used, and English is a popular international language and some students will prefer to answer with this variant.

Data Collection Procedures

One of the first procedures in organization of the data collection was to get acceptance from Nazarbayev University Institutional Research Ethics Committee. Then, communication with the research site university and getting their agreement by signing research consent form. Data collection is planned to be performed in the middle of February by sending to participants emails.

Data analysis

Answers will be received by Google Form online platform in the Google Table format and analyzed in IBM Statistical Package for the Social Sciences (SPSS) version 23, and Microsoft Excel. Cross tabulation descriptive analysis will be performed to organize a demographic table of participants with gender, age, year of education, supervisors' gender, age, and academic degree variables. Cronbach's alfa values are planned to be used to check questions' validity according to students' opinion on their supervisors and effective supervision. Descriptive statistics will be used to evaluate PhD and rank students' and supervisors' attitudes toward supervisors and effective supervisors' attributes. Pearson $\chi 2$ will be applied to significant differences between students' and supervisors' attitudes toward supervision and opinion about effective supervision by gender, year of education, and other variables. Phi, and Cramer's V will be in use to check for effect size of findings. Descriptive analysis with Cross tabulation will be used to explore differences between variables that have two categories with count and expected values. Compare means with One-Way ANOVA with F test and Partial Eta Squared will be performed find differences within variables that have more than two categories.

Ethical issues

During the semester each of Master's student at the Graduate School of Education passed a Collaborative Institutional Training Initiative (CITI) and took a certificate. Additionally, each student's survey and interview questions were analyzed and approved by NUGSE research committee.

All survey and interview participants will be informed about the purpose and risks of the study and will have ability to reject from any part of the survey questions. The survey will

be conducted anonymously; email addresses will be collected optionally, only from those participants who want to receive survey results. In the future we can use their email addresses to call them to interview. Final report edited and all personalized information was deleted from all resources.

Chapter 4: Findings

Introduction

This chapter presents findings of current research related to exploring the Computer Science PhD students' and supervisors' opinions and attitudes toward academic supervision. It consists of demographic profile of participants, survey reliability check, attitudes of Computer Science PhD students and supervisors toward academic supervision, elements of effective supervision based on students' and supervisors' opinions, and differences in attitudes of students and supervisors towards academic supervision, year of students' education, supervisors' academic status, students' gender, and supervisors' gender.

Demographic profile of participants

Demographic profile shows descriptive analysis of both PhD students and academic supervisors. PhD students' profile consists of the following variables: Gender, Age, Year of education, Supervisor gender, Supervisor age, and Supervisor degree. Overall in the survey 42 students participated, where 27 (59.5%) were female and 17 (40.7%) male. Most of the participants 22 (52.4%) are 21-30 years old, 12 (28.6%) between 31 and 40, and only 8 (19.0%) are above 40 years old. It shows how young PhD students are in the university. Students are distributed in balance with years of education. In first, second, and third year courses, about one quarter of participants were represented, and only in fourth year and above courses, 19% were represented. Most of the academic supervisors are male 31 (73.8%),

whereas female supervisors were not as common, only 11 (26.2%). Students had supervisors who are older than, most supervisors 26 (61.9%) over 40 years old, 15 (35.7%) between the age of 31 and 40. Academic supervisors can be divided into two main categories; scholars from the past (Candidate of sciences and Doctor of sciences) and fresh (PhD). Eighteen (42.9%) respondents have supervisors with a PhD academic degree, almost the same 16 (38.1%) for Doctor of sciences, 6 (14.3%) with a Candidate of sciences, and 2 (4.8%) candidates have professors as a scientific supervisor. Like with supervisors' descriptive statistics, academic co-supervisors also prevail in quantity, male 23 (54.8%) ten (23.8%) of the respondents did not have co-supervisors at all. This can be happen in cases where students study in the first year of education, and only 9 (21.4%) female supervisors. Co-supervisors' ages are close to the ages of academic supervisors. Descriptive statistics of demographic profiles of PhD students is displayed in Table 1.

Table 1

Demographic Profiles of PhD students' respondents.

Variables	Categories			
Gender	Male	Female		
	59.5%	40.5%		
Age	21-30	31-40	More than 40	
	52.4%	28.6%	19.0%	
Year of education	1	2	3	4 and more
	26.2%	26.2%	28.6%	19.0%
Supervisor gender	Male	Female		
	73.8%	26.2%		
Supervisor age	31-40	More than 40	Do not know	
	35.7%	61.9%	2.4%	
Supervisors' degree	Candidate of sciences	Doctor of sciences	PhD	Others
	14.3%	38.1%	42.9%	4.8%
Co-supervisor gender	Male	Female	No co-supervisor	

	54.8%	21.4%	23.8%	
Co-supervisor age	31-40	More than 40%	No co-supervisor	Do not know
	19.0%	54.8%	23.8%	2.4%

From Table 2 it is seen that 18 academic supervisors took part in the survey. Close to three quarters of them 14 (77.8%) were male and only 4 (22.2%) female. Most supervisors 11 (61.1%) are between the age of 31 and 40, one third are older than 40, and very young academic supervisors amounted to only one participant. Twelve of them (66.7%) are representative of fresh category of academic supervisors, with PhD degrees. And the rest are part of the old system of doctoral degree, Doctor of sciences 4 (22.4%), and only 2 (11.1%) of them have candidates of sciences academic degree).

Table 2

Demographic Profiles of PhD supervisors' respondents

Variables	Categories		
Gender	Male	Female	
	77.8%	22.2%	
Age	21-30	31-40	More than 40
	5.6%	61.1%	33.3%
Academic degree	Candidate of sciences	Doctor of sciences	PhD
	11.1%	22.3%	66.7%

Reliability check

For survey reliability check Cronbach's alfa values evaluated on questions according to students' and supervisors' opinions and attitudes toward academic supervisors, and elements of effective supervision. Table 3 shows that three section's α more than 90%, it shows that questions fit the survey properly and sections that belong to supervisors' attitude toward supervision has 84% validity, which is also satisfying the test.

Table 3

Cronbach's alfa on survey questions

Section	Names	Cronbach's alfa value	Items
	Students' attitude toward supervision	0,93	21
	Attributes of good supervision in PhD students' opinion	0,90	21
	Supervisors' attitude toward supervision	0,84	21
	Attributes of good supervision in PhD supervisors' opinion	0,91	21

Attitudes of Computer Science PhD students toward academic supervision

To measure students' attitudes and opinions toward academic supervision, 21 statement were used that were divided into 6 main sections. Each section represents the role of the academic supervisor, developer, deliverer, monitor, broker, innovator, and integrator. Descriptive analysis consists of four columns, statement, numerical mean (Mean), standard deviation (SD), and rank that was generated according to calculated mean by descending to show priority of each statement.

Regarding the students' opinions and attitude toward academic supervision, the most popular statement with rank = 1 is related to knowledge and experience of the supervisor regarding publishing academic papers in local, scientific journals that were recommended by the Ministry of Education of Sciences (Mean = 4.19, SD = 0.74, N = 42). As was mentioned above, publications in those journals is mandatory metric to graduate doctoral programs. Three out of 7 publications are expected to be published in VAK journals. The results of the research show that the second by priority students' attitude toward supervision is that supervisors are good at publishing papers in international journals with impact factor above zero or in journals in databases of Scopus with rank 2, (Mean = 3.85, SD = 1.11, N = 42). Supervisors have good relationships with scholars in this field (Mean = 3.83, SD = 0.90, N = 42) and good experience in supervising PhD students (Mean = 3.78, SD = 1.07, N = 42).

On the other hand, the findings show at least three important supervisors' characteristics, which are as follows, supervisors do not involve PhD students in workgroups, students work separately for peers (Mean = 3.04, SD = 1.30, N = 42), rank 20. Similarly, students are not involved in projects with funding, and supervisors do not help them to find funding for their own thesis projects (Mean = 3.07, SD = 1.35, N = 42), rank 19. It seems that it is not popular for supervisors to schedule regular meetings with students (Mean = 3.54, SD = 1.13, N = 42) and more specifically not popular to take notes during and after the meetings (Mean = 2.85, SD = 1.04, N = 42).

Table 4

Students' attitude toward supervision - Descriptive Statistics

Statement	Mean	SD	Rank
Supervisor has a common research interest with me	3.66	1.14	6
Is available on demand to make discussion on project/thesis	3.66	1.30	7
Involves me into research team with other students	3.04	1.30	20
Stimulates me to work independently	3.61	1.14	10
Helps me to be critical thinking person	3.11	1.19	18
Has good interpersonal skills	3.64	1.22	8
Understands my research capabilities	3.61	1.20	11
Ensures that the proposed research is manageable and achievable	3.71	.94	5
Schedules regular meetings to monitor my progress	3.54	1.13	14
Gives support and guidance about the research process, deadlines and the standards expected	3.42	1.17	15
Knows how to publish paper in international journals with impact factor above zero or in Scopus	3.85	1.11	2
Knows how to publish paper in journals recommended by Ministry of Education and Sciences (BAK/KKCOH)	4.19	.74	1
Requests from me to make periodic reports on thesis	3.59	1.16	13
Organizes periodic workshops and seminars	3.28	1.04	16
Keeps a written record on the content of the meeting	2.85	1.04	21
Has good connection with other researchers	3.83	.90	3
Helps with finding place were to pass international internship	3.61	1.28	12
Helps to find funding for research/included me to funded project	3.07	1.35	19

Thinks creatively about supervision practice and research projects	3.28	1.17	17
Has good experience in academic supervision	3.78	1.07	4
Is able to assess critically own strengths and limitations as a supervisor	3.64	.98	9

Attitudes of Computer Science PhD supervisors toward academic supervision

Supervisors' attitudes and opinions like students consists of 21 similar statements and was also divided into 21 portions, each for one supervisors' role, developer, deliverer, monitor, broker, innovator, and integrator. Table 5 represents answers of supervisors' participants of the survey on opinions and attitudes toward supervision.

By supervisors' opinion, mostly they are available on demand to make discussion on project/thesis topic (Mean = 4.22, SD = 0.65, N = 18), rank 1. They are also able to stimulate PhD students to work independently, a kind of *freedom-giver* position (Mean = 4.22, SD = 0.65, N = 18), rank 2. Next two ranks show that supervisors have good knowledge and skills in writing and publishing scientific papers in local journals recommended by Ministry of Education and Sciences (Mean = 4.22, SD = 0.81, N = 18) with rank 3 and in international journal with impact factor above zero or in journals in Scopus database (Mean = 4.11, SD = 1.18, N = 18), rank 4.

Supervisors reported that they do not help with finding a funded project for students and do not include them in financial projects (Mean = 3.50, 1.04, N = 18), rank 19. They also admitted that they do not have enough experience in academic supervision (Mean = 3.22, SD = 0.94, N = 18), rank 20. Supervisors agreed that they do not practice keeping notes during and after individual or group meetings with supervisee.

Table 5

Supervisors' attitude toward supervision - Descriptive Statistics

Statement	Mean	SD	Rank
I usually have common research interest with my students	3.78	0.55	12
I am available on demand to make discussion on project/thesis	4.22	0.65	1
I try to involves student into research team with other students	3.94	0.73	7
I stimulate student to work independently	4.22	0.65	2
I help student to be critical thinking person	4.00	0.91	5
I have good interpersonal skills	3.67	0.77	15
I understand student's research capabilities	3.72	0.67	14
I ensure that the proposed research is manageable and achievable	3.89	0.68	8
I make scheduling for regular meetings to monitor student's progress	3.67	0.59	16
I give support and guidance about the research process, deadlines and the standards expected	3.83	0.51	10
I have experience on publishing paper in international journals with impact factor above zero or in Scopus	4.11	1.18	4
I have experience on publishing paper in journals recommended by Ministry of Education and Sciences (BAK/KKCOH)	4.22	0.81	3
I request from student to make periodic reports on thesis	4.00	0.91	6
I do organize periodic workshops and seminars	3.56	0.98	17
I keep written record on the content of the meeting	2.83	1.20	21
I have good connection with other researchers	3.56	0.70	18
I help with finding place for student were to pass international internship	3.83	0.99	11
I help to find funding for student's research/included student to funded project	3.50	1.04	19
I think creatively about supervision practice and research projects	3.78	0.73	13
I have good experience in academic supervision	3.22	0.94	20
I am able to assess critically own strengths and limitations as a supervisor	3.89	0.68	9

Elements of effective supervision based on students' opinions

This and the following section consist of survey results regarding elements of effective supervision based on students' and supervisors' opinions. Each of the section consists of 21 statements that are mirrored from previous sections of attitudes, hence statements are divided into six portions, each describing one of six roles of supervisors Table 6 demonstrates descriptive statistics on this section.

From the students' point of view the first by importance of successful and effective supervision is that they need to have common research interests with their supervisor (Mean =

4.45, SD = 0.59, N = 42), rank 1, standard deviation is very low in answers for this statement, it indicates the strong validity of answers. Students current attitudes toward supervision are close to their expectations, according to supervisors' knowledge and skills on publishing scientific papers in international journals with impact factor above zero or in Scopus database (Mean = 4.38, SD = 0.82, N = 42) rank 2, and in local journals recommended by the Ministry of Education and Sciences (Mean = 4.33, SD = 0.87, N = 42) rank 4. Also, students want their supervisors to ensure that proposed research is manageable and achievable (Mean = 4.33, SD = 0.82, N = 42) rank 3.

It is interesting that from the other side, one of the lowest ranks in terms of students' expectation concerns the to management skills of their supervisor. They do not expect from him/her to be a good manager (Mean = 4.02, SD = 0.90, N = 42) rank 19. Participation in funded projects or including thesis work in a financial project is not considered as a necessary element of supervision by candidates. As in previous sections, the most unpopular element of supervision is not keeping scheduled meetings with academic supervisors (Mean = 3.64, SD = 1.28, N = 42) rank 21.

Table 6

Attributes of good supervision in PhD students' opinion – Descriptive Statistics

Statement	Mean	SD	Rank
Have common research interest with student	4.45	0.59	1
Be accessible on demand	4.17	0.82	13
Involve students to work a team	4.29	0.74	6
Develop student to work independently	4.19	0.77	11
Develop student's critical thinking	4.24	0.82	8
Able to easily communicate with student on different topics	4.10	0.91	14
Supervise students according their abilities and individual requirements	4.26	0.73	7
Ensure that proposed research is manageable and achievable	4.33	0.82	3
Organize periodic meetings	4.19	0.77	12

Be good manager	4.02	0.90	19
Know how to publish in international journals	4.38	0.82	2
Know how to publish in local journals	4.33	0.87	4
Request periodic updates on thesis work	4.07	1.07	15
Performs workshops and seminars	4.07	0.89	16
Keep notes after each meeting with student	3.64	1.28	21
Have good networking in the field	4.33	0.69	5
Help student to negotiate communication with foreign institution/co-supervisor to pass international practice	4.24	0.73	9
Include student to funded project/help to find funding for student's project	3.98	0.92	20
Be creative in supervision practice and research project	4.21	0.68	10
Have to be experienced in academic supervision	4.05	0.91	17
Assess critically own supervision strengths and limitations	4.05	0.88	18

Elements of effective supervision based on students' and supervisors' opinions

The final section of the survey for supervisors was about effective supervision elements. As shown in Table 7 critical thinking development (Mean = 4.39, SD = 0.50, N = 18)has rank 1 and facilitation to work independently that brings to students a feeling of their own responsibility for the research project is very important for supervisors (Mean = 4.33, SD = 0.69, N = 18) rank 2. For supervisors, next in importance is having common research interests with a student (Mean = 4.28, SD = 0.57, N = 18) rank 3.

Least important elements of effective supervision included, helping students negotiate communication with foreign institutions/co-supervisors in order to pass international practice (Mean = 3.78, SD = 0.88, N = 18) rank 19, be a good manager (Mean = 3.61, SD = 0.78, N = 18) rank 20, and keep notes during and after meetings with students (Mean = 3.33, SD = 1.08, N = 18) rank 21.

Table 7

Attributes of good supervision in PhD supervisors' opinion – Descriptive Statistics

Statement	Mean	SD	Rank

Have common research interest with student	4.28	0.57	3
Be accessible on demand	4.00	0.59	12
Involve students to work a team	4.22	0.55	4
Develop student to work independently	4.33	0.69	2
Develop student's critical thinking	4.39	0.50	1
Able to easily communicate with student on different topics	4.00	0.59	13
Supervise students according their abilities and individual requirements	4.17	0.62	7
Ensure that proposed research is manageable and achievable	4.22	0.73	5
Organize periodic meetings	4.06	0.64	9
Be good manager	3.61	0.78	20
Know how to publish in international journals	4.11	1.02	8
Know how to publish in local journals	3.83	0.99	16
Request periodic updates on thesis work	4.06	0.64	10
Performs workshops and seminars	3.83	0.79	17
Keep notes after each meeting with student	3.33	1.08	21
Have good networking in the field	4.22	0.88	6
Help student to negotiate communication with foreign institution/co-supervisor to pass international practice	3.78	0.88	19
Include student to funded project/help to find funding for student's project	3.83	0.86	18
Be creative in supervision practice and research project	3.89	0.68	15
Have to be experienced in academic supervision	4.06	0.87	11
Assess critically own supervision strengths and limitations	4.00	0.77	14

Differences in attitudes of students and supervisors towards academic supervision, year of students' education, supervisors' academic status, students' gender, and supervisors' gender.

This section is designed to show differences between different groups and their attitudes and opinion toward academic supervision. The following groups are going to be compared: students and supervisors, students by year of education, supervisors' academic degree, and students' and supervisors' age. To perform comparison analysis, crosstabulation and Analysis of Variance (ANOVA) tests were used. Cross tabulation is a bivariate analysis which is useful in comparing two nominal or nominal to ordinal variables (Mujis, 2004, p. 114). Student and supervisor gender are nominal values, and Likert scale statements from the

survey above are ordinal values. ANOVA is the analysis that compares means of multiple groups. Year of education, supervisors' academic degree, and participants' age are multiple groups that are compared with statements described above in the survey.

Difference by students' gender according to attitude toward supervision

According to findings in the previous table regarding the students' attitude toward supervision, cross tabulation was done by gender of students for 21 statements. Two statements have significant differences by gender, they are 'Is available on demand to make discussion on project/thesis', and 'Requests from me to make periodic reports on thesis'. The first statement 'Is available on demand to make discussion on project/thesis' has the following Chi-Square test output (chi square = 11.51, df = 4, p = 0.021) it shows strong significance of Probability value (P value) which is demonstrated in Table 9. It is observed that cross tabulation output from Table 8 has differences in observed counts and expected counts. It proves that there is relationship between the gender and statement 'Is available on demand to make discussion on project/thesis', but it is not so strong due to that found in Phi, and Cramer's values in Table 10 (Phi = 0.524, Cramer's V = 0.524) which means that it has a modest relationship.

Table 8 is a cross tabulation output that represents the following results: four female participants - 16% strongly disagreed with the statement and no one strongly disagreed from the male participants, 12% of female, and 5.9% male participants disagreed. In the neutral position where only 8% of females and more than one third of male with 35.3%, in total neutral position took 19% of all 42 candidates. Almost one half of all participants agreed and strongly agreed with the statement, whereas 40% of female and 11.8% of male participants agreed. The last answer is 'strongly agree', 24% of female participants and almost half of male

participants – 47.1% answered with this option. In general, one third of all answers were the 'strongly agree' option.

Table 8

Cross tabulation output for 'Is available on demand to make discussion on project/thesis' by gender of PhD students

			gender		Total
			Female	Male	
Is available on demand to make discussion on project/thesis	1.00	Count	4	0	4
		Expected Count	2.4	1.6	4.0
		% within gender	16.0%	0.0%	9.5%
	2.00	Count	3	1	4
		Expected Count	2.4	1.6	4.0
		% within gender	12.0%	5.9%	9.5%
	3.00	Count	2	6	8
		Expected Count	4.8	3.2	8.0
		% within gender	8.0%	35.3 %	19.0 %
	4.00	Count	10	2	12
		Expected Count	7.1	4.9	12.0
		% within gender	40.0%	11.8 %	28.6 %
	5.00	Count	6	8	14
		Expected Count	8.3	5.7	14.0
		% within gender	24.0%	47.1 %	33.3 %
Total		Count	25	17	42
		Expected Count	25.0	17.0	42.0
		% within gender	100.0%	100.0 %	100.0 %

Table 9

Chi-Square Tests for 'Is available on demand to make discussion on project/thesis' by gender of PhD students

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.513[a]	4	.021
Likelihood Ratio	13.260	4	.010
N of Valid Cases	42		

Table 10

Symmetric Measures for 'Is available on demand to make discussion on project/thesis' by gender of PhD students

		Value	Approximate Significance
Nominal by Nominal	Phi	.524	.021
	Cramer's V	.524	.021
N of Valid Cases		42	

The second statement found to have a significant difference by gender on PhD students' attitude toward academic supervision is 'Requests from me to make periodic reports on thesis' it has (chi square = 9.876, df = 4, p = 0.043) as shown in Table 12. Like in the previous statement analysis, the current statement has differences in observed and expected counts, and it is also proving that there is a relationship between answers by gender differences, however it is modest, which is shown in Table 13 (Phi = 0.485, Cramer's V = 0.485).

The cross tabulation in *Table 11* shows that most answers for the current statement were within the 'Agree' statement with 42.9% of overall answers and 56% of female and 23.5% male participants. The second option with 21.4% of all answers had option 'Strongly

agree', 12% of female and 35.3% male candidates' answers. The purest answers in 'Strongly disagree' answer where only 12% female and no one from male.

Table 11

Cross tabulation output for 'Requests from me to make periodic reports on thesis's by gender of PhD students

			gender		Total
			Female	Male	
Requests from me to make periodic reports on thesis	1.00	Count	3	0	3
		Expected Count	1.8	1.2	3.0
		% within gender	12.0%	0.0%	7.1%
	2.00	Count	3	2	5
		Expected Count	3.0	2.0	5.0
		% within gender	12.0%	11.8%	11.9%
	3.00	Count	2	5	7
		Expected Count	4.2	2.8	7.0
		% within gender	8.0%	29.4%	16.7%
	4.00	Count	14	4	18
		Expected Count	10.7	7.3	18.0
		% within gender	56.0%	23.5%	42.9%
	5.00	Count	3	6	9
		Expected Count	5.4	3.6	9.0
		% within gender	12.0%	35.3%	21.4%
Total		Count	25	17	42
		Expected Count	25.0	17.0	42.0
		% within gender	100.0%	100.0%	100.0%

Table 12

Chi-Square Tests for 'Requests from me to make periodic reports on thesis' by gender of PhD students.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.876[a]	4	.043
Likelihood Ratio	11.059	4	.026
N of Valid Cases	42		

a. 7 cells (70.0%) have expected count less than 5. The minimum expected count is 1.21.

Table 13

Symmetric Measurements for 'Requests from me to make periodic reports on thesis' by gender of PhD students.

		Value	Approximate Significance
Nominal by Nominal	Phi	.485	.043
	Cramer's V	.485	.043
N of Valid Cases		42	

Difference by students' gender according to effective supervision

A cross tabulation analysis was performed for all 21 statements from effective supervision from the student's side by gender, but no significant differences between the answers were found.

Difference by supervisors' gender according to effective supervision

It was found that two statements significantly differ between supervisors' opinion according to effective supervision regarding the gender. They are 'Supervise students according to their abilities and individual requirements' and 'Help students to negotiate communication with foreign institutions/co-supervisors to pass international practice'.

Chi-Square test for the statement 'Supervise students according to their abilities and individual requirements' shows a strong significance with the following output (chi square = 8.53, df = 2, p = 0. 014) as represented in Table 15. Expected and observed counts differ from each other as shown in Table 14 in each option of the statement, with a moderate relationship between gender and the statement of Phi value from Table 16 (Phi = 0. 688, Cramer's V = 0. 688).

Cross tabulation analysis showed that 50% of female answered for the statement with 'Neutral' and the other 50% with 'Agree' options, whereas males answered with 64.3% by 'Agree' and 35.7% 'Strongly agree' options.

Table 14

Cross tabulation output for 'Supervise students according their abilities and individual requirements' by gender of supervisors

			gender		Total
			Female	Male	
Supervise students according to their abilities and individual requirements	3.00	Count	2	0	2
		Expected Count	.4	1.6	2.0
		% within gender	50.0%	0.0%	11.1%
	4.00	Count	2	9	11
		Expected Count	2.4	8.6	11.0
		% within gender	50.0%	64.3%	61.1%
	5.00	Count	0	5	5
		Expected Count	1.1	3.9	5.0
		% within gender	0.0%	35.7%	27.8%
Total		Count	4	14	18
		Expected Count	4.0	14.0	18.0
		% within gender	100.0%	100.0%	100.0%

Table 15

Chi-Square Tests for 'Supervise students according their abilities and individual requirements' by gender of supervisors

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.532[a]	2	.014
Likelihood Ratio	8.638	2	.013
N of Valid Cases	18		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .44.

Table 16

Symmetric Measurements for 'Supervise students according their abilities and individual requirements' by gender of supervisors

		Value	Approximate Significance
Nominal by Nominal	Phi	.688	.014
	Cramer's V	.688	.014
N of Valid Cases		18	

The second statement with a strong significance by gender is 'Help student to negotiate communication with foreign institutions/co-supervisors to pass international practice' with Chi-Square test values (chi square = 8.93, df = 3, p = 0. 030) shown in Table 18 and different observed and expected values in every option of the statement demonstrated in Table 17. The relationship between gender and the statement is moderate with Phi value from Table 19 (Phi = 0.705, Cramer's V = 0.705).

Cross tabulation analysis that is shown in Table 17 has 50% of female with answers on the statement with option 'Strongly disagree', and by 25% on "Neutral' and 'Agree', whereas male answers were more positive with 64.3% of 'Agree' answer, 21.4% with 'Strongly agree' and only 14.3% with 'Neutral' position.

Table 17

Cross tabulation output for 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' by gender of supervisors

			gender		Total
			Female	Male	
Help students to negotiate communication with foreign institutions/co-supervisors to	2.00	Count	2	0	2
		Expected Count	.4	1.6	2.0
		% within gender	50.0%	0.0%	11.1%
	3.00	Count	1	2	3
		Expected Count	.7	2.3	3.0
		% within gender	25.0%	14.3%	16.7%

pass international practice	4.00	Count	1	9	10
		Expected Count	2.2	7.8	10.0
		% within gender	25.0%	64.3%	55.6%
	5.00	Count	0	3	3
		Expected Count	.7	2.3	3.0
		% within gender	0.0%	21.4%	16.7%
Total		Count	4	14	18
		Expected Count	4.0	14.0	18.0
		% within gender	100.0%	100.0%	100.0%

Table 18

Chi-Square Tests for 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' by gender of supervisors

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.936[a]	3	.030
Likelihood Ratio	8.749	3	.033
N of Valid Cases	18		

a. 7 cells (87.5%) have expected count less than 5. The minimum expected count is .44.

Table 19

Symmetric Measurements for 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' by gender of supervisors

		Value	Approximate Significance
Nominal by Nominal	Phi	.705	.030
	Cramer's V	.705	.030
N of Valid Cases		18	

Difference by students and supervisors group attitude toward supervision

It was found that students and supervisors have diverse attitudes and opinions toward academic supervision are different in four following statements 'B. Each of those statements has strong significance with P value below or equal to 0.05 and shown in Table 21, Table 24,

Table 27, and Table 30 with the following values respectively to statements (chi square = 10.08, df = 4, p = 0.03), (chi square = 7.82, df = 3, p = 0.05), (chi square = 11.22, df = 3, p = 0.01), and (chi square = 9.90, df = 4, p = 0.04).

Relationships between students and supervisors with statements exist, but not strongly approved by Phi values. The results are displayed in Table 22,

Table *25*, Table 28, and Table 31 demonstrate four statements' effect size with Phi value respectively (Phi = 0.410, Cramer's V = 0.410), (Phi = 0.361, Cramer's V = 0.361), (Phi = 0.433, Cramer's V = 0.433), and (Phi = 0.406, Cramer's V = 0.406).

Cross tabulation results in Table 20 demonstrates that students looking for the statement about involvement in working teams during supervision are more negative than supervisors, 14.3%, and 21.4% of students answered with 'Strongly disagree', and 'Disagree' respectively, whereas no one from supervisors answered with those options. The percentage of participants who answered with 'Neutral' option was almost same for students and supervisors with 26.2%, and 27.8% respectively. Half of supervisors' participants answered with the 'Agree' option and 21.4% from students, the highest satisfaction with the statement answered 16.7% of students, and 22.2% academic supervisors.

Table 20

Cross tabulation output for 'Involves me into research team with other students / I try to involves student into research team with other students' statement by participants group.

			group		Total
			student	supervisor	
Involves me into research team with other students / I try to involves student into	1.00	Count	6	0	6
		Expected Count	4.2	1.8	6.0
		% within group	14.3%	0.0%	10.0%
	2.00	Count	9	0	9
		Expected Count	6.3	2.7	9.0
		% within group	21.4%	0.0%	15.0%

research team with other students	3.00	Count	11	5	16
		Expected Count	11.2	4.8	16.0
		% within group	26.2%	27.8%	26.7%
	4.00	Count	9	9	18
		Expected Count	12.6	5.4	18.0
		% within group	21.4%	50.0%	30.0%
	5.00	Count	7	4	11
		Expected Count	7.7	3.3	11.0
		% within group	16.7%	22.2%	18.3%
Total		Count	42	18	60
		Expected Count	42.0	18.0	60.0
		% within group	100.0%	100.0%	100.0%

Table 21

Chi-Square Tests for 'Involves me into research team with other students / I try to involves student into research team with other students' statement by participants group.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.081[a]	4	.039
Likelihood Ratio	14.055	4	.007
N of Valid Cases	60		

Table 22

Symmetric Measurements for Involves me into research team with other students / I try to involves student into research team with other students' statement by participants group.

		Value	Approximate Significance
Nominal by Nominal	Phi	.410	.039
	Cramer's V	.410	.039
N of Valid Cases		60	

Like in previous statements involving cross tabulation analysis related to involvement to the work group of PhD students, it was found that students reviewing the statement about ensuring the proposal is manageable and achievable have more disagreement than supervisors

have. Only one participant from supervisors strongly disagree, it makes 5.6%, and 9.5% of students answered the same. One third of students – 33.3% answered with option 'Disagree', supervisors were not close to that number, only 11.1%. But in the option 'Agree' almost two third of supervisors – 72.2% versus one third of students – 33.3% selected the option, and the rest 23.8% of students, and 11.1% of supervisors chose 'Strongly agree'.

Table 23

Cross tabulation output for 'Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable' statement by participants group.

			group		Total
			student	supervisor	
Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable	2.00	Count	4	1	5
		Expected Count	3.5	1.5	5.0
		% within group	9.5%	5.6%	8.3%
	3.00	Count	14	2	16
		Expected Count	11.2	4.8	16.0
		% within group	33.3%	11.1%	26.7%
	4.00	Count	14	13	27
		Expected Count	18.9	8.1	27.0
		% within group	33.3%	72.2%	45.0%
	5.00	Count	10	2	12
		Expected Count	8.4	3.6	12.0
		% within group	23.8%	11.1%	20.0%
Total		Count	42	18	60
		Expected Count	42.0	18.0	60.0
		% within group	100.0%	100.0%	100.0%

Table 24

Chi-Square Tests for 'Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable' statement by participants group.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.822[a]	3	.050
Likelihood Ratio	8.037	3	.045

Table 25

Symmetric Measurements for 'Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable' statement by participants group.

		Value	Approximate Significance
Nominal by Nominal	Phi	.361	.050
	Cramer's V	.361	.050
N of Valid Cases		60	

In Table 26 it is also shown that the percentage of dissenting students prevails over academic supervisors. 42.9% of students answered for 'Strongly disagree' and 'Disagree' whereas supervisors 38.9%. More than half of supervisors - 55.6% answered with the 'Agree' option and one third – 33.3% of students. Only 5.6% of participants strongly agreed with the statement and 23.8% from supervisors.

Table 26

Cross tabulation output for 'Schedules regular meetings to monitor my progress / I make scheduling for regular meetings to monitor student's progress' statement by participants group.

			group		Total
			student	supervisor	
Schedules regular	2.00	Count	11	0	11
		Expected Count	7.7	3.3	11.0

meetings to		% within group	26.2%	0.0%	18.3%
monitor my	3.00	Count	7	7	14
progress / I		Expected Count	9.8	4.2	14.0
make		% within group	16.7%	38.9%	23.3%
scheduling for	4.00	Count	14	10	24
regular		Expected Count	16.8	7.2	24.0
meetings to		% within group	33.3%	55.6%	40.0%
monitor	5.00	Count	10	1	11
student's		Expected Count	7.7	3.3	11.0
progress		% within group	23.8%	5.6%	18.3%
Total		Count	42	18	60
		Expected Count	42.0	18.0	60.0
		% within group	100.0%	100.0%	100.0%

Table 27

Chi-Square Tests for 'Schedules regular meetings to monitor my progress / I make scheduling for regular meetings to monitor student's progress' statement by participants group.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.227[a]	3	.011
Likelihood Ratio	14.592	3	.002
N of Valid Cases	60		

Table 28

Symmetric Measurements for 'Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable' statement by participants group.

		Value	Approximate Significance
Nominal by Nominal	Phi	.433	.011
	Cramer's V	.433	.011
N of Valid Cases		60	

The last difference in this section shown in Table 29, is about the statement 'Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected'. And again, like in all previous statements in this section, students disagree more than supervisors. Students answered as 'Strongly disagree' and 'Disagree', 4.8%, and 21.4% respectively, none of supervisors made those choices. The 'Neutral' option was chosen by about one-fifth of both parties. Supervisors selected 'Agree' two time more by percent than students, 72.2%, and 35.7% respectively. The last option 'Strongly agree', was selected by 19% of students and 5.6% of academic supervisors.

Table 29

Cross tabulation output for 'Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected' statement by participants group.

			group		Total
			student	supervisor	
Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected	1.00	Count	2	0	2
		Expected Count	1.4	.6	2.0
		% within group	4.8%	0.0%	3.3%
	2.00	Count	9	0	9
		Expected Count	6.3	2.7	9.0
		% within group	21.4%	0.0%	15.0%
	3.00	Count	8	4	12
		Expected Count	8.4	3.6	12.0
		% within group	19.0%	22.2%	20.0%
	4.00	Count	15	13	28
		Expected Count	19.6	8.4	28.0
		% within group	35.7%	72.2%	46.7%
	5.00	Count	8	1	9
		Expected Count	6.3	2.7	9.0
		% within group	19.0%	5.6%	15.0%

Total	Count	42	18	60
	Expected Count	42.0	18.0	60.0
	% within group	100.0%	100.0%	100.0%

Table 30

Chi-Square Tests for 'Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected' statement by participants group.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.906[a]	4	.042
Likelihood Ratio	13.075	4	.011

Table 31

Symmetric Measurements for 'Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected' statement by participants group.

		Value	Approximate Significance
Nominal by Nominal	Phi	.406	.042
	Cramer's V	.406	.042
N of Valid Cases		60	

Difference by students and supervisors group according to effective supervision

Only one significant difference was found between students and supervisors according to effective supervision, a statement 'Be accessible on demand'. Table 33 demonstrates value of significance (chi square = 9.930, df = 4, p = 0.042) and Table 34 demonstrates modest relationship between students and supervisors toward the statement (Phi = 0.407, Cramer's V = 0.407). Cross tabulation output demonstrated in Table 32 where we can see that supervisors

more positively looks at the statement, 83.3% of them selected 'Agree' and 50% of student cast their vote for the same statement.

Table 32

Cross tabulation output for 'Be accessible on demand' statement by participants group.

			group		Total
			student	supervisor	
Be accessible on demand	1.00	Count	1	0	1
		Expected Count	.7	.3	1.0
		% within group	2.4%	0.0%	1.7%
	2.00	Count	0	1	1
		Expected Count	.7	.3	1.0
		% within group	0.0%	5.6%	1.7%
	3.00	Count	5	0	5
		Expected Count	3.5	1.5	5.0
		% within group	11.9%	0.0%	8.3%
	4.00	Count	21	15	36
		Expected Count	25.2	10.8	36.0
		% within group	50.0%	83.3%	60.0%
	5.00	Count	15	2	17
		Expected Count	11.9	5.1	17.0
		% within group	35.7%	11.1%	28.3%
Total		Count	42	18	60
		Expected Count	42.0	18.0	60.0
		% within group	100.0%	100.0%	100.0%

Table 33

Chi-Square Tests output for 'Be accessible on demand' statement by participants group.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.930[a]	4	.042
Likelihood Ratio	12.087	4	.017
N of Valid Cases	60		

a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is .30.

Table 34

Symmetric measurements for 'Be accessible on demand' statement by participants group.

		Value	Approximate Significance
Nominal by Nominal	Phi	.407	.042
	Cramer's V	.407	.042
N of Valid Cases		60	

Difference by students' age according to attitude toward supervision

A one-way ANOVA was conducted to compare attitudes toward supervision by students' age. It was found that the age of participants significantly affected attitudes toward the statement 'Knows how to publish paper in international journals with impact factor above zero or in Scopus' with $p<0.05$ with level of three groups [$F(2,41) = 10.776$, $p = 0.000$] (see Table 35), a Partial Eta Squared shows moderate effect size ($\eta 2=0.35$).

Table 35

A One-Way Between-Groups ANOVA for statement 'Knows how to publish paper in international journals with impact factor above zero or in Scopus' by PhD students' age.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.203	2	9.102	10.776	.000
Within Groups	32.939	39	.845		
Total	51.143	41			

Post hoc comparison using Scheffe was performed; it shows significant differences between ages 30 and 31-40 (M=4.18, SD=0.19), and (M=2.83, SD=0.32) respectively. The difference between ages according to the statement (M=1.34, SD=0.32, p=0.01). Also, a

significance between the age range of 31-40 (*M*=31-40, *SD*=0.26) and More than 40 (*M*=4.50, *SD*=0.32) was found with difference (*M*=1.66, *SD*=0.41). The founded results show that students in ages 21-30 and More than 40 were more satisfied with supervisors' characteristics on writing and publishing scientific papers in international journals with impact factor above zero. However, those between 31-40 do not think that their academic supervisors are good enough in doing international publications (see Table 36).

Table 36

Post Hoc Test – Scheffe for statement 'Knows how to publish paper in international journals with impact factor above zero or in Scopus' by PhD students' age.

(I) age	(J) age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
21-30	31-40	1.3485*	.32981	.001	.5092	2.1878
	More than 40	-.3182	.37943	.706	-1.2838	.6474
31-40	21-30	-1.3485*	.32981	.001	-2.1878	-.5092
	More than 40	-1.6667*	.41947	.001	-2.7342	-.5992
More than 40	21-30	.3182	.37943	.706	-.6474	1.2838
	31-40	1.6667*	.41947	.001	.5992	2.7342

Difference by students' year of education according to attitude toward supervision

To make a comparison of groups by year of education like, in the previous section the one-way ANOVA was conducted within all 21 statements on attitudes and opinions toward academic supervision. Two significant differences were found on the following statements: 'Helps me to be critical thinking person' and 'Understands my research capabilities'

For the statement regarding the critical thinking significance, the level is below 0.05 with [F (3,41) = 3.899, p = 0.016] (see Table 37), with a modest Partial Eta Squared effect size

($\eta 2=0.23$). And for understanding the level of students' research capabilities is [F (3,41) = 4.625, p = 0.007] (see Table 39).

Table 37

A One-Way Between-Groups ANOVA for statement 'Helps me to be critical thinking person' by year of study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.746	3	4.582	3.899	.016
Within Groups	44.659	38	1.175		
Total	58.405	41			

Scheffe Post hoc that was performed for critical thinking development shows comparison of means with significant difference only between group of first- and fourth-year students with the following values (M=3.72, SD=0.90), and (M=2.25, SD=1.28) respectively, with p=0.49 and difference of means (M=1.47). Other groups in comparison between each other did have any significant differences by Post hoc Scheffe test (see Table 38). Students of the first two courses do believe that their academic supervisors positively impact on development of their critical thinking (M=3.72) for the first course and (M=3.54) for second course students. On the other hand, the last course students in their third and fourth year of education have less opinion on that with (M=2.75), and (2.25) respectively.

Table 38

Post Hoc Test – Scheffe for statement 'Helps me to be critical thinking person' by year of study.

(I) year of education	(J) year of education	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.1818	.46226	.984	-1.1702	1.5339

	3.00	.9773	.45252	.216	-.3463	2.3009
	4.00	1.4773*	.50373	.049	.0039	2.9507
2.00	1.00	-.1818	.46226	.984	-1.5339	1.1702
	3.00	.7955	.45252	.390	-.5281	2.1191
	4.00	1.2955	.50373	.103	-.1779	2.7688
3.00	1.00	-.9773	.45252	.216	-2.3009	.3463
	2.00	-.7955	.45252	.390	-2.1191	.5281
	4.00	.5000	.49481	.796	-.9473	1.9473
4.00	1.00	-1.4773*	.50373	.049	-2.9507	-.0039
	2.00	-1.2955	.50373	.103	-2.7688	.1779
	3.00	-.5000	.49481	.796	-1.9473	.9473

Same test for statement 'Understands my research capabilities' shows significance in difference between the first (M=4.09, SD=0.25) and last course (M=2.37, SD=0.53) with p=0.015, and between 3 (M=3.91, SD=1.50) and 4 (M=2.37, SD=0.53) year of education with significance of p=0.031.

Table 39

A One-Way Between-Groups ANOVA for statement 'Understand my research capabilities' by year of study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.022	3	5.341	4.625	.007
Within Groups	43.883	38	1.155		
Total	59.905	41			

Table 40

Post Hoc Test – Scheffe for statement 'Understand my research capabilities' by year of study

(I) year of education	(J) year of education	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.3636	.45822	.889	-.9766	1.7039
	3.00	.1742	.44857	.985	-1.1378	1.4863

	4.00	1.7159*	.49933	.015	.2554	3.1764
2.00	1.00	-.3636	.45822	.889	-1.7039	.9766
	3.00	-.1894	.44857	.981	-1.5014	1.1226
	4.00	1.3523	.49933	.079	-.1082	2.8128
3.00	1.00	-.1742	.44857	.985	-1.4863	1.1378
	2.00	.1894	.44857	.981	-1.1226	1.5014
	4.00	1.5417*	.49049	.031	.1070	2.9763
4.00	1.00	-1.7159*	.49933	.015	-3.1764	-.2554
	2.00	-1.3523	.49933	.079	-2.8128	.1082
	3.00	-1.5417*	.49049	.031	-2.9763	-.1070

Difference by students' year of education according to effective supervision

Only one significant difference between year of education and effective supervision by students' opinion was found among 21 statements, is about 'Performs workshops and seminars. With level of significance $p<0.05$ of four groups by year of education [$F(3,41) = 7.249$, $p = 0.001$] (see Table 41) and Eta Squared ($\eta 2=0.364$) that shows moderate effect size.

Table 41

A One-Way Between-Groups ANOVA for statement 'Performs workshops and seminars' by year of education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.933	3	3.978	7.249	.001
Within Groups	20.852	38	.549		
Total	32.786	41			

A variety of differences was found in the Scheffe Post Hoc test by the year of education and performing the workshops and seminars by the academic supervisor as an element of good supervision. Significant differences were found between first (M=4.27, SD=0.64) and third (M=3.25, SD=0.96), p=0.021, second (M=4.36, SD=0.67) and third (M=3.25, SD=0.96), p=0.01, and between fourth (M=4.62, SD=0.51) and third (M=3.25, SD=0.96), p=0.003 courses. An interesting finding with the third course, is that it differ

significantly from all other courses according to the statement. The highest difference of the third course is with the fourth year of education (M=1.375).

Table 42

Post Hoc Test – Scheffe for statement 'Performs workshops and seminars' by year of education

(I) year of education	(J) year of education	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-.0909	.31587	.994	-1.0148	.8330
	3.00	1.0227*	.30922	.021	.1183	1.9272
	4.00	-.3523	.34421	.790	-1.3591	.6545
2.00	1.00	.0909	.31587	.994	-.8330	1.0148
	3.00	1.1136*	.30922	.010	.2092	2.0181
	4.00	-.2614	.34421	.901	-1.2681	.7454
3.00	1.00	-1.0227*	.30922	.021	-1.9272	-.1183
	2.00	-1.1136*	.30922	.010	-2.0181	-.2092
	4.00	-1.3750*	.33811	.003	-2.3640	-.3860
4.00	1.00	.3523	.34421	.790	-.6545	1.3591
	2.00	.2614	.34421	.901	-.7454	1.2681
	3.00	1.3750*	.33811	.003	.3860	2.3640

Difference by supervisors' academic degree according to effective supervision

The one-way ANOVA was executed to measure differences between academic supervisors' degree and attitudes toward supervision and between academic supervisors' and effective supervision attributes. Overall 42 ANOVA tests were performed in this section, and only three of them showed a significance in difference. All three from the effective supervision section, and none from the attitudes and opinions on supervision. They are 'Have to be experienced in academic supervision', 'Be good manager', and 'Know how to publish in international journals'.

As mentioned before, three statements have significant differences. A significance level for the statement 'Have to be experienced in academic supervision' $p<0.0.5$ in three groups [$F(2,17) = 9.290$, $p = 0.002$] (see Table 43) and moderate effect size ($\eta 2=0.553$). For statement regarding of being good manager is [$F(2,17) = 5.000$, $p = 0.022$] with modest Eta Squared ($\eta 2=0.400$) (see Table 45), and for the statement 'Know how to publish in international journals' the one-way ANOVA showed the following results of significance and F test [$F(2,17) = 9.891$, $p = 0.002$] with moderate Partial Eta Squared ($\eta 2=0.569$).

A Post Hoc Scheffe test was performed on each of the three statements to measure between group differences. It was found that by the opinion of academic supervisors of different degrees the importance of having enough experience in supervision was significantly diverse between Candidate of sciences ($M=4.500$, $SD=0.707$) and PhD ($M=2.75$, $SD=0.621$) with $p=0.013$. Also, Phd ($M=2.75$, $SD=0.621$) differs from Doctor of Science ($M=4.00$, $SD=0.816$) with $p=0.019$. There is no significant difference between Candidate of sciences and Doctor of sciences, it seems that both of them are representative of same supervisors' generation with preemption from Soviet education system (see Table 44).

Differences between academic degree group and variable 'Be good manager' by the help of Post hoc Scheffe test displayed within Doctor of sciences ($M=2.75$, $SD=0.50$) with $p=0.02$. Other parameters did not show any significant differences (see Table 46).

The same test for 'Know how to publish in international journals' revealed a significant difference between Doctor of sciences ($M=2.75$, $SD=0.95$) and Candidate of sciences ($M=5.00$, $SD=0.00$), $p=0.009$ and between Doctor of sciences ($M=2.75$, $SD=0.95$) and PhD ($M=4.41$, $SD=0.66$), $p=0.004$ (see Table 48).

Table 43

A One-Way Between-Groups ANOVA for statement 'Have to be experienced in academic supervision' by supervisors' academic degree

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.361	2	4.181	9.290	.002
Within Groups	6.750	15	.450		
Total	15.111	17			

Table 44

Post Hoc Test – Scheffe for statement 'Have to be experienced in academic supervision' by supervisors' academic degree

(I) Supervisor's degree	(J) Supervisor's degree	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Candidate of science	Doctor of sciences	.5000	.58095	.697	-1.0766	2.0766
	PhD	1.7500*	.51235	.013	.3596	3.1404
Doctor of sciences	Candidate of science	-.5000	.58095	.697	-2.0766	1.0766
	PhD	1.2500*	.38730	.019	.1990	2.3010
PhD	Candidate of science	-1.7500*	.51235	.013	-3.1404	-.3596
	Doctor of sciences	-1.2500*	.38730	.019	-2.3010	-.1990

Table 45

A One-Way Between-Groups ANOVA for statement 'Be good manager' by supervisors' academic degree

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.111	2	2.056	5.000	.022
Within Groups	6.167	15	.411		
Total	10.278	17			

Table 46

Post Hoc Test – Scheffe for statement 'Be good manager' by supervisors' academic degree

(I) Supervisor's degree	(J) Supervisor's degree	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Candidate of science	Doctor of sciences	.7500	.55528	.423	-.7569	2.2569
	PhD	-.4167	.48971	.702	-1.7456	.9123
Doctor of sciences	Candidate of science	-.7500	.55528	.423	-2.2569	.7569
	PhD	-1.1667*	.37019	.022	-2.1713	-.1621
PhD	Candidate of science	.4167	.48971	.702	-.9123	1.7456
	Doctor of sciences	1.1667*	.37019	.022	.1621	2.1713

Table 47

A One-Way Between-Groups ANOVA for statement 'Know how to publish in international journals' by supervisors' academic degree

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.111	2	5.056	9.891	.002
Within Groups	7.667	15	.511		
Total	17.778	17			

Table 48

Post Hoc Test – Scheffe for statement 'Know how to publish in international journals' by supervisors' academic degree

(I) Supervisor's degree	(J) Supervisor's degree	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Candidate of science	Doctor of sciences	2.2500*	.61914	.009	.5698	3.9302

	PhD	.5833	.54603	.577	-.8985	2.0651
Doctor of sciences	Candidate of science	-2.2500*	.61914	.009	-3.9302	-.5698
	PhD	-1.6667*	.41276	.004	-2.7868	-.5465
PhD	Candidate of science	-.5833	.54603	.577	-2.0651	.8985
	Doctor of sciences	1.6667*	.41276	.004	.5465	2.7868

Difference by supervisors' age according to effective supervision

To measure differences by supervisors' age regarding attributes of good supervision, an ANOVA test was used, then a cross tabulation due to that fact that only two age supervisor categories took part in the survey, 31-40 and those who are over 40 years old. From 21 variables, two significant differences were found on statements 'Supervise students according their abilities and individual requirements' (chi square = 6.545, df = 2, p = 0.038) (see Table 50) with moderate relationship (Phi = 0.603, Cramer's V = 0.603), and 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' (chi square = 7.950, df = 3, p = 0.047) (see Table 52) with moderate relationship (Phi = 0.665, Cramer's V = 0.665).

A Cross tabulation table for the statement supervision according to students' individual abilities shows that younger supervisors agree more with the statement than the older generation. Age group between 31-40 years old agreed – 58.3% and strongly agreed – 41.7%, it makes a positive statistic for 100%, whereas the more than 40 year old group for one third – 33.3% answered with 'Neutral', and two third – 66.7% by 'Agree' options. None of participants from the older group used nor 'Strongly disagree', nor 'Strongly agree' options (see Table 49).

Like previous cross tabulation tests between two ages categories, in cross tabulation test on 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' variable, younger supervisors generation looked more positively on the statement. Three quarters of them -75% chose 'Agree', 16.7% 'Strongly agree', and only 8.3% 'Neutral' options. Those who are above 40 years, prefer not to agree -33.3%, the same percent -33.3% neutral, and only 16.7% agree, and 16.7% strongly agreed with the statement (see Table 51).

Table 49

Cross tabulation output for 'Supervise students according their abilities and individual requirements' by age of supervisors

			age		Total
			31-40	More than 40	
Supervise students according their abilities and individual requirements	3.00	Count	0	2	2
		Expected Count	1.3	.7	2.0
		% within age	0.0%	33.3%	11.1%
	4.00	Count	7	4	11
		Expected Count	7.3	3.7	11.0
		% within age	58.3%	66.7%	61.1%
	5.00	Count	5	0	5
		Expected Count	3.3	1.7	5.0
		% within age	41.7%	0.0%	27.8%
Total		Count	12	6	18
		Expected Count	12.0	6.0	18.0
		% within age	100.0%	100.0%	100.0%

Table 50

Chi-Square Tests for 'Supervise students according their abilities and individual requirements' by gender of PhD students

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.545[a]	2	.038
Likelihood Ratio	8.494	2	.014
N of Valid Cases	18		

Table 51

Cross tabulation output for 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' by age of supervisors

			age		Total
			31-40	More than 40	
Help student to negotiate communication with foreign institution/co-supervisor to pass international practice'	2.00	Count	0	2	2
		Expected Count	1.3	.7	2.0
		% within age	0.0%	33.3%	11.1%
	3.00	Count	1	2	3
		Expected Count	2.0	1.0	3.0
		% within age	8.3%	33.3%	16.7%
	4.00	Count	9	1	10
		Expected Count	6.7	3.3	10.0
		% within age	75.0%	16.7%	55.6%
	5.00	Count	2	1	3
		Expected Count	2.0	1.0	3.0
		% within age	16.7%	16.7%	16.7%
Total		Count	12	6	18
		Expected Count	12.0	6.0	18.0
		% within age	100.0%	100.0%	100.0%

Table 52

Chi-Square Tests for 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice' *by gender of PhD students*

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.950[a]	3	.047
Likelihood Ratio	8.775	3	.032
N of Valid Cases	18		

Conclusion

The current chapter presented findings of the research. It demonstrated participants' demographic profile, showed reliability checks of the survey, explored descriptive statistics of the survey related to attitudes and opinions toward academic supervision, and opinions on elements of effective supervision. Cross tabulation and ANOVA analyses were revealed to find and show significant differences between group of participants, year of education, gender of participants, and supervisors' gender and academic degree. The next chapter discusses the implications of these findings in relation to past research identified in the literature review, and for the policies and procedures.

Chapter 5: Discussion

Introduction

The previous chapter presented the findings of the research, the purpose of which was to explore Computer Sciences PhD students' and supervisors' opinions and attitudes toward academic supervision and attributes of effective supervision. This chapter is a discussion of the findings in relation to the literature review presented in chapter 2. The research is based on the following questions:

1. What are attitudes of Computer Science PhD students and supervisors toward academic supervision?
2. What are elements of effective supervision based on students' and supervisors' opinions?
3. Are there any differences in attitudes of students and supervisors towards academic supervision and opinions on elements of effective supervision by participants types, year of students' education, supervisors' academic status, students' gender, and supervisors' gender?

The chapter is organized in a sequence related to epy findings chapter and consists of three sections. The first section discusses the attributes of PhD students and supervisors toward academic supervision. The second section explains how the findings on elements of effective supervision based on students' and supervisors' opinion are related to the supervision concepts identified in the literature review chapter. The third section draws attention the differences between attitudes and opinions on effective supervision by participant types, years of education, supervisors' academic degree, gender, and students' gender.

Students' and supervisors' attitude toward academic supervision

As mentioned in the findings chapter, ranks were generated by mean of statements in the survey, the highest mean being the lowest rank. By the rank of students' attitude toward supervision it was found that the highest response rate was to the statement related to knowledge and skills based on publishing scientific papers in local scientific journals that were recommended by the Ministry of Education of Sciences of Kazakhstan. The second highest rank was found to be the statement that is also related to publications, but in international journals with impact factor above zero or in the Scopus database. By Vilkinas

(2008) this statement is classified as a Deliverer role of academic supervisor, by Lee (2008) it satisfies the Functional approach of five supervision approaches. The statement matches with the requirements for successfull defense in which it is mandatory to publish three scientific papers in recommended journals by MoES and one in a journal with impact factor above zero. The rank shows that the next popular students' attitude toward supervision is related to Vilkinas (2008) Broker role, the statement 'Has good connection with other researchers' which has good professional networking to promote their projects. But from another side this statement contradicts the rank on students' answers regarding the statement about finding the funded projects or included in the funded projects, it took rank number 19 out of 21. So, partially the Broker role by Vilkinas (2008) satisfied the high rank regarding good contacts in the field but failed with the statement on the funded projects. A very low mean and rank of 18 was taken by the statement related to critical thinking development that shows that students' do not see their supervisors in the role of developer, also, it is proved by a low mean on the statement 'Involves me in research team with other students. Both of these statements were directed to find weather the supervisor is the Developer or not. The results of the survey also showed that supervisors are good Deliverers; they ensure that the proposed research is manageable and achievable, and furthermore, students did find them good at schedule regular meetings to monitor the thesis progress, give support and guidance about the research, and keeping written reports after each meeting with a student, the last statement took last position in the ranking.

To find supervisors' attitudes toward supervision, the same 21 statements were used in the survey with rephrasing. It seems that supervisors see themselves more as a person with whom students can make discussion on demand regarding the thesis project; this statement

took rank number 1. This matches well with the findings of Brown (1988) who stated that supervisors look to their roles more as freedom givers, and critics. By Vilkinas (2008), the finding related to this statement shows supervisors' attitude toward supervision is closer to the Developer role. By Lee (2008) the approach that was mostly used by supervisors is more related to Critical Thinking. One more piece of evidence for supervisors playing more of a Developer role is that the next by rank statement is 'I stimulate students to work independently'. It is interesting that both students' and supervisors intersect in statement related to experience on publishing papers in local journals recommended by the Ministry of Education and Sciences of Kazakhstan, and international journals with impact factor above zero, and in Scopus database. The most contradicting statement between students' and supervisors' attitude is found in the statement regarding the professional networking in the field of research. Students saw their supervisors more relevant when they are good in professional networking, more so than how supervisors saw themselves. Supervisors' role by their attitude was not related to the Monitor role by Vilkinas (2008). They did not organize scheduled meetings to monitor status of the thesis, and did not get involved in making periodic workshops and seminars. One more intercepting statement between students and supervisors was found about keeping notes during and after each meeting with PhD students; both participant group members stated that it is not done.

Elements of effective supervision based on students' and supervisors' opinions

It seems that students want to have supervisors who are familiar with the research topic and have to be in the role Developer by Vilkinas (2008), who is able to better understand the theoretical part of the study and be able to organize a team to work on the same project. A statement 'Have common research interest with student' has the rank of number 1 over 21.

Students also want to see their supervisors as a Deliverer by Vilkinas (2008) who is ensuring that proposed research work is manageable and achievable. In this role supervisors are described by the Vilkinas (2008) as a person who is managing the student's research project well, setting proper goals, outcomes, and objectives. At the same time students have an opinion about effective supervision which is the same or close to current attitudes toward supervisors, and shows satisfaction with current supervisors. By rank 2 and 4 on attributes of effective supervision are knowledge and skills of publishing papers in international and local scientific journals respectively, whereas attitudes are specified by students about same statements on ranks 2 and 1 respectively. The statement 'Have good networking in the field' is also very close in both cases. It is interesting that students want to see their supervisors more in the role of deliverer and do not want to have them as a Monitor Vilkinas (2008). In management it is usually common parts of a single process. Also, Broker, Innovator, and Integrator roles are not popular by student's opinion according to effective supervision attributes. For example, a statement 'Include student to funded project/help to find funding for student's project' is on rank number 20. Also, there is difference in how students see their current supervisors and what they expect of the Integrator role by Vilkinas (2008). As in previous section of discussion, we may find out that students want to have more of the Functional approach by Lee (2008) than Critical Thinking approach. By Gatfield (2005), in the Development of a dynamic conceptual model and its managerial implication, students' position toward effective supervision attributes is place with the Directional style, which is described as high structure, low support.

Supervisors in their turn think that the best attribute of effective supervision is development of student's critical thinking and giving to student wide autonomy to develop

them to work independently, they have ranks 1 and 2 respectively. This is matched with findings of Brown (1988), where he states that supervisors' find their role as a Freedom giver. By Vilkinas (2008) supervisors have role of Developer more than other roles. The Developer role is supported by next two statements: 'Have common research interest with student', and 'Involve student to work independently' are on third and fourth positions by ranking by means. They do not think that knowledge and skills of publishing in local journals are significant. This cannot be said about publishing skills in international journals. The difference between two statements are 8 positions in the rank. Also, supervisors' do not see as an attribute of effective supervision the statement related to Broker role by Vilkinas (2008) 'Include student to funded project/help to find funding for student's project', in rank 18 a statement 'Help student to negotiate communication with foreign institution/co-supervisor to pass international practice', rank 19. Statements related to Innovator, Integrator roles are also not popular among supervisors' opinions.

Differences in attitudes of students and supervisors towards academic supervision, year of students' education, supervisors' academic status, students' gender, and supervisors' gender.

In the findings chapter, the section related to differences between a variety of combinations of participants type, age, gender, and academic degree had a huge place on tables and gradients of comparison. Overall the findings show 16 significant differences between statements and variables.

Two significant differences by students' gender attitude toward supervision on following statements:

  - Is available on demand to make discussion on project/thesis. Male participants feel more freedom to organize meetings on demand than female. It can be the effect on easiness of same sex communication, because most supervisors' participants were Male.
  - Requests from me to make periodic reports on thesis. It seems that women feel more pressure in current supervision, they think that supervisors' requests from them to make periodic updates more often than males do think.

- Two significant differences by supervisors' gender according to effective supervision on statements:
  - Supervise students according to their abilities and individual requirements. In this statement males' participants answered more positively. The issue can be same as different sex communication. May be women are too shy to make communication with male supervisor and that is why they do not give permission to understand individual requirements on thesis work.
  - Help student to negotiate communication with foreign institution/co-supervisor to pass international practice. Same notion is detected in this statement as in previous. Female participants had more negative answers on this statement. It looks like, women have worse communication with supervisors than men.
- Four significant differences by students and supervisors group attitude toward supervision:

- Involves me into research team with other students / I try to involves students into research team with other students. Supervisors found themselves more positive in this statement than students. Students answered more with negative and neutral options, whereas more than two third of supervisors gave positive answers.
- Ensures that the proposed research is manageable and achievable /I ensure that the proposed research is manageable and achievable. Same as in previous section, students found their supervisors with less interest in ensuring that proposed research is manageable and achievable.
- Schedules regular meetings to monitor my progress / I make scheduling for regular meetings to monitor student's progress. Same situation with positive answers of supervisors.
- Gives support and guidance about the research process, deadlines and the standards expected / I give support and guidance about the research process, deadlines and the standards expected. Students' and supervisors' attitude toward supervision different by the same manner as it was described from previous statements, supervisors think that they are giving support and guidance for students more than students feel it.

- One significant difference by students and supervisors group according to attributes of effective supervision on statement:
  - Be accessible on demand. More supervisors' than participants have a positive attitude toward being accessible on demand too.

- One significant difference by students' age according to attitude toward supervision on statement:
    - Knows how to publish paper in international journals with impact factor above zero or in Scopus. It is interesting how students in the age between 31-40 critically evaluate skills and knowledge of supervisors toward publication of scientific papers in international journals with impact factor above zero. In comparison with other categories they are dissatisfied with supervision in this statement. It seems that they are usually in the age of their supervisors or their supervisors older than them, in case if it is second reason, then it can be that older supervisors are usually from old system and they can have preemption from the Soviet system of scientific research members of which are not good in publishing in those kinds of scientific journals.
- Two significant differences by students' year of education according to attitude toward supervision on statements:
    - Helps me to be a critically thinking person. With this statement more students of the first educational year agree in comparison with the last, fourth year. It gives us an understanding of satisfaction level by years. This finding helps us to understand that by Lee (2008) supervisors are more active in Critical thinking approach at the beginning of the PhD journey and then switch to active Functional approach at the end of the journey. Firstly, more supervisors' satisfaction by Lee (2008), then students. By Gatfield

(2005) it is normal that supervisors' style is changing during the process of education from one to another.

  - Understands my research capabilities. Findings showed dramatic difference between first and last year PhD students. The last course students gave almost twice fewer positive answers on this statement. The same notion was found on previous statements too. It seems that in the first year, PhD students' attitude toward supervision is better than the last year. Maybe it is because of less communication with the supervisor, because usually, on the first course students have to cover academic credits.

- One significant difference by students' year of education according to attributes of effective supervision on statement:
  - Performs workshops and seminars. The third course students realized that organized periodic seminars and workshops are not effective attributes in comparison with all other education years. They do not want to see their supervisors in the role of Deliverer by Vilkinas (2008).
- Three significant differences by supervisors' academic degree according to effective supervision attributes on statements, by supervisors' opinion:
  - Have to be experienced in academic supervision. Results showed that younger - PhD generation of supervisors do not think that experience in academic supervision is so important in comparison with Candidates of Sciences and Candidates of Sciences. The reason can be that PhD titled supervisors do not have experience and they feel more comfortable with

publishing international and local scientific papers and organize on time defense for their supervisees.

- Be a good manager. From the other side of the previous section, the comparison depended on the experience of supervisors, the statement 'Be good manager' have opposite responses. The Candidates of Sciences think that to be good manager is not significantly important for academic supervisors.
- Know how to publish in international journals.

- Two significant differences by supervisors' age according to effective supervision on statements:
  - Supervise students according to their abilities and individual requirements. Younger generation of supervisors who are in range of 31-40 years found that to supervise by taking in account individual requirements of supervisees is important in comparison with those who are more than 40 years old. As statistics shows, usually those supervisors who are above 40 used to be Candidates of Sciences or Doctors of Sciences.
  - Help student to negotiate communication with foreign institution/co-supervisor to pass international practice. Like the statement about individual requirements, the statement about negotiation with foreign institution was more important for PhD holders than for Candidates/Doctors of Sciences.

The discussion chapter described and compared the findings of this research in relation to previous research cited in the literature review. There were both similarities

and differences identified on issues relating to participant category, age and academic title of supervisors. This leads to the final, concluding chapter of the thesis.

Chapter 6: Conclusion

By answering three research questions, the research study reached its assigned goal of exploring Computer Science PhD students' and supervisors' opinions and attitudes towards PhD supervision in a private university. The first research question was about finding attributes of Computer Science PhD students and supervisors toward academic supervision. Descriptive statistics revealed that PhD students know their supervisors as deliverers who can help with publishing papers in international and local scientific journals. Supervisors mostly found themselves as people with whom students can discuss their research thesis on demand and be good publishers of scientific papers in local and international journals. Both parties of the survey did not find activity in supervision related to keeping notes of scheduled meetings.

The second research question related to exploration of elements of effective supervision based on students' and supervisors' opinion. Quantitative data analyses with descriptive statistics showed that for students it is very important to have supervisors with common research interests and that will help with publishing in local and international scientific journals. Less expected attribute of supervision in students' perspective is good managing skills, involving them in funded projects and keeping written notes during and after meetings with them. For supervisors, the most significant elements of effective supervision are development of students' critical thinking, facilitating them to work independently, and the presence of common research interests. What supervisors did not like as an attribute in effective supervision are organization of communication with international institution to help

with passing international practice, being a good manager, and keeping notes during the meeting with students.

The third question was directed at exploring differences in attitudes of students and supervisors toward academic supervision and opinions on elements of effective supervision by participants types, year of students' education, supervisors' academic degree, gender of both parties. Cross tabulation and ANOVA analyses showed significant differences between male and female students toward supervision in organizing meetings on demand with supervisor, men students being more flexible with it. Also, females more often strictly requested periodic updates than males. Male supervisors' gender negatively affected female students in understanding supervisees' individual requirements on research and help in negotiation of agreement with international practice institutions. In comparison between supervisors' and students' attitude toward supervision, it was found that supervisors' attitudes were more positive toward student involvement in research project teams, research proposal revision for manageability and feasibility, scheduling regular meetings, and support, and guidance provision for the research process. Supervisors stated that being accessible on demand was more significantly important than from students' perspective. Differences regarding attitude toward supervisors' knowledge in publishing scientific papers in international journals by students' age showed that 31-40 years students were less gratified than other age categories. A comparison of students' education year revealed that first year students were more satisfied than the graduating students in having help for critical thinking development and supervisors' understanding of their research capabilities. Third year students did not find organization of seminars as an attribute for effective supervision in comparison with other courses. Academic degree played a role in differences on effective supervision element too; PhD titled

supervisors do not agree that supervision experience matters in supervision in comparison with Doctor and Candidate of sciences. Both Candidate of sciences and PhD converge that knowledge of publishing in international journals is important in comparison with Doctor of sciences. Younger supervisors, those under 40 years, are more positive toward supervision of students according their individual abilities and in the negotiation of communication with foreign universities, than the older generation of supervisors.

Limitations

The study was conducted in a private Kazakhstani university in Almaty, with limited and uneven gender, year of education, category participants. Even if it covered most participants in the university's Computer Sciences PhD students' population, it is only a single university among 130 available Kazakhstani HEIs. Accordingly, it is not possible to generalize results of the study related to PhD students' and supervisors' exploration toward supervision and opinion on attributes of effective supervision to all of the country's universities. Nevertheless, contrary to these limitations, the findings of the study definitely have implications for PhD students, supervisors, university administration, leadership, and policy makers. Also, the results of the research can be a useful step for future research studies.

Implications

Those who embrace these study results should understand that the results are related to a private university and Computer Sciences specialty within the current Kazakhstani context of Higher Education. The rules and regulations in Education are transforming often, that is why, better to check them before any changes are performed. Students and supervisors should understand that participants from other specialties can have different attitudes toward academic supervision and options regarding attributes of effective supervision.

Faculty/university administration and leadership have to consider that students and supervisors have different points of view toward supervision and try to find the way of organizing synchronous understanding and satisfying both parties, and clarifying rules and regulations in universities that will clarify the roles of each party in the PhD education process that can enhance current situation with PhD dropouts. For policy makers, it is better to pay more attention to tensions regarding the requirement on the number of scientific papers before defense and organization of trainings together with university management teams for PhD supervisors.

Future Research

This study explored PhD students' and supervisors' attitude toward supervision and their options regarding attributes on effective supervision, and found significant differences between participants. It is suggested that more studies should be conducted to understand these issues more deeply of qualitative, well-supported research with the goal of improving the current situation with PhD studies.

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