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SHIFT IN PARADIGM: STARTUP BUSINESS-INCUBATION AT UNIVERSITIES DURING THE EDUCATIONAL DISCIPLINE INSIDE OF CURRICULUM RATHER THAN EXTRACURRICULAR ACTIVITIES OF STUDENTS

Abstract: Diploma or Dropout - it is argued, whether graduation is more important than a successful startup. Students drop either college or their ideas. A presented exploratory study about the incubation of technological startups among students tries to solve this contradiction. The curricula business incubation as the educational discipline inside of the curriculum was offered in opposition to the extracurricular activities of students. There is not a lot of data about this model of student incubation outside of the university's entrepreneurship center and every contribution is valuable. The used research method is Qualitative studies, so the surveys among students are conducted during and after the incubation process on the educational discipline "Startup & Technological Entrepreneurship". At the end of this research, the framework was proposed, a set of actions, for helping students to go all the way from Idea to Product and Techno-Business. The framework is tested on a limited number of students in several universities in developing countries. The experiment is about embedding the syllabus into the Curriculum and measuring of achievements of students. The course is supposed to be elective and only students wishing to develop something are accepted. Later, interviews are conducted with two groups of students: those who passed the offered course and those who tried to develop startups independently. The final aim is to prove whether the inter-curricular framework works and how it overperforms other similar extra-curricular solutions.

Keywords: startups, model of business incubation, accelerators, technology incubators, new technology-based firms, entrepreneurship, innovation, university spin-off, student new ventures.

Introduction

This solution aims to solve the problems of lack of time and motivation for student startups [1] and the shortage of resources at universities for running a full entrepreneurship center. The problem of highly motivated students with scaleups is also known as "Bill Gates's Dilemma" about choosing between finishing university or growing startup. The problem of idea-stage students is different: we need to awake a dormant entrepreneur and stimulate his activity [2]. During studies, undergraduates have no specially allocated time and structured plan to develop ideas into Products. As well, students experience a lack of long-term motivation. Students drop extracurricular business-incubation because they evaluate final marks of other subjects higher than attainable entrepreneurship skills and the possible success of their new venture [3]. Students are good at creating something new and universities could considerably help them. University reputation also adds to the tenants' marketing potential [4].

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Universities of developing countries needed help to afford a full staff for an entrepreneurship center or classical business-incubator. Nevertheless, there is an internal interest to try and support something new. Technology Licensing (or Transfer) Offices (TLO/TTO) do not have a place for students [5]. Student Business Incubators (SBI) could work as a fame generator and supply universities' marketing departments with news hooks about the participation of college representatives in startup competitions and wins of prepared student teams. SBI advertises an opportunity to become a successful techpreneur like Elon Musk. It helps during admission because it attracts schoolchildren to apply to the university. External forces like the government or stakeholders push the question.

"Universities have resisted, molded, and finally co-opted a new organizational form in response to a decade of political pressure. ... Responses are influenced by resource availability" [6].

Here comes the issue that it is hard to hire a knowledgeable manager of the Entrepreneurship Center and pay salaries to the full staff of Student Business Incubators (SBI). Hence, SBI should be self-sustainable or at least a low-consuming entity. Otherwise, *"When funding ceased, the universities responded by 'deleting' SBI* [7]. Talents are equally distributed, but access to opportunities for talent utilization is unequal. The purpose of University Technology Business Incubation (UTBI) is to create Technology-Based Firms (TBFs) [8]. Can we create TBFs during the student's study?

On the other hand, there is doubt about whether we should teach entrepreneurship or not because some researchers found out that "Entrepreneurial education" decreases the probability of a person having entrepreneurial intention by 9% [9]. Nevertheless, the student should have a realistic view on entrepreneur's life and understand that creation of a new venture is not for everyone. If we teach, then we should clearly distinguish between traditional entrepreneurship and technological entrepreneurship as it is done in books like "The Startup Owner's Manual" [10]. Technological Business implies exponential growth with fast scaling but does not assume the creation of a large number of new job places. It is important to note that there are different types of programs: a business incubator, a business accelerator, and a hybrid model combining both [11].

Definition 1. Incubation is the supervision of founders from the idea stage to Product, i.e., from Maximum Competitive Idea (MCI) to Minimum Viable Product (MVP). If a problem-solution fit (PSF) is found, MVP is ready and the first sale has happened, then startup founders could go to Accelerator and search for an ideal product-market fit (PMF).

Definition 2. Acceleration is the multiple directional growths of a Minimum Viable Organization (MVO) in terms of income, number of clients, geographical area, and other directions. Such startups are frequently named scaleups.

Scrutinizing only incubation programs, we distinguish between the idea-focused and the entrepreneur-focused selection as well as between "picking-the-winners" and "survival-of-the-fittest" selection [12].

As we see in the literature, there are several limitations. The literature states that startup business-incubation at universities in developed countries goes inside of Entrepreneurship Centers. Such an approach is not affordable for struggling universities in developing countries, and students need to be more mature and conscious in 3d world states. For developing countries, TBI could be the educational discipline inside the curriculum rather than students' extracurricular activities. Our approach of "curricula business-incubator" in the form of educational discipline is much cheaper and easier to embed. Every university could launch the course with only 1 prepaid teacher in "flipped class" pedagogical methodology instead of hiring at least 7 people as the full staff of a minimal classic business-incubator [13].

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Problem Statement

The research problem statement is formulated as follows: it is necessary to develop an author's model of startup incubation, which includes: an incubation program, a teacher-manager of the curriculum, students as incubatees, and an incubation space. Conduct approbation in the university environment and evaluate the effectiveness of the proposed model.

The research question is to develop an affordable/easy-to-embed/innovative, and effective model of business incubation within universities' educational programs.

Objectives:

1. Give students an understanding of the entrepreneurial process and the skills required by an IT businessman;
2. Improve IT knowledge, Agile, teamwork and soft-skills of students;
3. Create own startup in teams of 3-5 people with working products (MVP);
4. Connect students with the industry via events visiting from appropriate verticals;
5. Acquire first customers and make the first sale;
6. Become a resident of the Acceleration Program;
7. Develop entrepreneurial thinking, business mindset.

Materials and methods

Initially, a typical business incubation program was taken from the industry and offered to students of "KBTU Startup Incubator" at Kazakh-British Technical University. During the incubation process, many Student Problems arose, such as:

1. Consciousness of students: unserious, undergraduates barely know what they want;
2. Longterm motivation: "highest highs" and hardly overcoming "lowest lows";
3. Evaluating marks of other subjects higher than attainable entrepreneurship skills;
4. Avoidable milestones: deadlines for every step;
5. Absence of a structured plan to develop ideas into «Product»;
6. Digestible incubation format with intermediary controls such as quizzes, mid-term, end-term, and final exams.

Classical business incubator (BI) expects highly motivated founders who are maximally involved in their startup without external activities like a full-time job or education. On such input, BI produces new stable businesses in the form of the juridically registered company as an output. The Key Performance Indicator (KPI) is the number of new enterprises and job places created. University Technology Business Incubator (UTBI) has university staff, BSc, MSc, and PhD students as input [22-23]. For example, "KBTU Startup Incubator" conducts an incubation program only for undergraduates who are going to receive a Bachelor's Degree. So, we can explain all the above-mentioned problems from our experience and define other KPIs. Unconscious students come to UTBI with the "yesterday born idea" or are just willing to do something valuable without any idea. It is reasonable that they are highly inspired at the beginning and "ready to move mountains". We could call such high motivation as "The audacity of zero" according to the book "Lean Startup" [14]. Students quickly ignite and soon go out. Therefore, it is necessary to quickly assemble a team around the dreamer and bring them under commitments such as finishing the incubation program and performing at competitions. Otherwise, after several weeks, students meet deadlines for other educational subjects and get rid of the incubation program. If the process stopped once, it is hard to relaunch it. The solution was to equalize the perception of other education disciplines and entrepreneurship courses, i.e., put marks for everything. When motivation is exhausted, and students are at their Lowest Lows, they are obliged to continue for the sake of the grading points and by continuing, they return to the Highest High state of mind again. University grading policy is not avoidable, unlike deadlines of incubation programs. Third-party incubation programs do not fit into the

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standard university 100 points grading with quizzes, boundary control, and practical and theoretical mid-term, end-term and final exam. Hence, the whole "zero-to-one" path should be decomposed into small parts that students simply could not avoid accomplishing them. So we adapted grading for the incubation to the educational process of the Bologna credit system. Such a well-defined structured learning plan (syllabus) brings certainty into the VUCA-world of extreme uncertainty. The main goal is not only the actual creation of a new enterprise, but rather the study of the process of its creation. We teach "how to fish", not "how to catch a fish". [16-21]

Taking into account all aforenamed transformations, we could combine the KPI of the student business incubator:

1. Number of trained students;
2. Number of formed teams;
3. Number of created MVPs;
4. Number of applications to the acceleration programs and number of accepted startups;
5. Number of visited external events;
6. Number of victories in competitions;
7. Number of guest lecturers.

The amount of students who passed the training program makes a "contribution to sponsoring the university's mission" [15]. We should measure the number of students who went through the incubation program from beginning to end. We could measure it in absolute numbers and recalculate it in relative percentages from the total amount of university contingent. Teamwork is the cornerstone of a successful startup and elective subject for all specialties of all years from all faculties supposes different opinions and brings synergy. Guys should form cross-faculty multidisciplinary teams and work together. Their aim is to create MVP, which solves the problem of customers without problems. That is how they find Problem/Solution Fit (PSF). If the first sale has happened and the business-model has been generated, then teams apply to acceleration programs. Acceptance to the accelerator means the next level of the startup in the ecosystem hierarchy and serves as a confirmation of the quality of startups from a business incubator. Visiting external events gains publicity for the university and recognition in the startup ecosystem. As well, students have contact with the industry through professional mentors and networking at events. Victories in competitions generate fame for the university, news feeds and waves of applicants. Invitation of guest speakers demonstrates the role models for students. As the outcome, we get the prepared startups-teams with MVP, perfectly integrated into the startup-community, who are ready for Accelerators. Every student has the skills-set of a Product Manager and a job-hiring record in CV about their experience in a team startup project.

To achieve the goals of the author's curriculum-based incubation model, the following teaching methods are used:

1. Flipped class – when students watch video lectures and presentation slides at home and then teach the teacher (classes are more interactive and collectively students are more productive);
2. PBL – Project-Based Learning when students instantly apply the knowledge to their projects and therefore study deeper (education for themselves);
3. P2P-learning – mutual peer-to-peer education, when students teach students (explanation in simple words);
4. Massive Open Online Courses (MOOC) – when many students, along with other universities go through the educational program (sense of community);
5. Chat-bot in Messenger – automatically sends tasks and reminders according to the schedule to push the student through the program (auto-funnel in WhatsApp/Telegram);

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6. Guest speakers – invited experts from IT-Business (successful role models);
7. Brainstorm from the very beginning for devising a new Idea and pivoting it during the course.

Consider the method of business incubation in the university environment (Figure 1). The effectiveness of this method is due to the possibility of implementation in any educational organization, regardless of the specialty of students.

The proposed method can be divided into the following main stages: 1. Study of the subject area. 2. Analysis of the received information. 3. Observation. 4. Experiment. 5. Practical implementation. 6. Evaluation of the effectiveness of the developed product. 7. Sales to the end user.

At the first stage, market research is carried out, searching for promising projects, selecting the target audience, and guiding the startup. Several successful, profitable startups are selected as an example. The criteria for selection are the ease of implementation of the idea, the payback period, the required amount of investment to launch the project, and the popularity among end users.

The second stage is necessary for a detailed analysis of the structure and methods of implementing the selected projects, highlighting essential aspects, and searching for the key "idea" of a successful startup to develop students' startups from the chosen subject area.

The next stage is observation, which includes considering the target audience of the future startup and its characteristics in order to create a "unique value proposition" (UVP). Customer Development, a detailed study of the end user's needs, allows the creation of a product that best meets the requirements of potential buyers or users.

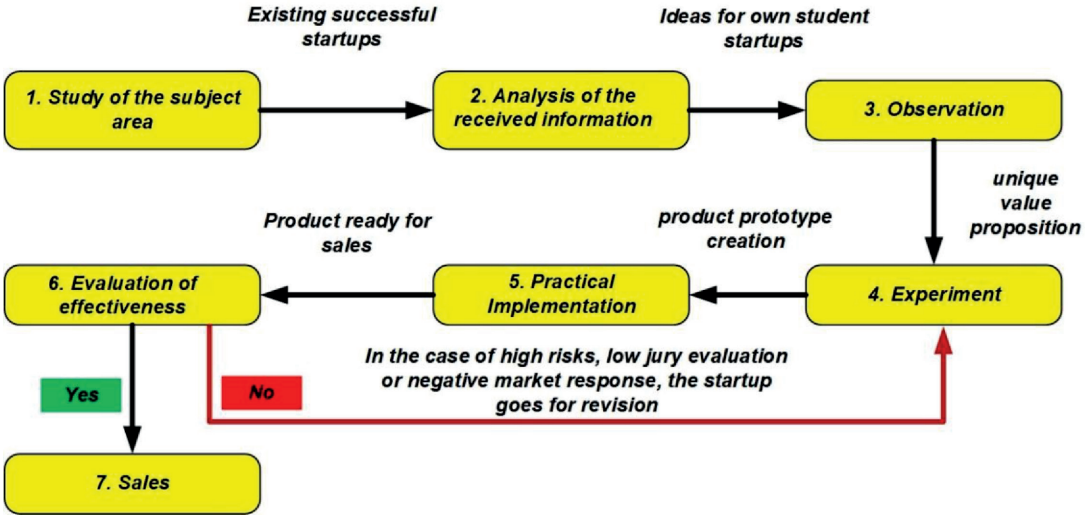

Figure 1. Method of business-incubation in the university environment

The experimental stage involves developing end-product prototypes, models, or mock-ups for testing, validation, and fixing weaknesses. This stage is accompanied by developing technical parts and economic components (pricing issues, cost, and payback period of the final product).

The next step is practical implementation and obtaining a finished product that enters the market and is ready for sale.

However, an important step is to evaluate the effectiveness of the developed product and make a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). To do this, a risk assessment matrix is compiled associated with launching the proposed products for sale. The

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expert helps the founders draw up a table with the requirements for the finished product. An expert can be a mentor or a course-lector with practical experience in preparing successful startups. Students can also validate their ideas/products via startup competitions with a highly experienced jury. During demo days and predemodays jury assess the startup by 10 criteria with 10 scales grading – thus maximum score is 100 points. If the average score is less than 50 points, the startup has high risks, and it is necessary to send it to stage 4. "Experiment", for further refinement. Nevertheless, the market is the best checker.

The final stage is the first sale to the end user. At this stage, the startup authors must achieve an actual sale using the developed "unique value proposition" obtained in stage 3. "Observation".

Development of a business-incubation model

Considering the author's business incubator model, the solution of the tasks was carried out using the algorithm shown in Figure 2.

Qualitative Problem-Driven Research focused on the UTBI field started from the Literature Review of the most related articles, conference proceedings, books, and governmental and NGO reports. Then all knowledge was combined into a research proposal. After that, we made corrections to the initial framework to conduct several more experiments in the form of business incubation. If surveys for incubatees indicate qualitative and quantitative improvements, then we could spread the framework worldwide (Figure 2). Important to notice that correction of the framework should NOT stop and will be continued in an iterative-incremental manner.

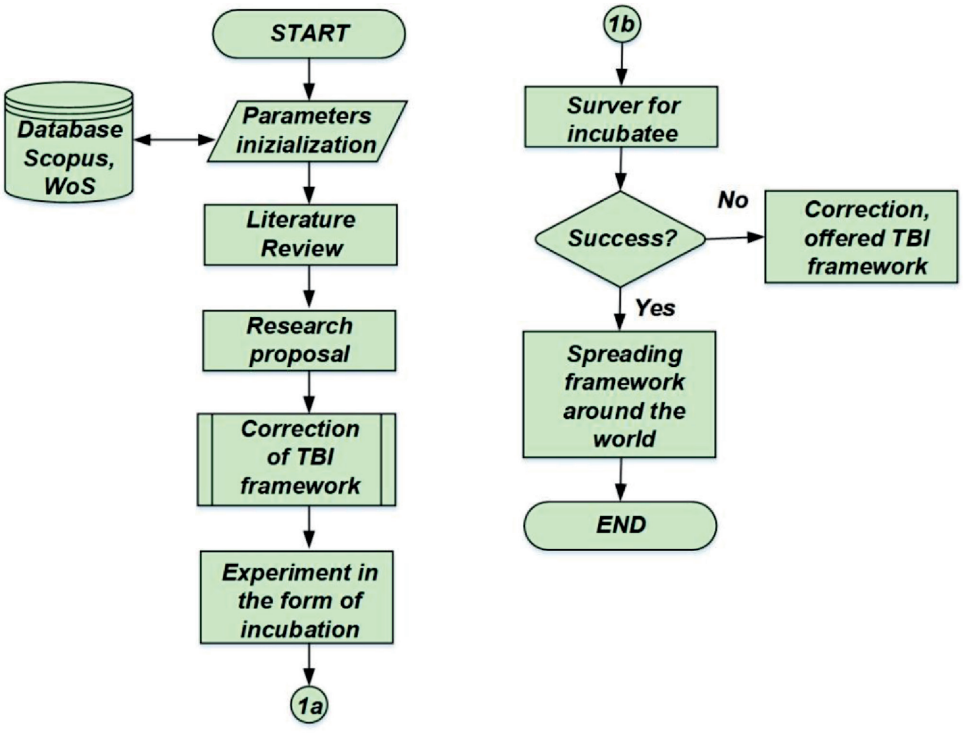

Figure 2. Workflow during the research

The 1st incubation program was running "as is" in request-response mode, i.e., "come if you have a question." Such a model does not suit students because they frequently have no questions or are shy to ask them. Starting from the 2nd batch, the incubation program was based on industry expertise from the vastly known VC fund. All educational content was composed only by practitioners from the field. A steady educational program was offered, but it was unclear how to evaluate student startup teams and their progress.

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Table 1. Comparison of proposed incubation model and analogues

№	Advantage/ Disadvantage	Proposed Startup-Course.com	IIDF starthub.vc	PBK rvc.ru/eco/education/innovative_economy/	CS183 Stanford Y-Combinator	МФТИ+ ФРИИ coursera.org
1	Academic structure according to Bologna education credit system with 100 points	✓	✕	✕	✕	✕
2	Smartphone friendly	✓	✕	✕	✕	✓
3	Automatic tests	✓	✕	✕	✕	✓
4	Open-ended questions	(✕)✓	✓	✓	✕	✕
5	Digest of videolecture	✓	✕	✕	✕	✕
6	Friendly URL for every lesson	✓	✕	✕	✓	✕
7	Glossary with main terms	✓	✕	✕	✓	✕
8	Chat-bot with autoreminders (autofunnel)	✓	✕	✕	✕	✕
9	Subtitles (EN, RU, KZ\\)	✓	✕	✕	✕	✕
10	Local success stories	✓	✕	✕	✕	✕

The incubation process was slightly improved and adapted to the university program.

Algorithm 1:

Step 1. Notification. Spreading information about the course and elective subject (via intranet, public chats, social networks, banners, leaflets, etc.). At the first stage, the collection of applications of candidates for the course is carried out. The application consists of personal data of candidates: information about achievements, talents and a motivation letter for participation in the program. Analysis and selection of candidates for the program.

Step 2. Motivation and Inspiration. Idea generation and refinement (Brainstorm, TRIZ, SCAMPER, etc.). Conducting creative workshops to form goals, creative ideas and analyze the sources of existing successful startups

Step 3. Formation of teams. The team consists of a minimum 2 people. The roles are distributed as follows: one candidate is a “hacker”, and the second is a “hustler”. The first team member must have technical competencies to create the Product, and the second must have marketing skills.

Step 4. Determining the Target Audience. At this stage, team members should break down the Target Audience into Customer Segments. Create a Unique Value Proposition (UVP) for each segment.

Step 5. Customer Development. Studying clients through the problem interviews.

Step 6. Analysis of competitors. Direct and substitute products. Market size calculation.

Step 7. Create an MVP. Product implementation according to MCI.

Step 8. Making a presentation for investors and start-up competitions. preDEMODAY

Step 9. Generating business models on a canvas. Running HADI (Hypothesis-Action-Data-Insights) cycles to test hypotheses. Finding the best monetization models.

Step 10. Calculate unit-economics and measure MVP metrics.

Step 11. Product pricing calculation.

Step 12. Carrying out marketing activities aimed at selling the product to the consumer.

Step 13. Product validation in sales channels. Scaling with positive unit-economics

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Step 14. Search for venture investors. Exploring investment rounds pre-seed, seed, A/B/C. Business angels and crowdfunding

Step 15. Presentation skills. Public speaking. DEMODAY.

Every Lesson consists of 3 parts:

1. Where have you been? What have you seen? (list of the passed ecosystem events)
2. Checking the lecture notes and tests. Discussion of the current topic 1-15. How did you apply it? What to add to the materials?
3. Where will you go? What will you do?

Unfortunately, no quantitative data was gathered during that first incubation. Since the 3d and 4th batch, we started to gather incubatees information. Net Promoter Score (NPS) was introduced in the 4th batch.

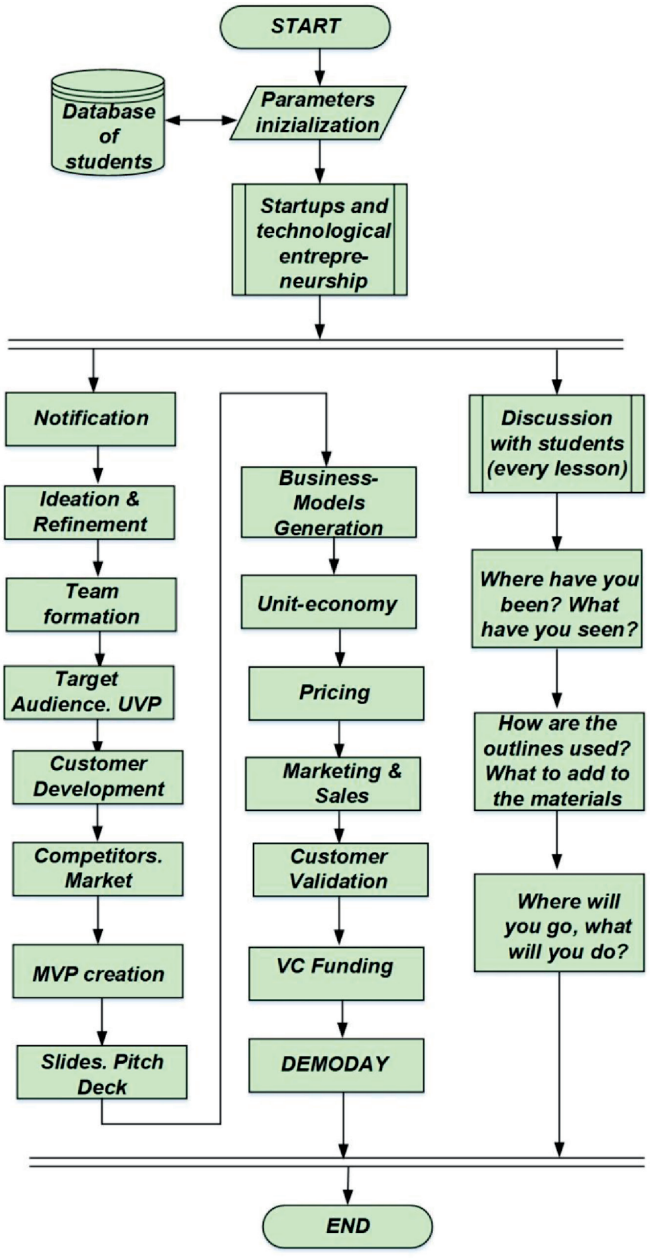

Figure 3. Algorithm of the Incubation

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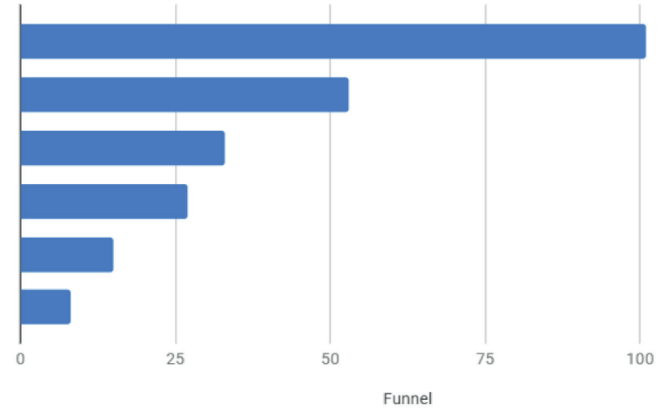
We can see that conversion was only 8 % (Figure 4) during the 4th batch. Half of the startupers left the program when asked to show their commitment by seriously treating the incubation program as any other educational discipline. All incubatees had a chance to drop the incubation program and work not only for fun but for satisfying customer needs.



People	
503	clicked on the link startup.kbtu.kz/apply
101	applied to Virtual Business Incubator
53	updated information about extracurricular/curricula
33	passed the lesson № 1/15
27	came to the lesson №2/15
15	finished 15 out of 15 lectures till the end of semester
8	got certificates about finishinig the course

Figure 4. Funnel of the experiment during the 5th batch

Later we started to correct the incubation program in accordance with the scientific view and combine it with the previous expertise from the field. Articles on best practices cite huge reports from governmental, business, and non-profit organizations, and this material is rigorously scrutinized to find new insights and correlations.

Figure 5 shows the interaction of the main elements of the proposed business incubator model.

The incubation model consists of the following:

1. «incubation program» – elective discipline in «flipped class»;
2. manager of curricula business-incubator – teacher with video-lectures from the field experts;
3. «incubates» – students with the initial self-motivation and later motivation by marks and cash prizes on startup competitions;
4. «incubation space» – lecture-halls and startup's corner in the coworking.

All the elements mentioned above form an ecosystem for STUDENT business incubation at the university. We also add external startup competitions for pitching skills and professional feedback, finding industry mentors, and involvement in the community in corresponding verticals and the innovation ecosystem. The offer is qualitative rather than quantitative. That is why a super-goal and expected outcome is prepared startups-teams with MVP, perfectly integrated into the startup-community, who are ready for Accelerators.

The goal is to give students an understanding of the entrepreneurial process and the skills required by an IT businessman, grow business-oriented students with an entrepreneurial mindset (sees the problem - offers the solution), and shifts youngsters from dependent thinking

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to proactive behavior. Students could become intrapreneurs in their future job places.

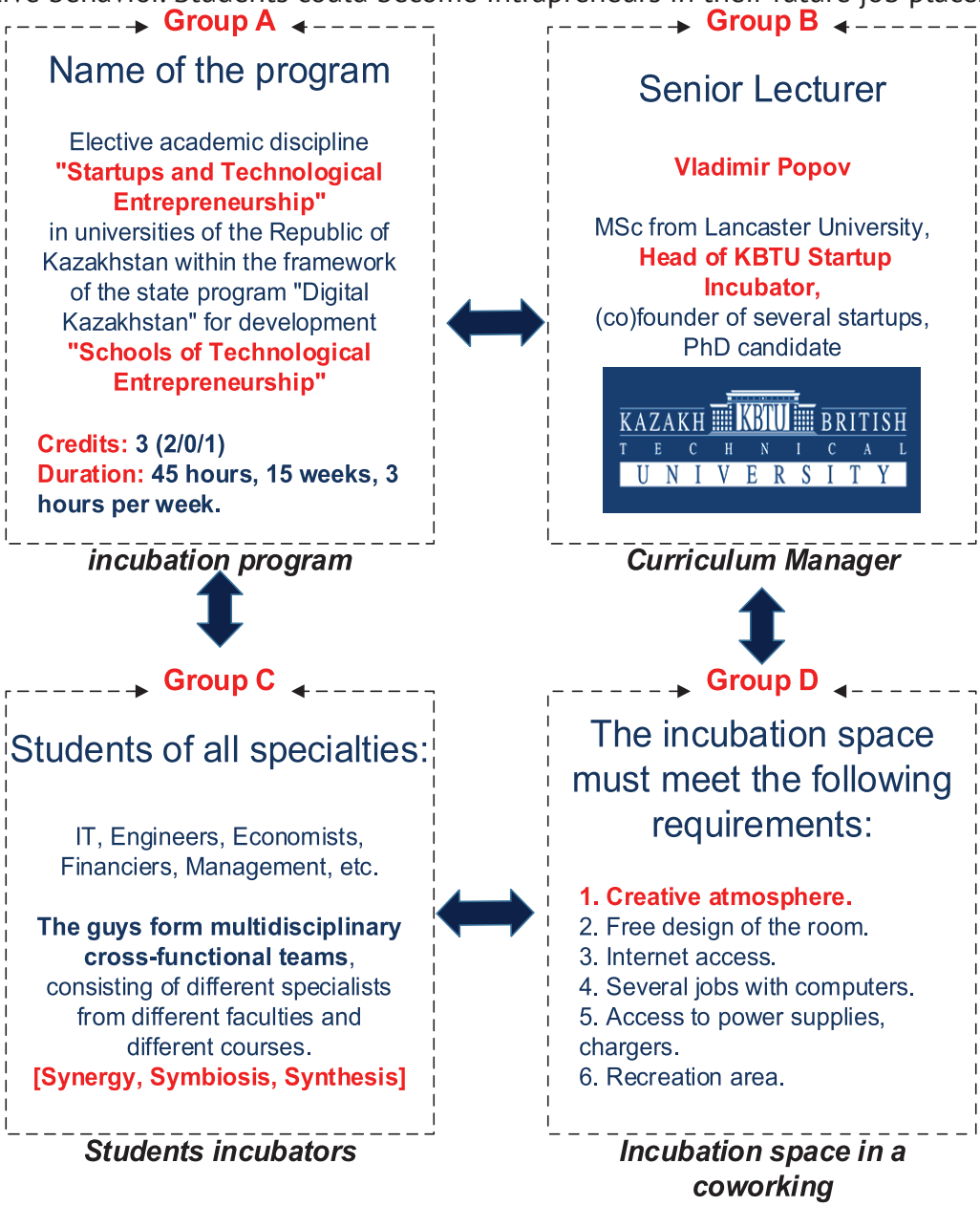

Figure 5. Model of business-incubation

We assume that the proposed framework is more efficient with university resources and presents a new capability for students and higher education institutes.

Hypothesis: Curriculum elective subject increases the success-rate of student startups and mastering of techpreneurship knowledge in comparison with extracurricular activities of students.

Results

The goal of the incubation program was to increase the quantity and quality of startups. If incubatees are happy, then they are ready to continue their projects. Feedback about lessons was introduced since the 4th batch, and measurements were done at the beginning (376 students), in the middle (244 students), and at the end (213 students) of the incubation program (Figure 6). The average mark varies from 8.27 to 8.37. It is expected to go down in the middle of the

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semester when students are distracted by other disciplines and blame business-incubator for the lack of time. Nevertheless, we could infer that students generally like it.

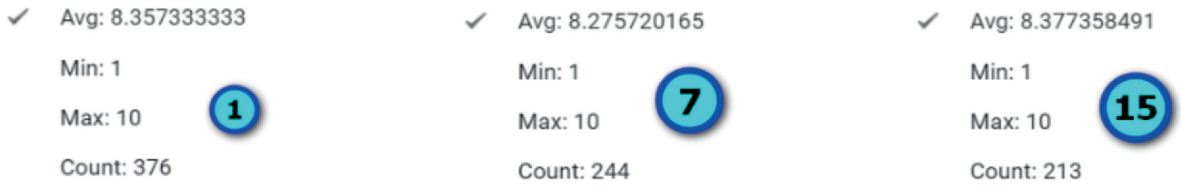

Figure 6. Evaluation of the incubation program by incubatees

The 7th batch was interviewed separately several weeks after finishing the incubation program. The questionnaire was anonymous. NPS (Net Promoter Score) was 41.1%, considering that 47% was neutral. The loyalty index is the satisfaction of incubatees, and this rate is considered good when its value is above 30%. More than 50% is an excellent result, meaning that half of the customers are happy with the interaction. All that is more than 70% is excellent! Anything below 30 is considered a bad indicator. We have a value of 41.1%, which is good.

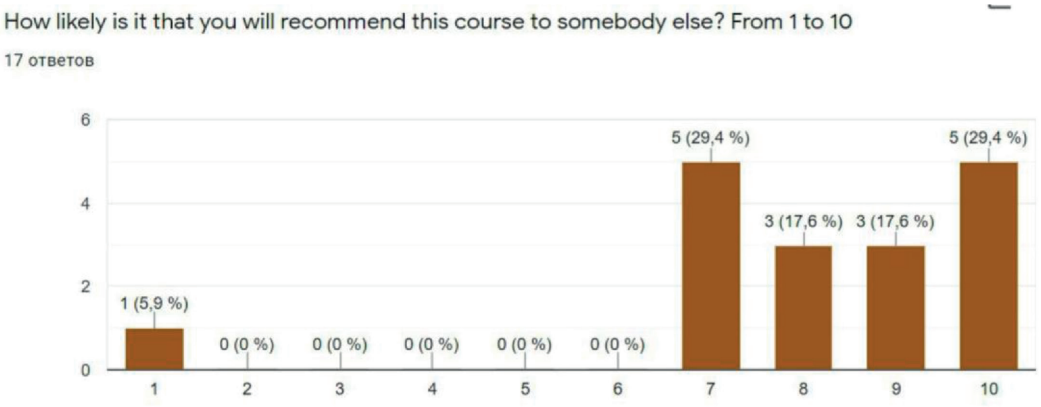

Figure 7. NPS of the 7th batch

NPS shows the excellent performance of our incubation program. On the opposite, it weakly demonstrated the performance of incubatees. There should be more soft measures added to the evaluation.

Conclusion

The proposed framework works on a suitable level, require much fewer resources, and could be adopted by many universities in developing countries. Success-rate of student startups is higher if business-incubation goes during curriculum elective subjects instead of students' extracurricular activity. It is much easier for universities to acquire the external incubation program and dispatch it to a responsible lecturer. Start from such a curricula business incubator and run a full entrepreneurship center only after incubatees show outstanding results.

The scientific novelty of the conducted research lies in the fact that, for the first time, it is proposed to modify the educational program for students of technical specialties, taking into account the introduction of a specialized elective discipline dedicated to the methodology of teaching students about technological entrepreneurship and startups. The proposed author's startup incubation model includes an incubation program, a teacher-manager of the curriculum, students-incubators, and incubation space in the coworking.

For further development, we should find peers in other countries and present findings at thematic conferences like World Incubation Summit (WIS) by UBI-global.com or the International Conference on Business Incubation (ICBI) by InBIA.org. Successful student business incubators rarely share their tips & tricks in scientific articles. There is a need for a clear comparison and division between student business incubators, academic business incubators, and university business incubators. Divide student business incubators according to the source of financing. Keep in mind the difference between Technological Entrepeneurship and Traditional Business. Find out the best place for hosting such a technological entrepreneurship hub and embedding the syllabus: either into engineering school or into business school [16].

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