



VILNIUS UNIVERSITY
BUSINESS SCHOOL

**METHODOLOGICAL GUIDELINES FOR A START-UP
CAPSTONE PROJECT**

DeepTech Entrepreneurship Master Degree programme

Vilnius University Business School, Faculty of Physics, Faculty of
Mathematics in cooperation with CERN (the European Organization for
Nuclear Research)

Vilnius, 2024

Prepared by: *Prof. Dr. Saule Maciukaite-Zviniene and Prof. Dr. Aurelijus Rinkevicius*

Reviewed by: prof. dr. Christoph Schaefer

Vilnius University Business School

Approved by the Council of Vilnius University Business School 25-03-2024 Protocol, Resolution No. (1.2 E)
280000-TPN-1

Table of Contents

INTRODUCTION	6
GENERAL INFORMATION	8
AIM AND OBJECTIVES OF A CAPSTONE PROJECT	10
REQUIREMENTS FOR UNDERTAKING A GROUP CAPSTONE PROJECT	12
ADVANTAGES AND DISADVANTAGES OF GROUP ACTIVITIES	12
GROUP STRUCTURE AND DIVISION OF TASKS	13
SUPERVISION AND PROGRESS MONITORING	13
ASSESSMENT PRINCIPLES FOR INDIVIDUAL CONTRIBUTIONS	13
A CAPSTONE PROJECT PROPOSAL	14
TIMELINE	14
GUIDELINES FOR A CAPSTONE PROJECT PROPOSAL	15
ASSESSMENT OF A CAPSTONE PROJECT PROPOSAL FORM	17
A CAPSTONE PROJECT PROGRESS REPORT	18
GUIDELINES FOR A CAPSTONE PROJECT REPORT	18
ASSESSMENT OF A CAPSTONE PROJECT REPORT FORM	18
A FINAL CAPSTONE PROJECT	19
LAYOUT	19
STRUCTURE	19
GUIDELINES FOR A BUSINESS PLAN	22
ASSESSMENT FORM OF BUSINESS PLAN	25
ASSESSMENT OF A FINAL CAPSTONE PROJECT	26
A CAPSTONE PROJECT POSTER PRESENTATION	27
REFERENCES	29

INTRODUCTION

Upon satisfactory completion of the second-cycle study program “DeepTech Entrepreneurship” requirements, the master student is required to prepare either the final traditional master’s thesis¹ or the research based start-up capstone project (hereafter- a Capstone Project), to apply his / her skills and knowledge in concrete research and business problem solving and eventually qualifying for master’s degree or developing an innovative start-up qualifying based on scientific foresights for master’s degree as well.

This methodological guidelines are for „DeepTech Entrepreneurship“² students who choose individually or in a group to develop an innovative research oriented start-up and underline generic rules for final preparation, technical requirements and defense.

A Capstone Project is an opportunity for students to demonstrate that they can indeed meet the levels of performance expected of a professional with innovation and science-backed leadership qualities and entrepreneurial skills. A student has individual responsibility for the timely completion of a significant Capstone Project under the guidance of an individual supervisor(s) and will be expected, only if applicable, to establish a start-up during the study process or after within a year. A student or a group of students (maximum 3 students) will be expected to demonstrate a professional level of preparation, planning, execution, testing and documentation of innovative solution, also deep understanding of research methodology and business analysis. A student or a group of students also will be expected to meet a number of strictly enforced milestones and to take considerable initiative in overcoming obstacles. A Capstone Project is one of the ways of determining whether a student is ready for graduation and acquiring master level qualification.

A Capstone Project is an independent, original project merging research and business analysis which requires enhanced information, skills and knowledge management competences. A Capstone Project is based on business intelligence and diverse research methods, also leading to business and research problem solving via conceptual, scientific, and practical approaches and finally establishing a start-up if applicable. Students are encouraged to demonstrate their capabilities to apply all the previously acquired knowledge and skills.

¹ https://www.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

² Master Degree programme. Coordinated by Vilnius University Business School in partnership with Vilnius University Faculty of Physics, Faculty of Mathematics and Informatics, and in cooperation with CERN.

A Capstone Project is usually conducted throughout four stages: first of all, the topic (business oriented research based solution) which is related 1) to strategic sustainable development goals 2) CERN related area of interest or CERN technologies¹ 3) innovation oriented solution is selected. During the first stage a preliminary innovative solution with potential for commercialisation is elaborated as proposal. The preliminary topic is proposed by a student or a group of students, in individual cases a topic might be proposed by also by scientists of Vilnius University. The selected case should be presented to appointed capstone development mentors (hereafter-mentors) and later to Study Programme Committee (hereafter Committee) for case approval and confirmation of supervisor (s) During the second stage, research and business strategic context-related information and elaboration of innovative solution to a strategic problem are covered; The third stage is oriented to preparation of analytical part and business plan, including development strategy, implementation and testing results, prototyping, etc. At the final stage - research and business analysis results, conclusions, recommendations and defense processes are organized. The students are also expected, however, it is not strictly compulsory for graduation (each case is individually evaluated), to proceed with establishing their own research oriented start-up at the final stage. Students should also show the skills in attracting investments for the first phase of start-up development and when upon availability participate in national and international pre-acceleration programmes.

A successful defense of a Capstone Project means that a student has successfully met study programs' requirements, reached the expected learning outcomes of "DeepTech Entrepreneurship" programme.

A Capstone Project should follow the Law of the Republic of Lithuania on Copyright and related Rights, the description of study cycles approved by the Order of the Minister of Education and Science of the Republic of Lithuania No. V-1012 on 17th November 2016 (revised 2020 10-15 No. V-1569), the Business study field descriptor approved by the Order of the Minister of Education and Science of the Republic of Lithuania No. V-1664 on 14th September 2021.) the ethical standards defined by the Code of Academic Ethics of Vilnius University approved by the Resolution of the Senate of Vilnius University No. S-2018-4-4 on 17th April 2018 (revised of Resolution No. SPN-54 as of 21 October 2020) as well as the Regulations for the Preparation, Defence and Storage of Research Papers of Students Studying at Vilnius University, approved by Resolution No. S-2017-12-11 as of 19 December 2017 (with later amendments) of the Vilnius University Senate. The final Capstone project should be prepared honestly and independently under the consultancy of supervisor (s) of the final master's work. Students are referred to Vilnius University rules regarding academic misconduct, including cheating and plagiarism, and also

¹ CERN technologies. Access to the link: <https://cernventureconnect.web.cern.ch/technologies>

refer to the VU Business Schools regulation on the application of artificial intelligence tools.

Vilnius University Business School is using the adapted APA (American Psychological Association) style for the formatting of the academic papers (see the Master's Thesis Methodological Guidelines³). Some relevant information on the Capstone Projects is listed in the References of this guidelines.

GENERAL INFORMATION

Students should begin thinking about a Capstone Project early in their course of study. Students enrol for Capstone Project for all three semesters, the project ideally should be a work in progress during all study process leading up to enrolment in and completion of a Capstone Project at the final semester. The workshops are organised with programme committee chair and Mentors to ensure a comprehensive systemic approach in the whole process during all three semesters. The length of the Capstone project manuscript depends on the magnitude of the investigation, however, the minimum page requirement is 55-70 pages in content. In case of preparing the work in groups, the scope and volume of a work can exceed 70 pages (writing alone – not more than 70; two people should not exceed 80; while three people should fit into 90 pages), business plan, concept of prototype (if applicable) are added as annexes. Although students can decide which part of work, they individually cover, they need to show their expertise with regards to other colleagues' parts, participate in the defense and be capable of answering the questions of a defense panel (see other sections) References and Annexes are not counted in the number of pages requirement. All work of a student or a group of students should be under the supervision and advice of the mentors and Capstone Project individual supervisor(s).

Depending on the area of interest in students' professional field, the Capstone Project should be research oriented, creative, i.e. revealing a synthesis of scientific discussion and content knowledge, applied and addressing a real problem, externally oriented, include business development, outcomes of research discussion, testing and other results, and finally meet all other additional requirements defined in this document and regulation on master thesis. For a Capstone Project economic values are negligible and they should be demonstrated. For a number of capstone projects intellectual property may be an issue because Vilnius University or external stakeholder may seek ownership to some of the intellectual property associated with a capstone project, in such cases additional consultations will be provided and an intellectual property

³ https://www.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

agreement will be proposed under the regulation of Vilnius University (Intellectual Property Management Regulations of Vilnius University approved by the Resolution No. TN-2018-18 of the Council of Vilnius University on 19th December 2018), legal acts of the Republic of Lithuania and the European Union. Such agreement must be signed by all relevant parties (student/groups of students, owner of conceptual idea or conceptual patent and VU BS) after a Capstone Project Proposal is approved. In case intellectual property determined in the process of Capstone Project or initiating start-up the agreement is signed between a student or a group of students and VU BS.

If needed a student may have the use of laboratory areas of Vilnius University, but permission must be first obtained from the relevant laboratory supervisor. This is a formal procedure, because the resources are limited and these limited resources are determined by VU regulation.

In general, mentors should provide information support for external funding, also when possible organise joint hearings with potential investors, especially during the final stage of a Capstone Project. Students will be provided with information about Lithuania's CERN Business Incubation Centre (CERN BIC) and CERN Venture programme and if applicable will be gradually introduced with CERN possibilities, including CERN Idea Square programmes.

If a Capstone Project is undertaken outside Vilnius University, a student should provide details regarding an external co-supervisor, accompanied by a letter of support, also a risk assessment self-evaluation should be presented. There will be initial liaison between VUBS mentor and external co-supervisor to agree at an acceptable mode of operation that ensures a student's work is properly credited and other assistance is well-defined. VU BS mentor may visit a Capstone Project site at appropriate time to assess the context of a Capstone project and to liaise with external supervisor.

A Capstone Project supervisor(s) must be sure that the proposed Capstone Project has sufficient elements of definition, contextual analysis and specification to allow opportunity for full and fair assessment of student's performance on a task. These mechanisms are detailed in the Guidelines to be in place which allow every student's contribution to the Capstone Project to be visible and traceable and clearly distinguished from the contributions of others, especially if the Capstone Project is prepared by a group of students.

AIM AND OBJECTIVES OF A CAPSTONE PROJECT

Capstone Project is undertaken from the end of the first semester of the studies and it is an opportunity for students to demonstrate that they indeed meet the levels of performance expected of a professional DeepTech entrepreneur and explorer. While preparing the Capstone Project a student or a group of students (hereafter-students) will have individual responsibility for the timely completion of a project under the guidance of senior professionals. Students will be expected to demonstrate a professional level of preparation, planning, execution, testing and documentation, and also to meet a number of strictly enforced milestones and to take considerable initiative in overcoming obstacles. The Capstone Project is the way of determining whether students are ready to graduate. If students miss a milestone or submit work that is not of a professional standard, the completion may be delayed by one or more semesters.

Every student is responsible for getting a Capstone Project done on time to an acceptable level. A supervisor helps a student, but is not responsible for his/her performance. In particular, the submission of the final Capstone Project. A Capstone Project has important educational and scientific objectives. Although each Capstone Project is different and the relative emphasis will vary, students will be involved in:

- integrating knowledge and skills gained in the courses in general;
- reinforcing and developing competencies that have not been sufficiently emphasized in student's choice of subjects or earlier experiences;
- defining a substantial task for innovative solution and carrying it to completion to a professional scientific and business oriented standard;
- bridging the gap between his/her studies and entrepreneurial future, and demonstrating professional competencies and capabilities;
- demonstrating initiative and creativity, developing many of the attributes expected of a business graduate, like personal responsibility, information literacy, management skills, problem posing and solving, technical expertise, academic literacy, scientific exploration skills, investment attraction.

In addition to the above here are additional more general requirements for submission of a Capstone Project.:

- identification and visibility why a Capstone Project is valuable to society, for example who are the stakeholders, who is advantaged and disadvantaged, what are the criteria by which benefits and costs, including social, environmental, and success are to be determined;

- identification and visibility why a Capstone Project has an added value to applicable research and business, for example research exploration and its results impact on defined business sector and research field are to be explained;
- the extent to which students are individually responsible for the definition, planning, monitoring, control, design, implementation, verification, validation, and documentation of the Capstone Project;
- the extent to which every student work autonomously or are supervised on the Capstone Project;
- identification of the knowledge and skills every student has applied on the Capstone Project;
- identification of the competencies every student has developed through the Capstone Project.

REQUIREMENTS FOR UNDERTAKING A GROUP CAPSTONE PROJECT

These requirements apply when two or more (but not more than three) students are working on a Capstone Project and when a Capstone requires interdisciplinary knowledge from more than two research fields.

In the case of a Group Capstone Project the final project is:

- more complex and demanding;
- allowing for broader debate and discussion of process and substance;
- enriched with learning through discussion and group synthesis of knowledge;
- an opportunity to develop team leadership skills;

less complicated establishing a start-up.

Students should be aware that the assessments awarded to individuals may vary greatly within one group, even to the point where some students may not pass while others achieve distinctions. Each student will be individually assessed on their performance as a professional in the study field.

Group Structure and Division of Tasks

Each group must document and implement a management structure of their Capstone Project. Group leadership roles must be clearly identified including who has responsibility for monitoring a Capstone Project deliverables and group coordination.

This role could be shared amongst group members at various times during a Capstone Project process.

A group project is interdisciplinary, with students enrolled in different fields. Before commencing the Capstone Project there must be an agreement amongst all students involved as to the division of tasks within the Capstone Project. This agreement will form an integral part of the project initial proposal as well as part of the final Capstone Project itself. Appropriate contingency plans must be considered.

Supervision and Progress Monitoring

It should be known that students will be individually assessed on their performance, each student must indicate in the Capstone Project proposals their tasks, analytical parts, etc., which clearly identify those aspects of the Capstone Project which are the student's responsibility and those which are shared responsibilities. In progress and final projects should be included references to every group member where appropriate. If agreed students may include separate documentation. The Capstone Project should be setup from the start with the contingency plan in place so as not to adversely impact individual students

Each student in a group project must have the same supervision. Different individual supervisors for different students are not acceptable. It is recognized that some projects have a complexity, so they may require few supervisors.

Assessment principles for individual contributions during workshops

It is necessary to effectively assess the professional contribution of each student. These Guidelines provide additional criteria for evaluating individual contributions. As a guide, this should be clearly identified in the Introduction chapter. During workshops students present personal reflections addressing the following:

- the particular contribution of each student, in detail;
- how the group was structured and managed;
- the main research or innovation challenge solved by each student;
- the greatest management challenge faced by the group;
- lessons learned in how to complete a group project to time and specification;
- relative contribution to the overall capstone project by each group member;
- timesheets showing all hours spent on the subject and the task done in those hours.

If agreed group members are allowed to prepare individual reports on their performance.

A CAPSTONE PROJECT PROPOSAL

The Capstone Project Proposal (or Proposal) is intended to be a planning document of a Capstone Project. It should present, in sufficient detail, key aspects, such as timeline, objectives, team capabilities, etc., of the anticipated Capstone Project's initial conditions (ingredients), needed efforts, and "milestones" that correspond to a successful completion of the Capstone Project itself. In other words, it should serve as a plan regarding how and what needs to be done in order to complete the Capstone Project.

Proposal and Timeline

In order to better evaluate the Proposal, a self-assessment should be presented. A self-assessment should cover the following indicators (the description for each should not exceed 50 words):

- Demonstrated abilities to "break in" (idea creation) with an innovative solution(s) (solving a problem), to apply an analysis-based (simulation/study-based) decision making, and to develop/design (thinking) the product itself.
- Demonstrated ability to take a holistic approach that incorporates all (including unforeseen) considerations.
- Understanding of the need to incorporate cost considerations throughout the design and execution of a Capstone Project and to manage within realistic constraints of time and budget (if applicable).

The effort that is invested in this Proposal will most likely have a direct impact on the success and the quality of a Capstone Project. A Proposal should be prepared in conjunction with the Capstone Project Timeline (see the table below for details of dates and times). However, a supervisor can recommend individual timelines for particular students. All the details should be included in a written proposal.

No. 1 Capstone Project Timeline

Months	Activity/Task
PROPOSAL PHASE	
1-2 months	Exploration phase: using your own experience (in course and at work) come up with a number of ideas that may lead to a worthwhile final project.
3 month	Commence a broad-based academic and business literature survey, refine a short list of potential proposals. Present you initial ideas to mentors and Study Programme Committee.
4 month	Finalise a (draft) proposal and submit it to your appointed supervisor.
4 month	Contact supervisor to receive feedback on proposal over the week Submit final proposal.

DRAFT PROJECT PHASE	
5-6 months	Work on project, meet regularly with supervisor
7 month	Presenting proposals to Lithuanian CERN BIC
7-13 months	Work on project, meet regularly with supervisor, participate in national and international acceleration programs
autumns semester	CERN screening week
13 months	Draft capstone report and demonstrate innovative solutions to supervisor.
14 month	Prepare presentation and submit it to supervisor
14-16 months	Students with satisfactory progress reports continue work on project, meet regularly with supervisor
FINAL PROJECT PHASE	
15 month	Meetings with potential investors, participation in public calls
15 month	Establishing a start up (if applicable) and signing agreement with VU for a long-term supervision
16-18 months	Capstone Project final submission and defense, includes poster presentation if needed.

From the beginning a supervisor discusses a Capstone Project with a student, identifies approximate timelines and meeting dates over the period. Students should also undertake a Risk Assessment for the Capstone Project (see Guidelines for a Capstone Project Proposal). If needed, a student or a group of students and VU BS sign Intellectual Property Agreement or Confidentiality Agreements. A Proposal remains a running document and will be subject to changes over the course of the whole process.

Guidelines for a Capstone Project Proposal

The Proposal must include a declaration of originality, i.e. the Proposal should contain sections which carefully address each of the following sections:

- *Project Title.* Students need an appropriate project title, one that encompasses the nature of process of work, without being too wordy or verbose.
- *Project outline.* Students give a brief qualitative description of the topic in plain English, and why it is of interest. Also, students present a more precise statement of the potential Capstone Project, using appropriate technical language by identifying what contributions the potential Capstone Project can make to the goals of sustainable development and/or areas of CERN activities and its community in terms of novel design, validation and verification of a possible innovative solution.
- *Capabilities of the student.* Students need to describe the suitability to undertake this potential Capstone Project. Give a brief description of the track record in the area of the topic, and/or how students developed interest. An important aspect to be considered here will be a students' ability to complete the project on time.

- *Objectives and Scope.* Students should describe: a) the specific objectives of his/her project; b) the need or value of the potential Capstone Project, and to whom; c) the viability of the potential Capstone Project to proceed with it. As students should also identify what are key and/or innovative assumptions which require verification and research analysis, how and to what extent students will be able to verify them. Student should also identify other non-technical assumptions on which the potential Capstone Project is based - economic, social, cultural, etc. the sources on which these assumptions are based, and how and to what extent a student will be able to verify them. Students should define the intentions (scope) for the period of the project, i.e., define (make the best “guess”) the foreseeable outcomes, note that the final goal, in principle, could extend beyond the master program itself.
- *Method:* Students need to be able to state here the different stages of a potential Capstone Project for example, literature review, experimental investigation, data interpretation, novelty of research, scientific discussion, etc. (see Final Capstone Project)
- *Strategies and resources.* Students should state possible requirements for undertaking a potential Capstone Project, where or whether resources are accessible, including any equipment, and any other laboratory facilities a student will need. Also, a student should indicate where resources and facilities are available, for example if at Vilnius University students should obtain a permission for the equipment or facility that a student intends to apply in alone or in cooperation with other University members, also any equipment or material which are not currently available at the University, and need to presented – include names of suppliers and costs, available financial support if any. Students should explain what, if any, skills acquisition will need to undertake in order to use the above resources, also nature of any assistance required from laboratory staff, and estimated time.

Students should state what, if any, are the data that will be needed to obtain or generate, and their sources or methods of generation. Provide indication of the likelihood that the data can be obtained. Finally, students should give title, author, and publication details of at least 3 key references which has been identified as academically accessible and appropriate in supporting the potential Capstone Project work and write a short paragraph on each of these references to describe what makes each of them accessible, for example what knowledge is assumed and what is useful about this literature for the potential Capstone Project.

- *Timeline.* Students should provide a realistic and detailed timeline for the potential Capstone Project completion. Identify key tasks, activities, milestones. A Gantt Chart or equivalent is expected.
- *A Risk Assessment.* Students should identify a broad range of foreseeable risks associated with undertaking the potential Capstone Project, and what contingency plans a student propose to deal with them. This section may include risk such as: procuring or availability of various equipment, access to research data, competing demands from external sources such as workplace commitments, supervisor's availability, even personal circumstances, etc.
- *References.* Students should provide a list of resources used in the preparation of the potential Capstone Project Proposal using the general guidelines for references of VU BS.

Assessment of a Capstone Project Proposal Form

Title of Proposal		
Student(s) name(s)		
Proposal requirement	Yes/No	Supervisor/Mentor Notes/Comments (if required)
Appropriate title		
Capstone Project outline		
Capabilities of student		
Objectives and scope		
Method		
Strategies and resources		
Timeline		
Risk Assessment		
Assessment Criteria		
References used		
Additional comments		

It is not allowed to repeatedly defend the final work that has been negatively assessed/not defended in the commission. Appeals regarding the assessment of the final master's thesis are not accepted.

A CAPSTONE PROJECT PROGRESS MONITORING

Monitoring of a progress is intended to monitor in adequate detail the progress made during the first phases of a Capstone Project.

Students should follow the implementation of tasks with the Capstone Project. A progress should show details of any changes to students' proposal submitted, including an updated project plan if needed students should submit to supervisor and mentors.

Students should present during the workshops:

- goals which a student set for the phase of process;
- comment on the progress in relation to the goals, work plans and any other achievements;
- problems or issues which affected students' progress and the strategies identified to overcome them;
- a comprehensive review of the academic literature related to a Capstone Project area which places student's work in the broader scale of knowledge;
- a comprehensive analysis of market and business competitors;
- the involvement of external or industry supervision (where applicable);

Students should regularly submit an updated version of a Capstone Project

Assessment of A Capstone Project Progress Form

Proposal requirement	Yes/No	Supervisor/Mentor Notes/Comments (if required)
Identified Goals		
Report of progress made		
Report on problem and issues		
Report on involvement with external stakeholders and industry partners		
Updated proposal		
Additional questions:	What has been the frequency of contact with ? What has been the frequency of contact with the external supervisor? Will students be working towards a potential completion?	

A FINAL CAPSTONE PROJECT

Layout

For a layout for the final Capstone Project, also requirements related to scientific discussion and research methods please follow general requirements for the master's thesis at VU BS. A supervisor will be able to offer relevant advice.

Structure

A final Capstone Project may be arranged in the sections described next.

Executive Summary

The purpose of the executive summary is to provide an abstract of the information provided in the Capstone Project. Clarity and conciseness are essential. Four to six brief paragraphs are usually sufficient.

Dedication and Acknowledgement

Inclusion of a dedication is optional. An acknowledgement of contribution by individuals may be included at the end of the Capstone Project.

Introduction

The introduction section begins with a brief discussion of the area of interest and then presents the following sub-sections:

- Background of the Problem. Description of the background of the problem (brief historical perspective and explanation of why the problem remains unsolved at this time). This part does not require an introduction to students start up. The scientific discussion, determination of novelty and other methodological principles should meet the requirements of VU BS Master Thesis requirements⁴;
- Statement of the Problem. The problem is presented in statement form, this section is concluded with a clear statement of the question or questions that need to be answered to solve the problem.
- Purpose of the Capstone Project. This section explains why the study is being conducted and arguments for commercialization activities are presented. For requirements related to the determination of objective, goals, research questions and etc. a student should follow the Methodological Guidelines for Writing Master's Theses⁵

Literature Review

The purpose of the Literature Review is to guide the inquiry. What research has been completed on similar topics in other organizations, the same industry, or other industries? This may include both academic and business literature. Questions to answer in this review might be the following: How have others defined similar problems? What approaches did they use to find solutions? What solutions did they discover? What were the critical weaknesses of these approaches? What else have you learned from these studies that will help the chosen approach be more productive?

The Literature Review should provide the foundation for the Methodological section. The presentation of the Literature Review should lay a logical and complete foundation for the Methodology that follows. Warning: The Literature Review should not be a history of the students' developed company or business sector the company is or might be established.

In other disciplines, this section can be called Theoretical Overview.

⁴ https://www.vu.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

⁵ https://www.vu.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

Methodology

In this section, students define a method(s), i.e., the strategy, that (s)he should take in order to answer the research question asked in the Statement of the Problem. A part of the section must explain what information/data should be collected inside and outside of the Capstone Project and for the future company in order to answer the question. The data collection methods, relevant for the Project, should be explained. The procedure and the actual steps to systematically analyze the needed (collected) data must be presented. A sufficient coverage of data analysis (statistical) methods in use should be present. For example, go into details on how the interviews are coded, i.e., planned and designed.

In addition, it is worth mentioning that drawing conclusions based on interpretations of a comment or similar is not acceptable. A scientific method on how one goes into the process of reaching the conclusions should be defined. Not the least important is the analysis of methods, especially the chosen methods, and the explanations of any ethical issues about collection of data or any sort of ethical issues involved if applicable. Moreover, the overall scope of methods and their application is explained in the Methodological Guidelines for Writing Master's Theses⁶. In a Capstone Project, the methodology section should provide clear guidance and demonstrate that students was thoughtful and thorough in his/her approach in solving the business development obstacles and providing possible innovative solutions to the problem defined.

In other disciplines, this section can be called Experimental Setup and Statistical Framework.

Empirical Part (results, findings, interpretation and discussion)

The research question defines the field of knowledge that a student is engaged with a Capstone Project. In this section students present the results of his/her research and, in particular, the outcomes of the methods defined earlier. Empirical research, in the context of the Capstone Project process, can take different shapes, however, in all cases it involves a primary data analysis and analytical techniques that cover the entire range of the social sciences (based on interpretive as well as positivist epistemologies). Here students lay out the statistical analysis and its interpretation. If needed, graphs and charts are included.

In other disciplines, this section can be called Statistical Analysis.

Conclusions

The findings are the setup for the recommendations to follow. This section briefly reviews and recaps what a student discovered through his/her research and business analysis:

- The problem and the question a student was expected to answer;

⁶ https://www.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

- The issues/problems that were investigated;
- Key findings of this investigation;
- Possible solutions for the problem and further development of business.

Recommendations

The recommendations should be built on conclusions by stating action steps that the student's company can take to address those conclusions and make improvements. A student should also consider the concept of "sufficiency" whether the recommendations are sufficient to significantly solve the problem, are they practical and affordable both in financial and other resources. Recommendations should clearly state the expected results of each recommendation and allow to weigh the options and make choices. In this section students should also explain why recommendations are the best solution/prediction, describe alternative recommendations and their limitations and finally, describe the implications for businesses with respect to these choices.

Appendices

This section includes information that is too detailed to be included in its entirety in the body of the Capstone Project. Firstly, business plan (see next section), presentations to potential investors. Secondly, raw data, sample questionnaires, and detailed computations, etc. This section would also include information that is referred to but is not essential to the project, such as relevant policies, laws, forms, pamphlets, sample letters sent to organizations and subjects, etc. Finally, if students develop a prototype, a conceptual description of development and application should be also included.

GUIDELINES FOR A CAPSTONE PROJECT'S BUSINESS PLAN

A business plan is a compulsory appendix of a Capstone Project and it should not involve a thesis-type literature review which students must do in the section of a literature review of a Capstone Project. However, a business plan does require research. At a minimum, marketing research is needed in order to quantify the opportunity which will include determining the total demand, the unmet demand, how a student's offering is to be distinctive in this market, present reasonable sales projections, etc. A business plan also involves an analysis of demographics and customer profiles in markets, and the comparison of such demographics and customer profiles to those of the proposed new market. Students where applicable should cite the specific sources from which data are obtained.

Students should demonstrate a connection between the market demand and the financial statements, present foundation for the projected revenue figures cited, including initial sales and sales growth.

A business plan should include the following sections; however, they might be organized in different orders but the content must be included:

Introduction

- Purpose of the plan (attract investors, diversification, etc.) /
- Introduction to market opportunity
- The Start-up
- How Start-up will respond to opportunity
 - o Marketing and Sales Activities
 - o Product or Service Research and Development
- Organization and Personnel

Market

- Industry Overview
 - o The history of the industry
 - o Size of the Industry
 - o Industry Evolution
 - o The trend-Where the industry is expected to be in 5 or 10 years
 - o The key players in the industry
 - o Barriers to entering the market
- Competition strengths and weaknesses
- Target market
 - o Major characteristics of the target market
 - o Expected target market growth for the next 5-10 years
- Product and Industry Life Cycles
 - o How does the position in the Product Life Cycle affect this business plan?
 - o How does the position in the Industry Life Cycle affect this business plan?
- Product or Service Research and Development

Start-Up Description

- Type of Business and Legal Structure
- Mission and Objectives
- Distinctive Core Competencies

Management and Ownership

- Board and Rationale for Members (if applicable)
- Management staff structure
- Key managers (if applicable)
- Future Additions to the Current Management Team

Marketing Activities

- Overall Marketing Strategy
- Sales Strategy / Analysis-Strengths
- Weaknesses as they relate to Opportunities
- Threats (SWOT/TOWS)

Risk Management

- Loss Control
- Retention of Personnel
- Insurance

Products and Services

- Detailed Product
- Service Description
- Product Life Cycle
- Copyrights, Patents, and Intellectual Property Rights
- Research and Development Activities

Operations

- Production and Service Delivery Procedures
- Supply Chain

Financial Analysis

- Funds required and their uses
- Current funding requirements
- Funding requirements over the next three years
- Use of funds

Financial statements for first 3 years (monthly first year and annually for years 2 &3)

(use template)

- Income statements
- Balance sheets
- Cash flow statements
- Determine capital requirements

Business plans are expected to present a convincing business case for the establishment, expansion, or continuation of a business. Students must present data to substantiate there is sufficient demand to support this venture. Business plans are required to document either an unmet or under-met need in the market. This need should be quantified to the degree possible. The less the need is quantified, the higher the risk factor for a start-up. A business plan should include a clear demonstration of the opportunity in the market place and what will be required to capitalize on it. Students should ensure that his/her business plan addresses: current demand in the market, market trends, competitors' market share and explain how an established start-up will better or equally satisfy the need.

Each business plan must include the following financial data. The figures for the first year are presented by month. Later years should show summary figures by year for the first three to five years. On projected income statements (profit and loss statements), vertical percentages as well as euros amounts for each year are recommended. Students are required to provide the required data in a format that contains the information in a standard presentation format. Financial data should include: sales forecast, projected income (loss and profit statement), projected cash flow, projected balance sheet, a breakeven analysis for each year.

Assessment Form of a Capstone Project's Business Plan

	1	2	3	4	5	6	7	8	9	10	NA
Research 20 %											
Evidence of higher level research											
Evidence of multiple sources											
Evidence of primary data											
Content 50%											
Completeness											
Relevancy											
Appropriate analysis											
Appropriate conclusion drawn											
Logical rational and/or justification											
Original thought											
Structural 30 %											
Grammar											
Spelling											
Citations											
Clear expression											
Tables, graphics, etc. appropriate and clear											
Original words											
Overall											
Comments:											

FINAL REMARKS

Students at the final stage are expected to demonstrate ability to design a study, to collect new or existing data, to analyse the findings, and to communicate the results, also ability to write analytically in a style that is well informed, well-reasoned, and be literate. Students demonstrate oral communication skills by informed and well-reasoned arguments, finally mastering the higher order thinking skills necessary to analyze and interpret social sciences and transdisciplinary research fields. Where applicable students should follow the general regulation on VU BS Master thesis methodological guidelines⁷.

⁷ https://www.vu.lt/external/vm/files/PDF/studentams/Magistro_metodiniai_nurodymai_EN_2022-02-08.pdf

REFERENCES

1. Adams, J.C. *Chance-It: an object-oriented capstone project for CS-1SIGCSE '98*: Proceedings of the twenty- ninth SIGCSE technical symposium on Computer science education March 1998 Pages 10–14. <https://doi.org/10.1145/273133.273140>
2. Capstone Project Manual, 2019. Available at:
https://www.alcorn.edu/uploaded/files/oaa/schools/grad/ASU_Capstone_Project_Manual.pdf
3. Capstone Project Handbook. Available at:
<https://uca.edu/honors/files/2017/10/Capstone-Project- Handbook.pdf>
4. Elwell, G., Dickinson T., Dillon M. *A postgraduate capstone project: Impact on student learning and organizational change*, 2021. SAGE.
<https://doi.org/10.1177/09504222211036584>
5. Farrell, V., Ravalli G., Farrell, G, Kindler, O., Hall, D. *Capstone project: fair, just and accountable assessment*. ITiCSE '12: Proceedings of the 17th ACM annual conference on Innovation and technology in computer science education. July 2012 Pages 168–173
<https://doi.org/10.1145/2325296.2325339>.
6. How to write a Capstone Project. Available at: <https://answershark.com/writing/research-papers/how-to-write- capstone-project.html>
7. Nelson, NZ. *Methodology in Software Development Capstone Projects* 20th Annual Conference of the NACCQ, 2007. Available at:
https://www.academia.edu/2376908/Methodology_in_Software_Development_Capstone_Projects
8. Taajamaa, V., Westerlund, T., Liljeberg *Interdisciplinary Capstone Project*. SEFI Conference, 2013.