BUSINESS PLAN VRNRS

1. EXECUTIVE SUMMARY

1.1 OVERVIEW OF BUSINESS IDEA

VRNRS is a startup to develop a software to integrate different codes with the aim to simulate the operation of nuclear reactors in a virtual reality environment.

1.2 DESCRIPTION OF PRODUCT/SERVICE

- Preset scenarios for the nuclear reactor operation that can be run on the virtual reality tools.
- Complete simulator that can be installed at the customer location.
- Customized problem solution.

1.3 BUSINESS GOALS

- Provide a high-quality simulator in an affordable price.
- Increase product awareness.
- Product distribution according to the spread plan.

1.4 TARGET MARKET

- Universities.
- Research centers and regulatory bodies.
- Schools and institutes.

1.5 YOUR COMPETITION

- The Consortium for Advanced Simulation of Light Water Reactors (CASL).
- L3 MAPPS.
- Graphical RELAP/SCDAPSIM Analysis Platform for Education and Engineering (GRAPE).

1.6 YOUR MANAGEMENT TEAM AND THEIR EXPERIENCE

- Nuclear Engineering Team
  - Hanaa Hassan Hamdi Abou Gabal
  - Ayah Elsayed Mohamed Elshahat
  - Mohamed Anwar Yahia Abdulhameed
- Design Team
  - Menna Mohamed Abd-Elhalim
- Programming Team
  - Hicham Elmongui
  - Walaa Abdelrehim Sayed Mohamed
- Finance and Marketing Section
  - Abdelraman Magdy Ibrahim Mohamed

1.7 FINANCIAL SUMMARY

- **Total cost**
  - 62,000 $ fixed.
- **Price**
  - 40,000 $: Steady state (basic) package including training.
  - 60,000 $: Transient package (steady state + 4 scenarios).
  - 5000 $: Individual scenario.
- **Sales**
  - 2 packages/year.

2. COMPANY DESCRIPTION

A company under construction.

2.1 BIOGRAPHY

1. **Ayah Elsayed Mohamed Elshahat**
   - Age: 42
   - Email: aya.elshahat@alexu.edu.eg
   - Phone number: 00201005614004
   - University/Faculty /Major: Alexandria University, Faculty of Engineering, Nuclear and Radiation Engineering Department.
   - Graduation year: 2001
   - Brief about the founder's professional background, experience, and achievements:
     Ayah E. Elshahat is an assistant professor in the Nuclear and Radiation Engineering Department, Faculty of Engineering, Alexandria University, Egypt. She graduated from the Nuclear and Radiation Engineering Department in 2001, received a MSc in nuclear engineering (thermal performance of nuclear reactors) from Alexandria University in 2005, and received a PhD in nuclear engineering (enhancing nuclear energy sustainability using advanced reactors) from Manchester University in 2016. She has experience in simulation of advanced nuclear reactors, safety of nuclear reactors, and thermal hydraulics of nuclear reactors. She supervised some graduation projects about virtual reality simulation of nuclear reactors. She supervised postgraduate students (MSc and PhD) in developing some simulation models of nuclear reactors.
   - Current job, if applicable: Assistant professor
   - LinkedIn profile: Ayah Elshahat https://www.linkedin.com/in/ayah-elshahat-8899a431/

2. **Hanaa Hassan Hamdi Abou Gabal**
   - Age: 62
   - Email: hana.abogabal@alexu.edu.eg
   - Phone number: 00201113760888
   - University/Faculty/Major: Alexandria University, Faculty of Engineering, Nuclear and Radiation Engineering Department.
   - Graduation year: 1980
   - Brief about the founder's professional background, experience and achievements:

Hanaa Abou-Gabal received her BSc (1980) and MSc (1983) both in Nuclear Engineering from the University of Alexandria, Egypt. She received her MSc (1986) and PhD (1989) both in Nuclear Engineering and Engineering Physics from University of Wisconsin-Madison, USA. She then joined the Department of Nuclear and Radiation Engineering, University of Alexandria, Egypt, where she is currently an emeritus professor. From March 2015 to May 2019, she was the acting head of the department. She is also the academic advisor for graduate studies in the department, and the contact point of the International Nuclear Security Education Network (INSEN) at Alexandria University.

Her scientific interests focus presently on the neutronics and kinetic calculations of the nuclear reactors and the use of thorium as fuel in the different types of reactors as well as the physical protection of nuclear facilities. She is also interested in the fields of plasma processing of materials and plasma applications in environmental protection. She participated in an STDF Capacity Building Project to enhance the radiation detection lab and the plasma physics lab in the Nuclear and Radiation Engineering Department. She was the Principle Investigator in a project related to the plasma treatment of textiles funded by the University of Alexandria within its Research Enhancement Program (ALEX REP). She was also the Principle Investigator for the concept paper titled "Preparation and Characterization of Chalcopyrite Thin-Film Solar Cells Using Nanotechnology Applications" funded by Smart Critical Infrastructure Research Center (SmartCi). She supervised more than 30 MSc theses and 8 PhD dissertations in addition to many graduation projects with five of them about the virtual reality simulation of nuclear reactors.

- Current job, if applicable: Emeritus Professor
- LinkedIn profile: Hanaa Abou Gabal https://www.linkedin.com/in/hanaa-abou-gabal-2b24a141/

3. Hicham Elmongui

- Age: 44
- Email: elmongui@alexu.edu.eg
- Phone number: 01009269340
- University/Faculty/Major: Associate Professor in computer and systems engineering, Alexandria University
- Graduation year: 1998
- Brief about the co-founder's professional background, experience and achievements:

Prof. Hicham G. Elmongui was born in Alexandria, Egypt, in 1976. He received the B.S. (Hons.) and M.S. degrees in computer engineering from Alexandria University, Alexandria, in 1998 and 2001, respectively, and the M.S. and Ph.D. degrees in computer science from Purdue University, West Lafayette, IN, USA, in 2003 and 2009, respectively.

From 2001 to 2009, he was a Doctoral Fellow, a Teaching Assistant, and a Research Assistant with Purdue University. He was a Research Intern with Microsoft Research, Redmond, WA, USA, every summer from 2006 to 2008. In 2010, he was a Software Development Engineer with Amazon Web Services, Ashburn, VA, USA. Since 2010, he has been an Assistant Professor (now Associate Professor) in computer and systems engineering with Alexandria University and an Adjunct Professor in computer science

and electrical and computer engineering with Virginia Tech, Blacksburg, VA, USA. From 2014 to 2018, he has been on-leave visiting Umm Al-Qura University in Saudi Arabia where he worked at the GIS Technology Information Center. He has authored or co-authored over 40 papers and two patents.

Dr. Elmongui is a member of the Microsoft Research Alumni Network, CERIAS Alumni, and Upsilon Pi Epsilon. He has been recognized through many awards and honors, including the Outstanding Teaching Award and the Outstanding Service Award from Purdue University. He has served on the Technical Program Committee of several conferences.

- Current job, if applicable: Associate Professor in computer and systems engineering with Alexandria University
- LinkedIn profile: Hicham Elmongui https://www.linkedin.com/in/hicham-elmongui-1853953?originalSubdomain=eg

4. Walaa Abdelrehim Sayed Mohamed

- Age: 26
- Email: walaaabdelrhim97@gmail.com
- Phone number: 00201284954257
- University/Faculty/Major: Alexandria University, Faculty of Engineering, Nuclear and Radiation Engineering Department.
- Graduation year: 2018
- Brief about the founder's professional background, experience and achievements:

Walaa Abdelrehim graduated from the Nuclear and Radiation Engineering Department, Faculty of Engineering, Alexandria University in 2018. Her graduation project entitled "Virtual Reality Simulation of a RELAP/SCDAPSIM Simulated LOCA Accident" which a scenario describing a LOCA accident in the VVER-1000 reactor was studied using the RELAP/SCDAPSIM software, A Matlab code was written to plot some properties, 3D models of all component of nuclear power plant were created using 3Ds Max, Finally, the Vizard program was applied to display the 3D plant models, imported from 3Ds Max, as well as the results obtained in the studied simulation cases in the virtual reality domain using a Python programming language code. This project ranked first and earned her the skill of dealing with these used programs.

She worked on special studies "Operational limits and conditions (OLCs) for Nuclear Power Plants" in 2018. She also participated with paper titled " Creation of Ultra−Cold Atoms using High Energy Laser beam" that ranked first at science project, Zewail city friends 2016.

- Current job, if applicable: ---
- LinkedIn profile: Walaa Abdelrehim https://www.linkedin.com/in/walaa-abdelrehim-b85703107/

5. Menna Mohamed Abd-Elhalim

- Age: 25
- Email: mennamohamedmoly@gmail.com
- Phone number: 00201277255763
- University/Faculty /Major: Alexandria University, faculty of Engineering, Nuclear & Radiation Engineering Department.
- Graduation year: 2020

- Brief about the founder's professional background, experience and achievements: Manna is a user for 3Ds Max with certification from Autodesk and beginner in Blender &cinema 4D, had Diploma in graphic including Photoshop, illustrator and Flash. working on adobe primer. Participates in Nasa space app competition 2018 and 2019.Worked in civil works 2015 as project manger for let's make a robot competition ,2016 supervisor in science club team ,2017 head of media committee in science club team and nuclear week event.
- Current job, if applicable: --
- LinkedIn profile: https://www.linkedin.com/in/mennamohamedmoly/

6. Mohamed Anwar Yahia Abdulhameed

- Age: 24
- Email: muanwar96@gmail.com
- Phone number: 00201115746682
- University/Faculty/Major: Alexandria University, Faculty of Engineering, Nuclear and Radiation Engineering Department.
- Graduation year: 2020
- Brief about the co-founder's professional background, experience and achievements: Senior student at the Nuclear and Radiation Engineering Department, Faculty of Engineering, Alexandria University. Through working on his graduation project, titled Thermal Hydraulic Analysis of VVER-1000, he gained deep knowledge about RELAP-SCDAPSIM, the behind-the-scenes engine of the simulator, and its evaluation models. He has also written a general-purpose Python code that performs post-processing on the RELAP-SCDAPSIM results.

  As of July 2019, he became a fellow of the Nuclear Nonproliferation Education and Research Center (NEREC), Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea.

  He has also done many internships, e.g., as a mechanical engineer at Cairo Metro, as a sales engineer at SIS for Engineering Solutions, where he currently work. He was also a student of the 5th Spring Plasma Physics School, British University in Egypt (BUE), and an online student of solid state physics at the International Center for Theoretical Physics (ICTP), Trieste, Italy.

  His Toolbox includes Python, Linux, Fortran 90/95, Maple, Mathematica, RELAP/SCDAPSIM, LAMMPS, Quantum Espresso, OpenSCAD, and SimScale.

  His sole publication is a research paper at the 2019 NEREC Annual Report: Mohamed Abdulhameed, Leonardo Francisco Moraes Correia Candido Ribeiro, and Nakita Pradhan, "Can Privatization Solve the Spent Nuclear Fuel Issue in South Korea?" he also gave a presentation titled "Materials Engineering Challenges in Fusion Reactors," at the 2nd One-Day Plasma Physics Conference, Port Said, Egypt.

  His sole achievement is a 2nd Place at the "Design by Nature" Category, NASA Space Apps Alexandria 2018
- Current job, if applicable: Sales Engineer, SIS for Engineering Solutions
- LinkedIn profile: https://www.linkedin.com/in/mohamed-abdulhameed-51905b113/

7. **Abdelraman Magdy Ibrahim Mohamed**
   - Age: 27
   - Email: abdelrahmanmagdiibrahim@gmail.com
   - Phone number: 00201226993381
   - University/Faculty /Major: Alexandria University, Faculty of Engineering, Nuclear and Radiation Engineering Department.
   - Graduation year: 2016
   - Brief about the Businessman's professional background, experience, and achievements: Abdelrahman Magdy is a Nuclear Engineer. He worked as a technical sales engineer in ACCC company for 2.5 years which worked on Radiation Protection and Non-destructive testing. He founded MZS Trade company which worked on Medical supplies and Lab Devices supplies in 2019. He has an experience in Radiation Protection and Safety devices.
   - Current job, if applicable: Quality Control Engineer (Lab Engineer)
   - LinkedIn profile: https://www.linkedin.com/in/abd-el-rahman-magdy-079733125

2.2 GAPS

- Legal advisor (outsourcing).

2.3 ADVISOR

- Architecture and computer science experts.

3. PRODUCTS AND SERVICES

3.1 PRODUCT / SERVICE

- Preset scenarios for the nuclear reactor operation that can be run on the virtual reality tools.
- Complete simulator that can be installed at the customer location.
- Customized problem solution.

3.2 PROBLEM SOLVED

Visualization of the operation of a nuclear reactor.

3.3 SPECIAL FEATURE THAT GIVES COMPETITIVE ADVANTAGE

The simulator provided will be based on precise calculations by a reliable code in the nuclear community. The output will be displayed in the virtual reality environment. The simulator will cover the different scenarios of operation of the nuclear reactor (steady state, transient and accidents).

3.4 COMPETITION ANALYSIS

- **Competitors**
  - The Consortium for Advanced Simulation of Light Water Reactors (CASL) established in 2010 by the US Department of Energy developed the Virtual Environment for Reactor Applications (VERA), a 3D model of the reactor core that can accurately simulate the physical processes taking place in a reactor core in both steady-state and transient conditions.

- L3 MAPPS, a Canadian company, develops many high-fidelity 3D simulators of complete nuclear reactors in steady-state conditions.
- Graphical RELAP/SCDAPSIM Analysis Platform for Education and Engineering (GRAPE) created by Nuclear Engineering Ltd (NEL) and ISS Inc. is a 2D schematic model of a nuclear reactor that can simulate a number of predefined nuclear accidents.

Factor	VRNRS	CASL	GRAPE	L3 MAPPS
Service	Simulate all reactor components in different scenarios.	Simulate reactor core only.	2D simulation.	Simulate steady state operation only.
Price	Low.	High.	High.	High.
Location	Variety of customer segments.	American authorities.	No. of Universities.	No. of Universities.
Product	VR models, consultation.	VR models.	Platform.	Platform.

3.5 PRICING THE PRODUCT /SERVICE

- Fixed price of the basic package (steady state scenario).
- Scenario-based pricing for additional modules.
- Consultation priced by agreement.

4. MARKETING PLAN

4.1 MARKETING GOALS

- Cover all customer segments.
- Increase product awareness.
- Ensure the marketing plan is effective and adaptive.

4.2 TARGET MARKET

- Universities.
- Research centers and regulatory bodies.
- Schools and institutes.

4.3 SITUATIONAL ANALYSIS AND TARGET MARKET

4.3.1 SWOT Analysis

❖ **Strengths**

1. The existence of experts of nuclear engineering in Alexandria University in one of the leading departments in Egypt and Worldwide.
2. The experience of the project team gathering Nuclear, Computer and Architecture Engineering expertise.
3. Previous experience in the Faculty of Engineering, Alexandria University in using simulation solutions in training.
4. Previous experience in the Faculty of Engineering, Alexandria University in using virtual reality solutions in training.

❖ **Weakness**

1. The unavailability of some needed information for some types of nuclear reactors.

❖ **Opportunities**

1. The growing importance of using non-conventional ICT based solutions in teaching and training.
2. The importance of the proposed training domain (i.e. nuclear field) which is a priority to all countries and actors as it addresses national security issues and represents an extremely specialized know-how.
3. No competitors exist in Egypt or the MENA region.

❖ **Threats**

1. Technology dependence on some vendors for parts of the solution.
2. The possibility of having some substitute international products that may be adopted by some training institutions.

4.3.2 PESTEL analysis

❖ **Political**

1. Security issues to gain some needed information or proprietary data.
2. Government policy forbidding/phasing out nuclear energy.

❖ **Social**

1. Small nuclear community due to the limited industrial scale.
2. Public acceptance may lead to a decline in building new reactors.

❖ **Technological**

1. Code/software licenses.

4.4 MARKETING OBJECTIVES

- Attract the entities who would invest in such an important environment.
- Provide the simulator to the universities and schools that offer curricula in the nuclear power plants field.
- Provide the simulator to the nuclear power plants authorities.

4.5 MARKETING STRATEGIES

❖ **Growth strategies (Ansoff)**
Product development strategy.

❖ **Competitive strategies (Porter)**
Differentiation.

4.6 STP

4.6.1 Market Segmentation

- Universities that include nuclear engineering departments or that offer courses in the nuclear engineering field within their curricula.
- Technical schools or institutes that offer courses in the field of nuclear power plants.
- Research centers and regulatory bodies related to the nuclear power plants area.

4.6.2 Market Targeting

- Seminar to discuss the product and invite the officials who would be interested in it.
- Visits by marketing representatives to the universities and schools to show the product demos.
- Email marketing campaign.
- One to one demo using LinkedIn connections.
- Web site.
- Social media

4.6.3 Market Positioning

- User-friendly; validated VR simulation in a stand-alone software; Learn on the run; Live the tech.

4.7 SALES STRATEGY

4.7.1 Locations

- Entities related to nuclear engineering first in Egypt, MENA then in Africa and East Europe.

4.7.2 Distribution Channels

- Online

4.7.3 12 Months Sales Forecast

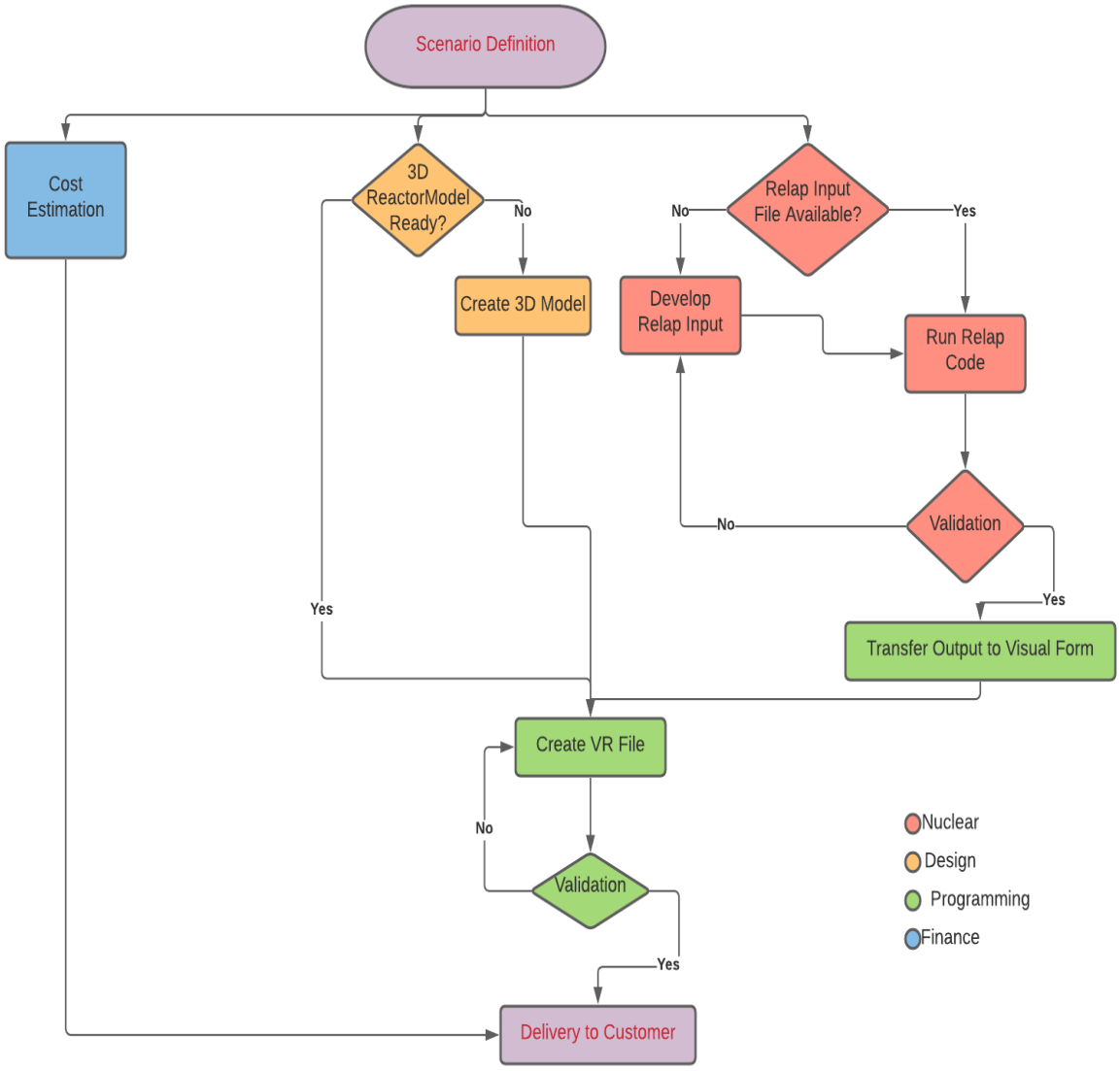
- 2 Simulators.

4.8 IMPLEMENTATION

- Launch the product in the market.
- Monitor market reaction.
- Adjust the marketing plan/product.

5. OPERATIONAL PLAN

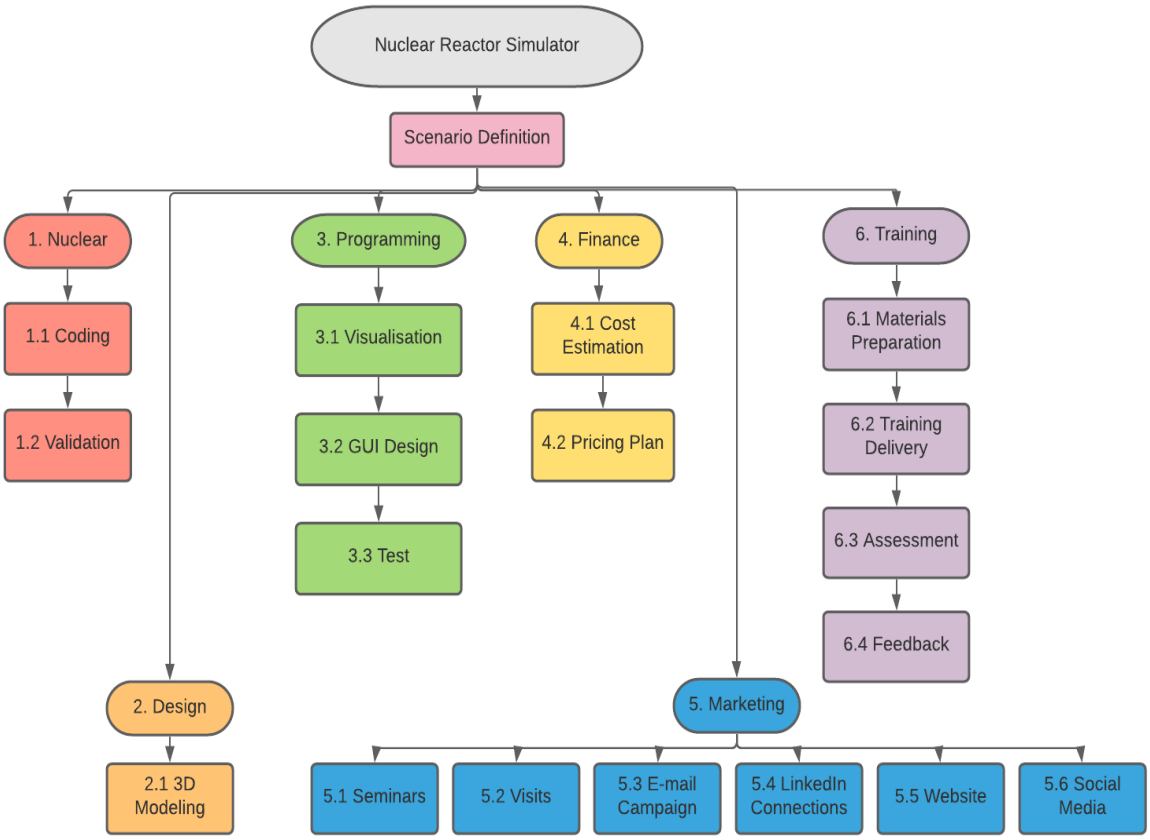
5.1 OPERATION MANAGEMENT



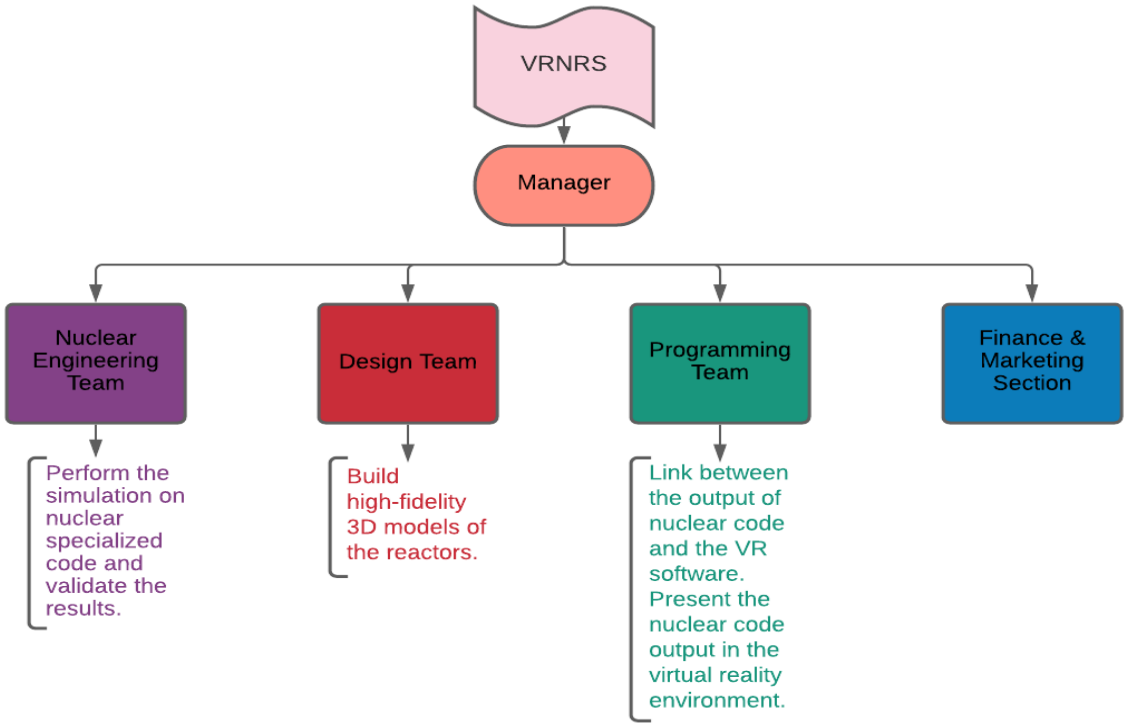
5.2 MOSCOW ANALYSIS

Must	Stand alone VR simulator that accurately represents reactor conditions
Should	The user should have full control of the simulation
Could	The user can run both steady state and transient conditions
Won't	The user could input arbitrary accident conditions

5.3 WORK BREAKDOWN STRUCTURE (WBS)



6. MANAGEMENT AND ORGANIZATION



7. FINANCIAL PLAN

Hardware	3138 $
3d max	1620 $
Photoshop	240 $
Substance painting	149 $
Vizard	120 $
REALAP/SCDAPSIM	
Cloud	50 $
Salaries	30133 $
Total cost	62,000 $
Price	
40,000 $: Steady state (basic) package including training.	
60,000 $: Transient package (steady state + 4 scenarios).	
5000 $: Individual scenario.	
Sales	
2 packages/year	