Project Overview	
Project Title (in English): The development of an education and research center with automatic virtual reality platform for 3D interactive learning and big data analytics	Project Title (in Chinese): 發展具有自動虛擬現實平台進行互動學習和大數據分析的教育及研究中心

Executive Summary

(Please provide, within this page, an executive summary of the project.)

The increased complexity in data and operation processes in global organisations has posted a growing demand on big data and process analysis in most of the industries, especially in logistics and transportation, supply chain finance and healthcare logistics sectors. The current mode of classroom teaching and learning with the help of textbooks and case studies, or even field studies and on-site visits, are not able to illustrate the complexity of operations to the students. The multi-dimension operations and statistics are often unable to be demonstrated in two-dimension textbooks or videos. Large data sets with multi-dimensions require sophisticated virtual environment for visualization. Very often graduates, or even practitioners, are not able to visualize the end-to-end process of the entire supply chain, finance, or medical operations. Many graduates are not well-equipped before entering the workforce. A mounting awareness in the security and safety of industrial operation sites has limited the accessibility of restricted areas for students to visit and understand their operations. Common restricted areas include cargo terminals, cranes, and vessels in logistics industry, trading platforms and servers in financial sectors, surgery operations in medical service, etc. The government of Hong Kong is recently promoting the use of virtual learning initiatives to support education needs. Post-secondary educations should be equipped with a virtual environment system to allow teaching and learning in a multi-dimension perspective, demonstrating effectively on big data analytics, and providing a platform for students to experience end-to-end operations in logistics, finance, and healthcare sectors. This allows students to be well familiarised with both overall perspective and detailed operations in their corresponding industries. Thus, there is a need for our students to practice in a virtual environment beforehand for critical operations in the supply chain, finance, and healthcare sectors.

To achieve the development of an interactive virtual reality platform for learning and big data analytics, a Cave Automatic Virtual Environment (CAVE) system is needed to develop various modules in a number of degree programs in the School. An educational and research center, Virtual reality and Big data analytics research and training center (VB Center), with automatic virtual reality platform for 3D interactive learning and big data analytics will be developed and maintained by the Department of Supply Chain Management. The CAVE system to be developed is a fully immersive and interactive visualization system that provides extremely vivid stereoscopic views of sceneries in 3D design, refer Figure 1 in Part G. It is a low cost, high performance generic system that provides a versatile and powerful virtual reality platform for cost effective design, analysis and evaluation of complex engineering systems and operations, e-training, and e-learning. In practice, the system can be readily configured to provide an immersive virtual environment for users to obtain firsthand experience of

such environment without the limitations of time and space. The system can also be used for training and skill evaluation, a tool for complex system analysis and design such as in the development of products, buildings, and other facilities, refer Figure 2 in Part G. In addition, user interfaces such as data gloves, trackers, joysticks, motion platform can be readily connected to the system for enhanced immersiveness and interactivity of the virtual environment. The CAVE system can be applied to teaching and learning in programs, including BBA (Honours) in Supply Chain Management and Bachelor of Management Science and Information Management and other similar programs in supply chain, data analytics, and financial analysis. The CAVE can support research and development in the areas of supply chain, finance, statistics, and healthcare. Two 3D mock-up diagrams are shown in Figure 3 in Part G.

The development of the CAVE system, including the infrastructure set up, system design and integration, and content development is a two-year project. The content to be developed in this project will focus on supply chain, transportation and logistics. The shipment flow in air cargo terminal operation in a 3D virtual reality interactive environment will be developed. The operations of air cargo terminal will be used as a blueprint of the content. An example will be a product transshipped to Hong Kong from overseas, arriving the air cargo hub of standalone facility in place. Then, the cargo goes through a series of operations processes, for example, automated sorting process, material handling system, container storage system, quality control, customs, security, loading and unloading. In the long-run, when the development continues after the successful implementation. Further segments of supply chain process will be developed, followed by the whole end-to-end 3D interactive visualization of supply chain could be developed for training and research. With the establishment of the CAVE, priortised projects to be carried out, for example, the virtual museum on Chinese artifacts and bronze vessels and neonatal service development. The developed CAVE will also be used for training and demonstration for the industrial practitioners.

Problems Identified

(Please provide your assessments to the problems / needs identified.)

With the current mode of classroom teaching and learning using mainly textbooks and case studies, the mode of teaching is not able to illustrate the complexity of operations to the students. Field studies and on-site visits are limited and unable to fully demonstrate the daily operations and problems in detail. There are also security and safety issues in the industrial operation sites that limit the accessibility of restricted areas for students to visit and understand the operations. Thus, there is an increasing need of virtual reality 3D interactive platform to facilitate teaching, learning, and research:

1) The need of illustration in 3D during trainings

   Current lecture and training is often limited in a two dimensional environment with text data on notes and textbooks, graphical information in video, and occasionally onsite visits in unrestricted areas. Students are often unable to visualize the whole end-to-end operation in their study disciplines. There are statistical theories and models requiring 3D illustration for better understanding.

2) The need for big data analysis and visualization in training and research

Complex data visualization and analysis are required in finance, logistics, statistics and healthcare. Research and training in cargo terminal operations, stock trading platform, geometry and correlation analysis, and healthcare experiments involved in multi-dimension analysis require the support from CAVE.

3) Lack of opportunities to experience and visualize the end-to-end process operations

It is commonly found that graduates are not able to visualize the whole supply chain process in person before they enter into the workforce. An executive in a shipping line might not have visited a vessel onboard, a manager in a logistics company might never have seen a delivery document before, a banking officer might not have the chance to observe the end-to-end banking operations. The increasing division of labour in the workforce results in a lack of overall knowledge and scope in an industry. 3D visualization of end-to-end supply chain, including factory, trucking, terminal, vessel and aircraft operator, distribution center, customer premises and warehouses could be supported by the use of CAVE.

4) Chance of visiting and experiencing operations in restricted areas

Increased security and safety awareness in industrial operation sites results in a lack of opportunities for students to understand the operations, notably, dangerous goods handling, customs areas in cargo terminals, vessels and aircrafts operations, etc. CAVE provides a platform for students and practitioners to learn and understand the operations of restricted areas.

5) Enhance the skills through practice in a virtual environment beforehand

Complex and critical operations require full training before an operator is qualified to be responsible for the designated operations. These often occur in the operation of cargo terminal, cranes, material handling systems, medical surgery, and healthcare experiments. CAVE offers an environment for operators to learn and practice before they are assigned to work in the real life operations.

Project Objectives and Deliverables	
Measurable Objectives	**How it can be achieved**
1. To enhance students learning experience in sophisticated supply chain operations with the use of interactive 3D visualization platform. Measureable means: (1) Number of students visited the CAVE system, (2) Feedback survey to be completed by the students after experiencing the CAVE system.	▪ Develop an immersive 3D interactive CAVE system and logistics operations content; ▪ Conduct students visits to the CAVE learning platform; ▪ Conduct teaching in designated modules with the use of CAVE system. ▪ Carry out feedback survey with the users. ▪ Demonstrate developed CAVE system and content to various parties, including academics and students in Shue Yan University and SCOPE.

2. To improve the quality of teaching facilities, methodology, and practices on complex supply chain operations. Measurable means: (1) Usage of CAVE systems by instructors.	▪ Develop an immersive 3D interactive CAVE system and logistics operations content; ▪ Conduct teaching in designated modules with the use of CAVE system. ▪ Demonstrate developed CAVE system and content to other academics, including academics from Shue Yan University, SCOPE, and NTU.
3. To facilitate closer alignment between academic institutions and industry sectors as well as among academic institutions. Measurable means: (1) Number of visitors to the center and the CAVE system; (2) Promotions to industry on potential usage and trainings; (3) Number of research opportunities and project collaborations identified between academics and industry.	▪ Invite industrial practitioners to visit the CAVE system and demonstrate the content to the practitioners; ▪ Provide a platform possible for companies to train their staffs; ▪ Seek for collaboration with industry on potential research projects with the use of the CAVE system.
4. To promote interactive 3D learning and teaching platform with the use of the CAVE system. Measureable means: (1) The usage count of the CAVE system will be recorded; (2) A feedback survey will be provided to the users and audiences.	▪ Develop an immersive 3D interactive CAVE system and logistics operations content; ▪ Count the visit and usage of system; ▪ Conduct feedback survey with the visitors.
5. To provide a platform for research on 3D interactive virtual reality on supply chain, finance, big data, and healthcare. Measurable means: (1) Research output, including conference paper, article, and /or journal paper.	▪ Submit a conference paper for this project; ▪ Carry out further research on supply chain, logistics finance, big data, and healthcare in the end of the second year upon the completion of the project.

Project Deliverables

(Please list out all the deliverables to be achieved and how they can be shared with, if possible, other institutions.)

Deliverables	Sharing mechanism
1. Developed CAVE system – A CAVE system is developed for the interactive 3D visualisation learning and big data analytics in logistics, supply chain and transportation.	Students and academics from other institutions can benefit from visiting and using the 3D contents developed. The first batch of visit is planned to have self-finance institutions Hong Kong Shue Yan University (HKSYU), and School of Continuing and Professional Education (SCOPE). The second batch will be other

	education institutions, including The University of Hong Kong and The Hong Kong Polytechnic University. The third batch will be the academics from Nanyang Technology University (NTU), Singapore.
2. Developed content with teaching materials on international logistics hub, warehouse, and supply chain flow.	Upon the smooth rollout for the developed content on CAVE system to the modules in HSMC, the developed system can be opened and shared to other institutions for teaching.
3. Published conference or academic paper on the development of CAVE system on supply chain and logistics teaching.	The published conference paper will be available in the website of the conference as well as the website of the project.
4. Established a website to disseminate the project deliverables, including the details of the developed system and content.	The information of the developed system and content will be shared in the website for reference and knowledge sharing to other institutions.

(Please indicate the information that can be uploaded onto relevant EDB websites during and after the project period.)

Information to be uploaded to EDB websites during project period:

The funded project, titled "The development of an education and research center with automatic virtual reality platform for 3D interactive learning and big data analytics", aims to develop a Cave Automatic Virtual Environment (CAVE) system to improve the teaching methodology and practices, strengthening quality teaching, facilitate closer alignment between education institutions and industry sectors, and improve overall learning experience in the supply chain discipline. The system provides a versatile and powerful interactive virtual reality platform for operators to train and practice in complex and critical operations before assigned to work in real life operations. With the support of CAVE system and simulation software in the center, sophisticated big data in multi-dimension analysis will be carried out. The center aims to focus on the interactive visualization and big data analytics research and development in the areas of supply chain, finance, and healthcare logistics as well as provide an excellent interactive 3D learning platform to the students, academic researchers, and industrial practitioners.

Information to be uploaded to EDB websites after project period:

Virtual reality and Big data analytics Research and Training Center (VB Center) in the Department of Supply Chain Management aims to enhance the development in teaching and research with the support of a fully immersive and interactive visualization system. A Cave Automatic Virtual Environment (CAVE) system will be developed to provide vivid stereoscopic views of sceneries in 3D design to facilitate visualization on 3D illustration of industrial supply chain operations, geometrical

theories, financial modelling, and healthcare logistics operations. The system provides a versatile and powerful interactive virtual reality platform for operators to train and practice in complex and critical operations before assigned to work in real life operations. With the support of CAVE system and simulation software in the center, sophisticated big data in multi-dimension analysis will be carried out. The center aims to focus on the interactive visualization and big data analytics research and development in the areas of supply chain, finance, and healthcare logistics as well as provide an excellent interactive 3D learning platform to the students, academic researchers, and industrial practitioners.

Beneficiaries

Expected type and number of beneficiaries of the project	‣ Post-secondary students ‣ Academics and Research scientists ‣ Industrial practitioners

(Please provide justification to support the above estimation and explain how they can be benefited from the project.)

The developed CAVE system and the supporting software in the center will benefit the post-secondary students, academics, research scientists, and industrial practitioners, especially in the area of supply chain, transportation, shipping, finance, statistics, and healthcare sectors, both within and after the project period.

1) Post-secondary students

The beneficiaries of the projects include post-secondary students of Hang Seng Management College, other self-finance institutions, and universities.

- Hang Seng Management College (HSMC)

  The developed CAVE system benefits the students taking:

  - BBA (Honours) in Supply Chain Management (BBA-SCM) – about 400 students:
    The developed content can support the teaching in the modules of Operations and Supply Chain Management (SCM1006), Shipping and Transport Logistics (SCM4202), and Logistics Management (SCM3201);
  - BBA of Business Administration (Honours) (BBA) – about 850 students:
    The developed content can support the teaching in the module of Operations and Supply Chain Management (SCM3006);
  - Bachelor of Management Science and Information Management (BMSIM) – about 90 students:
    The established CAVE system can benefit the students from the BMSIM; and
  - Others potential students taking the below modules could be benefit in the future: Bachelor in Data Science and Business Intelligence (BSc-DSBI) (about 70 students) and BBA in Financial Analysis (BBA-FA) (about 80 students). Upon the development of further content, students in the BSc-DSBI and BBA-FA will benefit from the further development of the content.

  After the development and completion of the project, the CAVE system can benefit more than 1,200 students in each academic year. More students will benefit from the system upon future development on additional content in various disciplines.

- Other self-finance institutions
  - The Hong Kong Shue Yan University (HKSYU) – BBA of Business Administration (Honours)

(BBA);
    - School of Continuing and Professional Education (SCOPE), City University of Hong Kong – Professional Diploma in Shipping & Logistics Management; and
- Other universities and institutions
    - Students from the related department in The University of Hong Kong and The Hong Kong Polytechnic University will be invited for the sharing and explanation of the system and content.
    - Other institutions will be invited as well, including School of Professional Education and Executive Development (SPEED), The Hong Kong Polytechnic University – Bachelor of Arts (Honours) in Business (Operations and Supply Chain Management).

2) Academics and research scientists
    - Academics and research scientists in HSMC and other institutions will benefit from the developed system and content through teaching and research activities.

3) Industrial practitioners
    - Industrial practitioners will be invited to visit the CAVE system, through the channel of Hong Kong Logistics Association (HKLA), The Chartered Institute of Logistics and Transport (CILTHK), and Institute of Industrial Engineers (IIE). From the figures of government and Education Bureau, in 2010, there were over 12,000 firms in the logistics industry with over 100,000 people employed, representing 2.7% of the total employment in Hong Kong. The estimated beneficiaries will be the industrial practitioners in the logistics industry.
    - Members of Institute of Industrial Engineers (IIE), comprises industrial practitioners, young members, and student members, will benefit from the developed platform through training workshops.

The main outcome and deliverables include:

1) Developed CAVE system

   A CAVE system is developed for the development of interactive learning and big data analytics in the field of supply chain, logistics, transportation, finance, and healthcare.

2) Teaching and learning in degree programs

   The CAVE developed in the center will support the virtual reality and data visualization activities in the teaching curriculum and modules in various disciplines of the degree program in HSMC and students from other institutions, including School of Continuing and Professional Education (SCOPE) and Hong Kong Shue Yan University (HKSYU).

3) Industrial training and practice

   Upon completion of project, the CAVE can regularly support the activities in the industrial training in the supply chain, logistics, finance, and healthcare sectors.

4) Research and development

   Possible research and development projects will be conducted in the center. The potential projects to be carried out in the first batch are listed in earlier section.

5) Visitors showcase

   The center will support the visitor showcase to promote the teaching and research activities conducted in the center.

6) Publications

   With the establishment and development of the CAVE technology for learning and research, conference paper and/or journal paper will be published on the application of CAVE on learning, industrial practices, and problem solving in the supply chain, finance, and health care sectors.

7) Future development of learning platform

With the developed platform, further development will be proceeded after the project, including the mobile virtual reality and e-learning platform. These two learning instruments can be developed with School of Continuing and Professional Education (SCOPE) and Hong Kong Shue Yan University (HKSYU) as a sharing platform on the learning on modules including operations management, logistics, and supply chain.

8) Synergy on multidisciplinary research

The development of CAVE systems provides a useful platform for, including transportation logistics, financial analysis and modelling, banking wealth management, healthcare, and history and culture preservation, details can be referred to Part G Item 7.

Implementation Schedule

(Please list out the implementation schedule and key milestones to be achieved on a half-yearly basis.)

Estimated start date of the project (month/year)	December 2015
Estimated end date of the project (month/year)	November 2017
Project duration (months)	24 months

Month	**Key milestones**	
	In terms of project activities and deliverables	**In terms of monitoring and evaluation**
1-6	1. Infrastructure set up ▪ Arrange and set up center in the identified location in the campus; ▪ Fine-tune the mock-up design of the CAVE system; ▪ Build the frame and tracking system. 2. System development ▪ Procure and install of the systems and software; 3. Content development ▪ Conduct site visit to CPSL, compile process mapping, and develop various case scenarios of operations in the logistics hub. 4. Recruitment of Engineer and Multi-media designer as research assistants ▪ Start recruiting engineer and multi-media designer. One Multi-media Designer, with	➢ Infrastructure set up: Photos will be taken to record. The set up will be evaluate and modify regularly. The record will be shared or discussed in the quarterly meeting or update. ➢ System development: Testing on the system. The result of the test will be recorded and discussed in the quarterly meeting or update. ➢ Quarterly meeting or update: Two quarterly meetings or updates conducted by the Project Team will be held at the end of third and sixth month.

	knowledge of multi-media design and supply chain, will be recruited to assist on the content development. One System Engineer will be recruited to assist on the infrastructure, systems, and programming development.	
7-12	1. Infrastructure set up ▪ Conduct testing on the frame, tracking system, motion sensor, and projectors; 2. System development ▪ Carry out system integrations and testing; ▪ Perform 3D visualization graphic design; ▪ Start programming on initial developed content; Develop user-interface; and carry out calibration and surface rendering. 3. Content development ▪ Develop case scenarios and teaching materials 4. Website development ▪ Consolidate the content of project and develop the website for disseminating the information of the project deliverables. 5. Recruitment of supply chain operation analyst ▪ Start recruit supply chain operation analyst (part-time).	➢ System development: Testing on the system integration ➢ Content development: Meetings and discussions will be carried out to evaluate and modify the content. ➢ Website development: Testing on website functionalities and content will be conducted. ➢ Quarterly meeting or update: Two quarterly meetings or updates will be carried out by the project implementation team. ➢ Yearly meeting or update: A yearly meeting or update will be carried out by the project evaluation team. ➢ Progress Report: A yearly progress report will be compiled for record and monitoring.
13-18	1. Content development ▪ Refine case scenarios and finalizing the content. 2. System development ▪ Continue on the 3D visualization graphic design; ▪ Continue on the programming, user-interface, calibration and	➢ Testing: Carry out testing on the content development. ➢ Quarterly meeting or update: Two quarterly meetings or updates will be carried out by the project implementation team. ➢ Website development: The number of visitors who access the webpage will be counted. The website administrator will

	surface rendering. 3. Module enhancement ▪ Review and update the modules that will use CAVE system for demonstration and illustration, if involving level changes. 4. Website development ▪ Publish website content. 5. Project dissemination preparation ▪ Prepare the brochure of the developed CAVE system.	monitor and record the hit count weekly.
19-24	1. Content development ▪ Refine the case scenarios and finalizing the content. 2. System development ▪ Complete the 3D visualization graphic design; ▪ Finalize the programming codes, user-interface, calibration and surface rendering. 3. Project dissemination ▪ Trial run on selected modules of programs in HSMC; ▪ Invite visitors from HKSYU and SCOPE to illustrate the educational content on visualizing content of air cargo terminal; ▪ Disseminate the brochure; ▪ Publish conference paper in international conferences related to virtual reality, refer to the Item 2 of publicity plan.	➢ Invitation of visitors: ▪ Visitor count – The number of visitors to the centre will be counted and record. ▪ Student survey – Students participated in the illustration and demo will be required to fill in a questionnaire survey to evaluate the effectiveness of the learning platform. The questionnaire focuses on (i) feedback on learning experience on the platform and (ii) measure their understanding and knowledge on the teaching area. ▪ Visitor survey – Visitors participated in the illustration and training workshops will be invited to fill in a survey to evaluate the effectiveness of the learning platform. ▪ Interviews – Interview with participants and invite them to express and jot down their feedback on the developed learning platform. The feedbacks will be collected and summarised. ➢ Quarterly meeting or update: Two quarterly meetings or updates will be carried out by the project implementation team. ➢ Yearly meeting: A yearly meeting or update will be carried out by the project evaluation team.
Publicity Plan		

(Please describe all the publicity activities to be organised and materials to be produced to acknowledge the support of Quality Enhancement Support Scheme. Please suitably reflect the publicity activities as key milestones in the implementation schedule above.)

The deliverables and development of the Virtual Reality 3D interactive CAVE system for learning and research will be published in the following publicity plan.

1. **Website**

   A website describing the project, CAVE development, and the center will be established.

2. **International conference paper and/or journal paper**

   A conference paper will be submitted to a conference similar, but not limited to, the following conferences, to discuss, share, and exchange the ideas in the advancement on 3D interaction in CAVE in the end of the second year of the project.

   - IEEE Virtual reality 2015 – March 23-27, 2015 in France. (Link: http://ieeevr.org/2015/);
   - 2015 International Conference on Virtual Reality – April 9-10, 2015 in Los Angeles, USA. (Link: http://www.icvr.org/).

   And / or a journal paper will be submitted, but not limited to, the following journals:

   - Journal of Future Intelligent Educational Environments;
   - International Journal of Human-Computer Studies;
   - British Journal of Educational Technology;
   - Decision Sciences Journal of Innovative Education;
   - International Journal of Education and Development using Information and Communication Technology; or
   - Journal of Research on Technology in Education.

3. **Demonstrations for industry and associations**

   - A series of workshops or visits will be organized for logistics and transportation industry via Hong Kong Logistics Association (HKLA), The Chartered Institute of Logistics and Transport in Hong Kong (CILTHK), and Institute of Industrial Engineers (IIE) Hong Kong.

4. **Promotion brochure**

   - A brochure will be distributed to visitors, associations, and overseas academics to promote the virtual reality 3D interactive learning system and facilities developed in Hang Seng Management College.

5. **Invitation of visitors**

   - **Self-finance institutions**

     Academics from The Hong Kong Shue Yan University (HKSYU) and School of Continuing and Professional Education (SCOPE), City University of Hong Kong will be invited to visit the center upon the completion of the project. Institutions, including HKSYU and SCOPE have expressed their interest to visit the platform, details refer Part G.

   - **Industrial practitioners**

     Invitations will be send directly to the related industrial practitioners from existing network of the department as well as recent supply chain management graduates of department. Invitation will be send through the Chartered Institute of Logistics and Transport in Hong

Kong (CILTHK) and Hong Kong Logistics Association (HKLA).

- **Associations**

  Institute of Industrial Engineers (IIE) has expressed their interest to the platform. The institute would like to collaborate with the project team members and support the dissemination of project deliverables to their members.

  Invitations will also be send to Hong Kong Logistics Association (HKLA) and The Chartered Institute of Logistics and Transport in Hong Kong (CILTHK) to invite the members to visit the center.

- **Overseas academics**

  Academics from Nanyang Technology University (NTU), Singapore show interest and would like to visit the developed immersive virtual reality interactive platform. It is a useful platform for their courses on Port Planning and Operations, Distribution and Warehousing, and Shipping Logistics in the program of Bachelor of Science in Maritime Studies. We shall arrange a demonstration upon their visit after the completion of the project.

- **Government bodies**

  An invitation will be send to representatives of Transport Department of HKSAR to visit the developed platform in the center. The visit will explain the learning platform on transport and logistics industry. Opportunities on further collaboration with Transport Department could be explored.

6. Others

- Other activities will be organized, e.g. student class visits, photo sharing in campus TV, etc.
- Acknowledgement to the support of Quality Enhancement Support Scheme (QESS) in the brochure, posters, website and related materials.

Cash Flow and Budget

Project Expenditure

	Amount in HK$			
Period	**Year 1**	**Year 2**	**Year 3**	**Total**
Manpower	559,000	187,000		746,000
Equipment / Facilities				
Services				
General Expenses	1,222,700	10,300		1,233,000
Others (e.g. auditor's fee)	3,000	18,000		21,000
Total	1,784,700	215,300		2,000,000

Project Income *(if any, e.g. fees received)*

	Amount in HK$			
Period	**Year 1**	**Year 2**	**Year 3**	**Total**

Total				

Grant Sought under the Quality Enhancement Support Scheme	2,000,000
Funding from the Applicant	0
Funding from Other Sources	0
Total Project Value	2,000,000

(Please specify the amount to be funded by each funding source (e.g. donations, contributions from applicant / its parent organisation) and whether the funding has been secured. If not, please provide the plan to obtain the funding.)

N/A

(Please provide the duty lists of manpower to be funded by this project.)

Post	Duties
System Engineer (Infrastructure, system development, and programming)	‣ Responsible for the procurement of the hardware and software, setting up of tracking system and hardware, installation of the software, system integration, testing, and verification. ‣ Responsible for the programming and visualization, including the motion capturing, user-interface, calibration, and rendering.
Multi-media Designer (Content development)	‣ Responsible for the design of the content development on the cargo terminal operations and case scenarios. ‣ Responsible for the support in the conference paper publication and project deliverables disseminations.
Supply Chain Operation Analyst	‣ Responsible for the operation analysis, documentation, website management, conducting survey, and assisting in drafting conference and journal papers

Project Sustainability

(Please estimate the amount of recurrent expenditure and describe how you will commit the resources to ensure sustainability of the project. Please put supplementary information (e.g. proof of financial support) at appendix.)

Building on the success of the CAVE system in the virtual reality and big data center, the college is devoted to allocate resources for the continuing operation of the center in quality teaching and research:

- *Continuous funding and donations* – The College supports the development of the CAVE system and continues to identify budget, funding, and donations for the further development of the system.
- *Extension on teaching and research content* – Further content will be developed in the area of supply chain operations, bank wealth management, financial modelling, and healthcare analysis. The developed content will be used in the teaching of related modules in the programmes.
- *Further publicity, sharing, and exchange* – Invitations will continue be send to other academics and students in the self-finance institutions for visits and trainings.
- *Incoming generation* – Brochures will be send to companies in the industry. Overhead cost could be charged to the industry for trainings after six months from the completion of the project, subject to response and needs from industry. Workshops and seminars will be explored and organized. Classroom teaching, discussion, and demonstration will be carried out.
- *Future development* – In the long-run, the CAVE system will be further extended and developed with an e-based platform and portable handheld device that will be available for other self-finance post-secondary institutions.