ASSIGNMENT 3: NEW PRODUCT DEVELOPMENT
FOR
(GROUP 1/TRIPOD +)

FACULTY	:	FACULTY OF BUILT ENVIRONMENT
PROGRAM CODE	:	CFAP220
GROUP	:	CFAP2207A
COURSE	:	TECHNOLOGY ENTREPRENEURSHIP
SEMESTER	:	OCTOBER 2025 – JANUARY 2026
GROUP MEMBERS	:	FATIN NURATHIRA BINTI ANUAR (2022856332)
	:	IZAAN LINA BATRISYIA BINTI IZUDDIN (2022622156)
	:	MUHAMMAD ADIB AIMAN BIN MUHAMMAD KHAIRUDDIN (2022604276)
	:	NUR SARAH ZUFAYRA BINTI ROSLAN (2022604912)
	:	SITI SARAH BINTI MUSA (2022835414)
	:	WAN AMZHAR ARIEF BIN WAN MOHD SAFUAN (2022478576)

Submitted to:

DR NOOR FAIZAH BINTI MOHD LAJIN

Submission Date:
2 JANUARY 2026

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Tripod+ is an innovative surveying tripod designed to address common challenges faced by surveyors when working in uneven and sloped terrain. The innovation focuses on improving stability, usability and efficiency during field measurements, particularly when using sensitive surveying instruments such as total stations and GNSS receivers. Unlike conventional tripods, Tripod+ incorporates a double-height extendable leg system, adaptive terrain feet and lightweight yet durable materials to enhance performance in diverse field conditions.

The primary purpose of Tripod+ is to reduce measurement errors caused by tripod instability and to minimize the time required for setup and adjustment. By allowing greater leg extension and improved ground grip, the product provides a more stable platform for accurate data collection especially in challenging environments such as hilly areas, construction sites and uneven landscapes.

The target market for Tripod+ includes professional land surveyors, engineering surveyors, construction companies and academic institutions involved in surveying and geospatial studies. This product is particularly suitable for users who frequently operate in outdoor or non-ideal terrain conditions where standard tripods are less effective.

The idea for Tripod+ was derived from observations of real-world surveying practices, literature review and analysis using the NABC framework, which highlighted the limitations of existing tripod designs. Further evaluation using SWOT analysis reinforced the need for innovation in tripod functionality and design. Overall, Tripod+ represents a practical and feasible improvement to existing surveying equipment with strong potential for commercialisation in the surveying industry.

1.0 Introduction

The key elements in the new product development (NPD) process, as it relates to enhancing surveying technology, shall be discussed later in this section. A problem statement, which is crucial for identifying the need for improvement in current surveying tripods, especially their stability on uneven land and the need for manual adjustment, formed the rationale for the development of this project. The research work proposes the extended leg tripod system along with adaptive tripod feet as the technological answer for bridging such as drawbacks. This report defines the depth and limitations inherent in the proposed innovation, in relation to describing the method applied for accumulating and improving information on the secondary research and problem identification. This introduction section establishes the setting for the development of the new product, which would significantly improve field work productivity, precision and equipment safety in the surveying industry, as it follows the detailed steps organized in the NPD process.

1.1 Problem Statements

The challenge of equipment instability and height drift while traversing rough terrain is the central factor that fuels the development of this project. According to a paper entitled “Deformation Analysis of Tripods under Static and Dynamic Loads”, any conventional tripod can deform considerably during the loading process. Concurring to Eichhorn et al (2009), the accuracy of high precision measuring instruments can be considerably threatened by these deformations, especially if they are installed on unstable surfaces and are subjected to vibrations from the surrounding environment. Moreover, conventional lightweight aluminium tripods can also deform vertically by 0.03 mm and horizontally by as much as 10” (30 cc) when they are subjected to stress, according to the technical specification papers of Leica Geosystems. Furthermore, actual testing conditions show that the tripod legs may slip or settle unseen upon an unstable surface such as soft ground or asphalted surfaces that are hot enough on a warm day to shift the measurement, causing inaccuracies of as much as 50% when taking actual readings, especially during extreme environmental conditions. Even a level inaccuracy of 1 mm in 1 meter can lead to the project being delayed by several days in large constructions and cost businesses thousands of dollars in terms of labour and material. Such errors cause rework and incur significant costs.

The first objective of the project is to eliminate the instability by the tripod when placed on irregular and soft ground. Nowadays, when the weight of the surveying instruments rests on the irregular ground, the conventional structure fails to ensure the level surface of the platform. The aim of our project is to stop the tremors and tendencies to tip, which are exhibited from affecting the data obtained in the field.

The second objective is to improve operations effectiveness by simplifying the manual setup system. The standard tripod centering and adjusting system is time consuming and highly vulnerable to human errors. There must be an automatic or quick adjustment system in place to minimize the “invitation to error” as well as boost overall productivity in the field because a significant portion of the surveyor’s daily activities are devoted to such setup.

The third objective is the protection of valuable property. While the cost of surveying instruments can range from $2,000 to over $15,000, the tripods they are mounted on do not have adequate ergonomic safety measures and shock protection. In an effort to ensure the instruments are not damaged due to miscalibration and damage when transporting from one site to the next, the idea proposes the use of robust materials and lock systems.

1.2 Methodology

In this project, technical analysis and secondary research were employed as methodology, which was conducted from October to December 2025. This was largely done by scanning various technical documents of similar products from world leaders, such as Leica Geosystems, Myzox, which establish this project’s fundamental source of data by identifying various gaps that our project will be based upon as indicated by vertical deformation of 0.03 mm of normal aluminium tripods.

However, in order to understand the environmental and physical constraints of field surveys, a comparative study of current support technology was also conducted. In order to acquire direct insights into equipment malfunction in difficult environmental conditions involving extreme heat and terrain irregularly, this took the form of data collection from professional forums such as the RPLS Forum. Based on this data, requirements for the new product involving the use of carbon fiber material and developing call joints based on terrain modification were identified. In doing so, it is ensured that the innovation that finally emerges is not only possible from a technology point of view but also satisfies immediate professional requirements.

1.3 Scope and Limitations

The design and improvement for functionality related to surveying support equipment and more specifically to the Extended Leg Tripod System with Adaptive Tripod Feet are the key points in this project. Land surveyors, civil engineers and managers in building sites in difficult geographic areas such as slopes and soft grounds are primarily addressed as people influenced by this development. From a technical point of view, the project involves designing a ball joint adjustable foot system for enhanced stability and the application of light weight but high strength materials such as carbon fibre. To minimize stability issues in terms of horizontal drift and vertical deflections in conventional Aluminium tripods, this research will address the first stages of NPD as related to problem identification and conceptual design and preliminary Technology Description.

In spite of having an innovative approach, challenges were encountered during the course of developing the technology. First and foremost, since this report will cover only the conceptual development stages, a physical prototype still has not gone through a series of field tests for different conditions due to certain limitations. Secondly, while considering that if a product proves to collaborate with some popular brands such Leica, Topcon or Trimble, there might be a need for additional different adapters for universal usage of all surveying equipment. Lastly, not favoring their lessened budgets, many small companies or self employed people might find it feasible to buy a more advanced technology with prices at a premiere level due to high end materials such as carbon fiber.

2.0 NABC Approach

The NABC approach is a systematic way of concept or product development and explanation. It leads to a better comprehension of the market's demands, the ways in which the product or idea is a good fit for the demands, the benefits that will be experienced by the users and also the comparison with the already existing products in the market. Since it gives a greater understanding of the reason why a product is significant and how it provides the best solution, NABC is very much used in business and product development.

Needs	**Approach**
● The typical tripods are still facing problems that include uneven height adjustment, cracks and lack of instrument protection. ● A tripod that is not only more effective but also more reliable and safer is a need for surveyors.	● The plan is to introduce the combination of an integrated laser with an adjustable height function. ● Height adjustment ensures flexibility for working on uneven ground. ● The integrated laser makes the measurement and setup very precise and easier.
Benefits	**Competition**
● The whole range of field problems is solved the accuracy, height adjustment and instrument protection. ● It increases safety by protecting the equipment and lessening the chance of accidents. ● It gives the advantage of doing the setup quicker and more accurately, thus increasing productivity and accuracy.	● Few competitors offer the combination of adjustable height and built in laser. ● It gives the tripod a competitive edge in the market by incorporating multiple functions into one. ● It attracts the attention of surveyors looking for a complete solution.

In surveying, a dependable and solid tripod is a necessity for getting proper measurements. On the other hand, the traditional tripods usually bring about difficulties such as being unable to adjust the heights to the desired level, which is very cumbersome when one wants to place the surveying equipment on uneven or sloped ground. Moreover, these tripods are very likely to break or become unstable after a time of using them especially when the environments in which they are used are harsh. Such a situation can easily lead to the damage of the equipment which is very expensive and can also cause a delay in the work. The surveyors also have a hard time when it comes to procuring equipment that has the desired features of stability and protection because these features are vital in ensuring that the costly surveying instruments like GPS or total stations are not damaged during fieldwork. Hence, there is a demand for a tripod that is more adaptable, long-lasting and secure which would lead to greater field efficiency and at the same time guard the tools that are most prone to damage due to their high cost.

Next, we will explain the approach. Improvements which are really good and well thought out can be done to this product thereby making it more versatile and better in performance for different survey conditions. To the tripod's leg, a handle crank and lock have been added which allows for smooth, precise height adjustments and simultaneously assures that the tripod will not move once set. This feature usually results in more stability and faster adjustments during the fieldwork. Surveyors are now able to position their tools fast and accurately without using extra instruments thanks to a laser embedded in the middle of the tripod which also enhances the precision of the alignment and hastens the setup.Surveyors can get the legs longer for taller setups or shorter for easy storage and transportation due to the tripod's double height telescopic design that greatly enhances its adaptability to various conditions. Extra-long legs are also quite useful on slopes where common tripods can not reach the required height or provide the needed stability. The feet of the tripod can be changed to accommodate different terrains by alternating between spike, rubber pad and claw grip thus creating a versatile tool. The tripod feet can be effortlessly adapted to maintain stability and accuracy on rocky, concrete or soft soil thus giving a strong base for taking precise measurements in any condition. With the newly introduced features, this product is now a much more important device for surveyors working in various places.

The tripod provides surveyors with a number of important advantages that improve stability and productivity. It ensures that the tripod remains firmly in place even on uneven terrain, which is essential for precise measurements by offering increased stability on slopes. The tripod is safer for instruments because of its increased stability, which shields priceless equipment from harm. Surveyors can work more effectively and complete the task at hand more quickly thanks to the quicker setup time which decreases the amount of time spent adjusting the tripod. It is adaptable to

various field circumstances because it is made to operate on many types of surfaces including hard, rocky and soft ones.By ensuring correct alignment and stability throughout the procedure, the tripod's design also lowers measurement errors. The tripod may be slowly adjusted for exact height settings without the possibility of abrupt shifts even when heavy instruments are set up. Additionally, the tripod makes setup faster and more precise by enabling surveyors to quickly assess the instrument's position while making adjustments. Lastly, it has a safe carrying box that makes it simple to move and store minor accessories like tape, a level bubble and a magnifying glass keeping everything accessible and organised in the field. The tripod is a dependable and effective instrument for any surveying activity because of these features.

Lastly, a few products in the market offer both characteristics in a single tripod, therefore the tripod stands out from many of its competitors because of its integrated laser and adjustable height. The tripod has a major competitive advantage because of its creative design, which makes it a more useful and adaptable option for surveyors. Surveyors can rely on a single device to effectively perform both laser alignment and height changes rather than hauling several gears. This multifunctionality enhances fieldwork's overall convenience and productivity while also saving time. Surveyors seeking a comprehensive solution to expedite their job will find the tripod particularly appealing due to its ability to provide exact setup with a fast adjustment process.The tripod stands out as a more dependable and effective instrument by covering several needs with a single product which makes it an attractive option for surveyors aiming to improve productivity while reducing equipment burden.

3.0 New Product Development

3.1 Definition

To provide a high precision surveying instrument with a stable base free from vibration, there was designed a high stability supporting platform which is an Extended Leg Tripod System with Adaptive Tripod Feet. The product can be described as an adjustable engineering accessory which fills the distance between advanced surveying instruments such as total station instrument and GNSS receivers and the uncertain nature of the environment within the building site because usual tripods rely solely on positioning. The invention acts as the essential link which ensures that environmental factors are not reflected in high precision digital geographical information.

The sophisticated telescoping leg design and ground sensing base system are the cornerstones of the product's uniqueness. The surveyors can erect their equipment on the slopes of embankments or hills where other tripods will not be able to reach the level plane because the "Extended Leg" part offers an overwhelmingly greater adjustment range vertically. The "Adaptive Tripod Feet" with their built in balls joints and grippers that can adapt to the ground angle and texture, whether loose gravel, soft earth or hard rock, are an added feature to this.

It is its "reduction of vertical deformation" and "horizontal drift" capabilities that make this product what it is. The issues that represent important engineering weaknesses in current models in surveying tools. Its portability and shock resistance make this product excellent in its field. It is not a simple stand. Rather, it is not a simple stand. Rather it is a total stability system that was engineered for protecting expensive surveying equipment and for making field setup easier and faster.

3.2 Classification of NPD

This product falls under the category of improvements and revisions to existing products because the intent is to enhance the functionality and value of an already existing tool. Rather than create a completely different class of equipment, the development takes the fundamental concept of a surveying tripod and leverages technology to resolve some of the technical problems inherent in it. It is designed to replace prior, less efficient models with more desirable functional benefits.

The classification is justified based on incorporation of “Extended Leg” and “Adaptive Feet” technologies, which specifically solve the shortcomings of conventional aluminium tripods. According to the NPD criteria for this category, the new product must perform better than the prior generation. This system offers the required “enhanced performance” and “increased value” for it to be classified as product revision by solving problems from vertical deformation (0.03 mm) and horizontal drift (10”) found on conventional models.

It also targets the same group of people, namely land surveyors and civil engineers and offers better services thus this category also applies. The service has remained the same thus no need to be classified as “New to the world”. However, the substantial improvement it has undergone, including the material it uses which is made out of carbon fiber and how it can adjust to different mechanics (ball joint feet), makes this a high value upgrade to become the industry standard.

3.3 New Product Development Process

3.3.1 Research & Development

A. Idea Generation

The need to overcome the usual problems encountered by surveyors while working on uneven or sloped ground led to the invention of the Extended Leg Tripod System. Traditional tripods with fixed length legs on slopes have difficulty remaining stable which results in inaccuracies in measurements and tedious adjustments. The Extended Leg System was designed to prevent this. With this system, one leg of the tripod can go down the slope farther while the other legs are positioned higher. This feature of the tripod makes it stable for areas with hills or mountains where stability is a prerequisite for the accuracy of the measurements since it ensures that it is level and steady regardless of the ground being uneven.

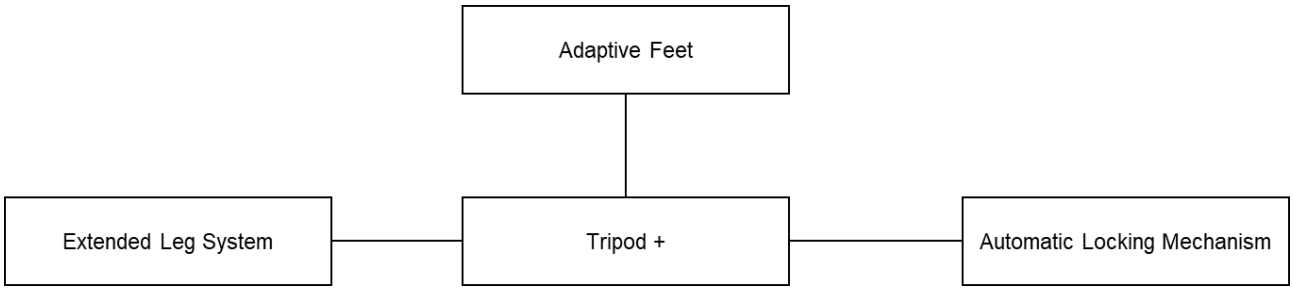
Moreover, the idea of Adaptive Feet was born from the necessity of being able to change handling according to different terrain conditions. Regular tripod feet cannot meet the requirements of all the different surfaces that surveyors often use such as mud, rocky ground, concrete and gravel. Apart from the feet with the capability to alternate between claw grips for rough terrain, rubber pads for hard concrete and spikes for soft dirt, no other equipment for different terrains are required and setup time is greatly reduced since it is assured that the tripod will be stable on any surface.

Finally, the Automatic Locking Mechanism was introduced to reduce the inconvenience of slow manual setup. Traditional tripods employ manual screw locks, which take a lot of time and necessitate precise adjustments, particularly when operating under pressure. Surveyors can adjust and secure the legs in a matter of seconds due to the tripod's quick release lock which replaces the manual locking method. This makes the setup procedure considerably quicker and more effective which is essential when working under time limitations.

B. Idea Screening

Three key components contribute to the idea screening concept for the Extended Leg Tripod System which is believed to address the practical issues surveyors encounter most frequently on the ground. The Extended Leg System was chosen because it can maintain the tripod's stability and levelness on uneven or sloping terrain. When surveyors must navigate hilly or sloping terrain, this characteristic is important because a standard tripod can lead to poor balance and deceptive measurements. The tripod's stability is ensured by the mechanism that permits one leg to be extended further than the others maintaining measurement precision.The tripod was then made even more versatile with the addition of the Adaptive Feet function. This eliminates the need for several tripods or other attachments for each type of terrain because the feet can be quickly adjusted to accommodate a variety of surfaces including rocky terrain, hard concrete and soft soil. In addition to saving time, the field is made more accessible and easier to work in.

These features make the system more practical and efficient than before when paired with the Automatic Locking Mechanism. Surveyors can install the tripod much more quickly and efficiently using the Automatic Locking Mechanism compared with standard manual locking techniques. Surveyors can put up the tripod in a matter of seconds due to the quick release system which saves a significant amount of time, especially when operating under time constraints or in inclement weather. The Extended Leg System, Adaptive Feet and Automatic Locking Mechanism together create a comprehensive solution that not only gives stability but also opens up new applications and boosts field efficiency, increasing survey work's accuracy and productivity.



This figure show the idea screening for Tripod +

3.3.2 Product Design/Features & Technology Description

The proposed product is an innovative survey tripod called Tripod+ which is designed to enhance stability, adaptability, and efficiency during land surveying operations. The tripod serves as a supporting structure for surveying instruments such as total stations, theodolites, GNSS receivers, and laser scanners. It is specifically developed to address common challenges faced by surveyors when working on uneven terrain, varying land surfaces, and under time constraints. The product targets professional surveyors, civil engineers, and construction personnel who operate in diverse environmental conditions.

The Tripod+ consists of several integrated components working together as a single support system. The main structural elements include:

I. Three extendable legs with independent height adjustment

II. An interchangeable foot system attached to each leg

III. A quick lock mechanism for fast and secure leg positioning

IV. A dedicated waterproof carrying bag with storage compartments

Each component is designed to be modular, allowing maintenance, replacement, or upgrades without affecting the overall system integrity. Below is the detailed description of each of the product's design and architecture:

A. Extendable Leg

The tripod is equipped with individually adjustable extendable legs, enabling stable deployment on sloped or uneven terrain. Each leg can be extended or retracted independently, allowing precise leveling of the tripod head. This feature ensures optimal instrument alignment, which is critical for maintaining measurement accuracy in challenging environments such as hilly areas, embankments, and construction sites.

B. Exchangeable Tripod Foot

To improve ground grip and stability, the tripod includes exchangeable feet that can be selected based on terrain conditions. These feet may include:

- Spiked metal feet for soft soil or grass
- Rubber feet for hard surfaces such as concrete or asphalt
- Wide-base feet for sandy or loose terrain

The interchangeable design allows users to quickly replace feet without specialized tools, reducing slippage and enhancing safety during surveying activities.

C. Quick Lock Mechanism

A quick lock mechanism is integrated into each tripod leg to facilitate fast and secure height adjustments. This mechanism allows surveyors to lock or release leg extensions with minimal effort, significantly reducing setup and breakdown time. Once engaged, the locking system ensures firm grip and prevents unintended leg movement, thereby maintaining stability throughout the surveying process.

D. Waterproof Bag

The product includes a waterproof carrying bag designed to protect the survey tripod from rain, dust, and harsh environmental conditions during transportation and storage. The bag features:

- Durable water-resistant material
- Multiple external and internal pockets for storing small surveying accessories such as magnifying glass, level bubble etc.
- A secure zipper closure system to prevent moisture ingress.
- Ergonomic, padded handle.

This bag ensures both the protection of the equipment and efficient organization of essential accessories. The carrying bag is equipped with an ergonomic, padded handle that provides user comfort during transport. The handle design reduces hand strain and improves grip, making it easier for surveyors to carry the tripod over long distances or rugged terrain. This ergonomic consideration enhances overall user experience and portability.

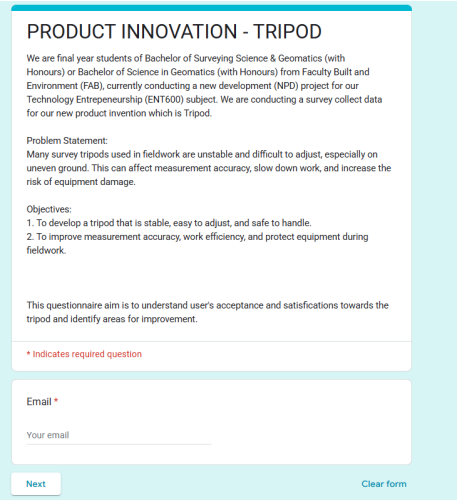
Some of the required parameters to satisfy the market needs can be found in this tripod design and features. The tripod is designed to maintain high levels of stability and reliability under varying environmental conditions. Its adjustable legs and interchangeable feet improve load distribution and ground contact, reducing vibration and movement. The quick lock mechanism is engineered to resist loosening due to vibration or repeated use, ensuring consistent performance during surveying operations.

Safety considerations include slip-resistant feet, secure locking mechanisms, and stable load-bearing capacity to support heavy surveying instruments. The use of corrosion-resistant materials extends the lifespan of the tripod, even when exposed to moisture, dust, and outdoor elements. The waterproof bag further enhances durability by protecting the tripod during transport and storage.

3.3.3 Concept Testing

Concept testing can be described as the process of reviewing a concept for a potential product by showing the concept to potential consumers before the actual development of the product. The objective of concept testing can be identified as determining the willingness of consumers toward a concept, potential for enhancement and minimizing the chances of failure for a product once it is placed in the marketplace. For this project, concept testing was conducted to assess the interest of professionals such as surveyors and engineers in a new tripod surveying tool, identify the most important features and determine acceptable pricing.

The questionnaire is designed to gather quantitative information using Google Form then distributed over the social media site.The questionnaire is designed to perceived usefulness, stability and durability as well as the likelihood of purchasing the product.


PRODUCT INNOVATION - TRIPOD

We are final year students of Bachelor of Surveying Science & Geomatics (with Honours) or Bachelor of Science in Geomatics (with Honours) from Faculty Built and Environment (FAB), currently conducting a new development (NPD) project for our Technology Entrepeneurship (ENT600) subject. We are conducting a survey collect data for our new product invention which is Tripod.

Problem Statement:
Many survey tripods used in fieldwork are unstable and difficult to adjust, especially on uneven ground. This can affect measurement accuracy, slow down work, and increase the risk of equipment damage.

Objectives:
1. To develop a tripod that is stable, easy to adjust, and safe to handle.
2. To improve measurement accuracy, work efficiency, and protect equipment during fieldwork.

This questionnaire aim is to understand user's acceptance and satisfications towards the tripod and identify areas for improvement.

* Indicates required question

Email *

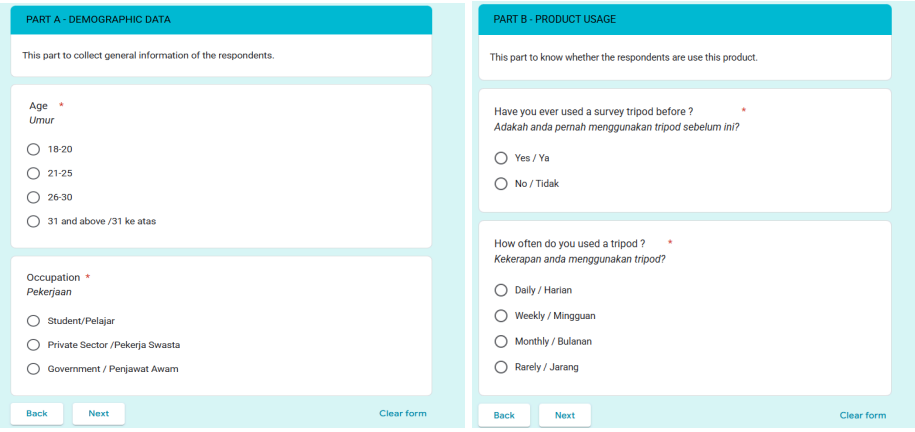
Your email

Next

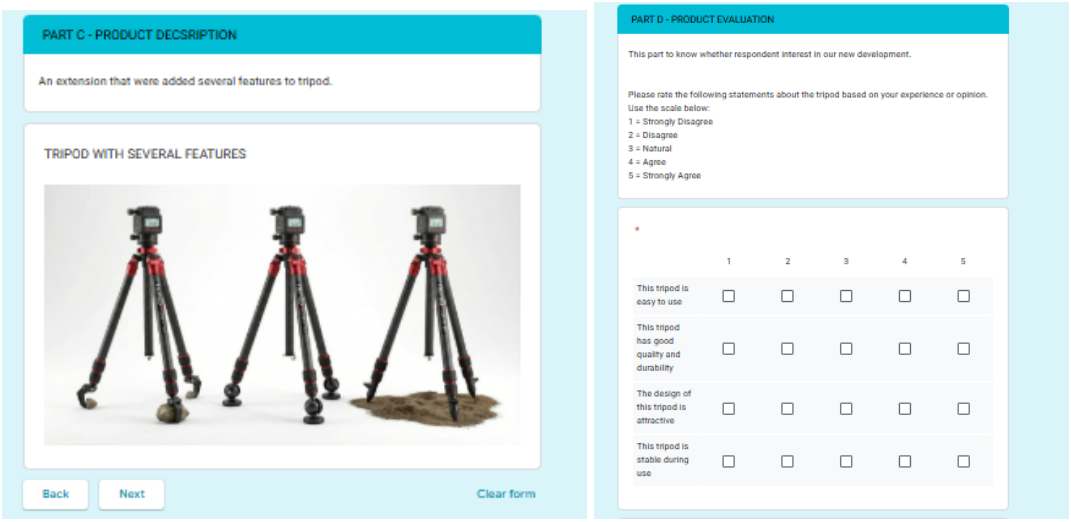
Clear form

For this concept test, the survey participants who belong to the concept of surveying tripod are made up of 30 respondents consisting of students, government and private sector employees. The groups were selected considering the need to have a wide array of views regarding the surveying tripod concept offered by the product. Students will have views concerning the use of the concept for learning and training and the government and private sector will have views concerning the use

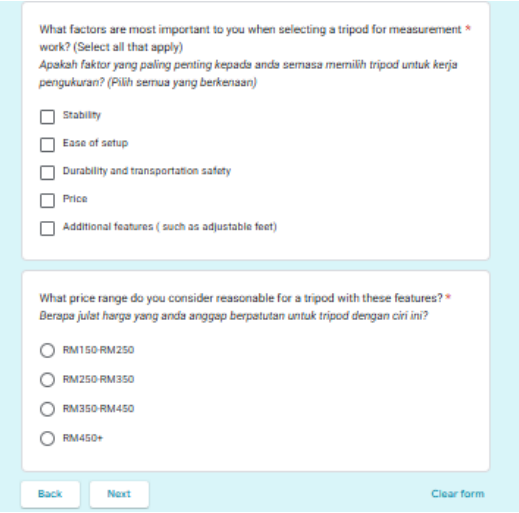
of the surveying equipment, which could have been used to carry out various projects by the involved institutions and organizations.



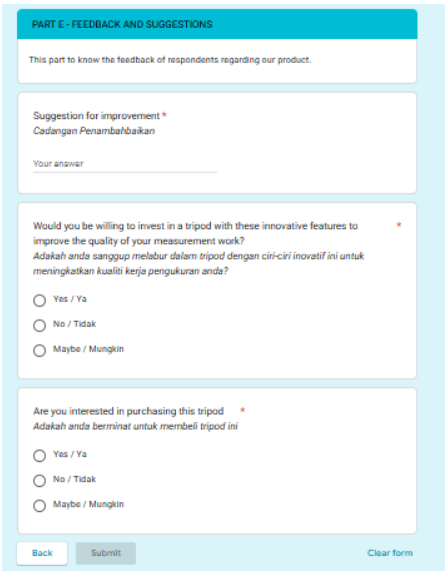
The concept of the surveying tripod is presented to the respondents through a written description that defines the product's characteristics and function. Image or drawings of the surveying tripod are also provided to enable the respondents to vividly appreciate the product's design.



Respondents choose their interest in the tripod and purchasing suggesting price whether the product is perceived as affordable and valuable.This ensures that both product features and price meet customer expectations. Additionally, this is to guide a good decision before prototype development.



Open-ended questions allow respondents to suggest additional features or improvements. The questionnaire provides a structured method to gather feedback and ensures that responses can be analyzed systematically.



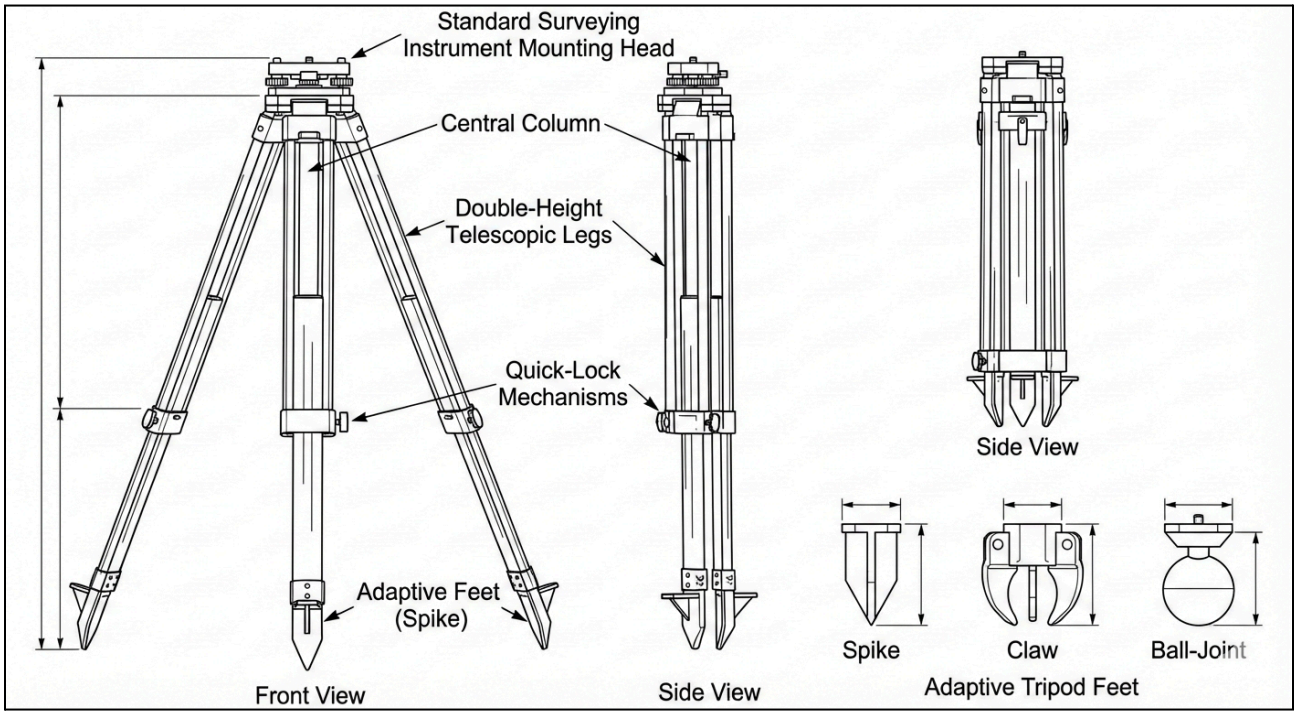
The questionnaire responses will be analyzed to assess overall acceptance of the surveying tripod. Positive feedback indicates strong potential, while suggestions will guide improvements to design and functionality, ensuring the prototype meets user needs and reduces development risks.

Overall, concept testing is important because it allows companies to evaluate a product idea before investing in full development, reducing the risk of failure in the market. It helps identify which features users value most, their willingness to pay and any potential improvements needed. By gathering feedback from the target audience early, concept testing guides design decisions, ensures the product meets user needs and increases the chances of market acceptance.

3.3.4 Build Prototype (2D or 3D)

In this stage of the New Product Development process, a non-functional prototype was developed to visualize the proposed product concept. Due to time, cost and resource limitations, the prototype was designed in 2D and 3D conceptual form rather than as a physical working model. The purpose of this prototype is to represent the overall design, structure and key features of the Tripod+.

The 2D prototype consists of labeled sketches illustrating the main components of the Tripod+, including the double-height telescopic legs, adaptive tripod feet, quick-lock adjustment mechanism and instrument mounting head. These sketches help to clearly communicate the functional layout and design intentions of the product, allowing stakeholders to understand how the tripod operates in different terrain conditions.



The 2D Prototype Sketch With Gemini AI

Meanwhile, the 3D prototype was generated using artificial intelligence visualization tools to create a realistic representation of the Tripod+. The 3D rendering shows the tripod's proportions, material appearance and overall form, including the extended leg height and interchangeable foot designs. This prototype provides a clearer visual understanding of how the product would look in real-world use and how its innovative features differentiate it from conventional surveying tripods.

Overall, the development of the 2D and 3D prototypes enables early evaluation of the product concept, supports concept testing and serves as an effective communication tool before proceeding to physical prototyping or manufacturing stages.

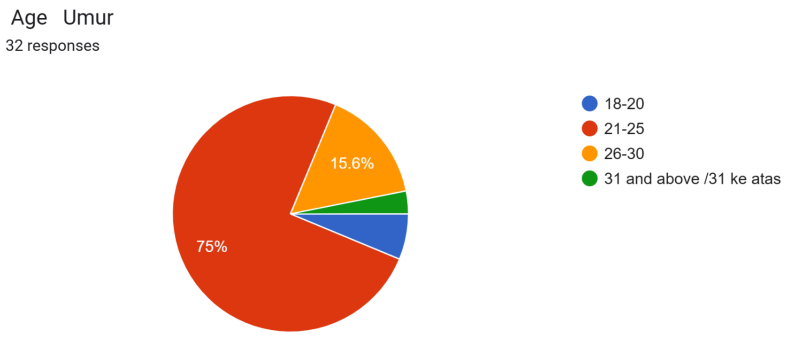
3D Prototype Image Rendering (Concept Render)

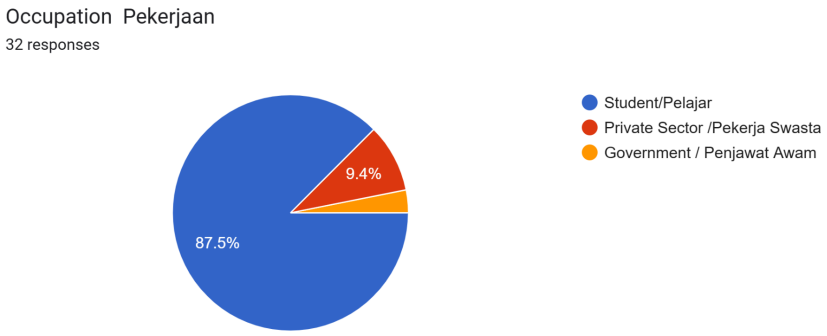
3.3.5 Test Marketing

Test marketing was conducted to evaluate the level of acceptance, purchase intention, and perceived value of the proposed innovative survey tripod prior to full scale commercialisation. According to the New Product Development (NPD) process, test marketing is an essential stage that allows entrepreneurs to introduce a newly developed product to a representative sample of the target market in order to assess real market reactions and predict future sales potential.

A structured questionnaire was distributed online to a total of 32 respondents. The respondents were selected based on their relevance to the target market, particularly individuals involved in surveying and measurement related activities.

I. Respondent Demographics

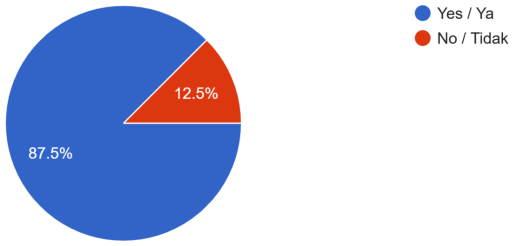




The majority of respondents were aged 21–25 years (24 respondents), followed by those aged 26–30 years (5 respondents). In terms of occupation, students accounted for 28 respondents, while the remaining respondents were from the private sector and government employment. This profile is appropriate, as surveying students and early career professionals are primary users of survey tripods.

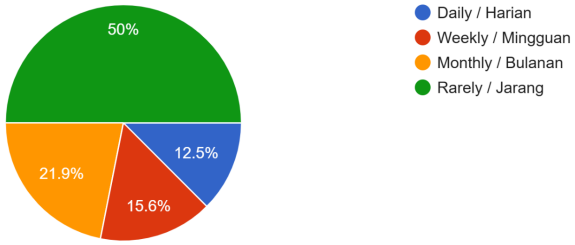
Have you ever used a survey tripod before ? Adakah anda pernah menggunakan tripod sebelum ini?

32 responses



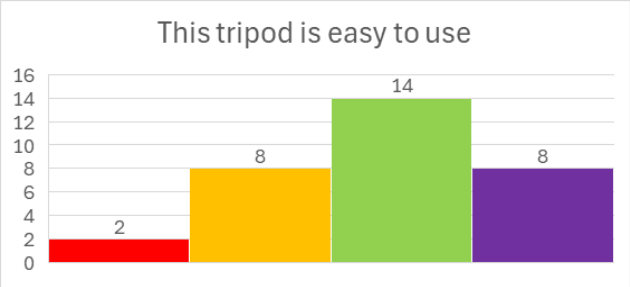
How often do you used a tripod ? Kekerapan anda menggunakan tripod?

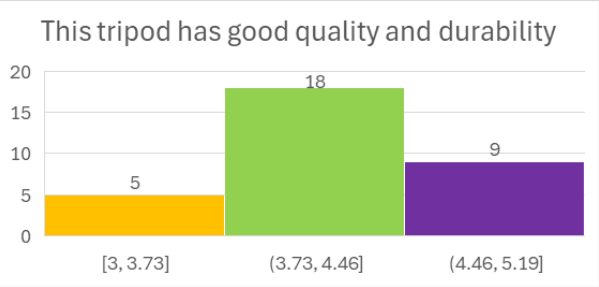
32 responses

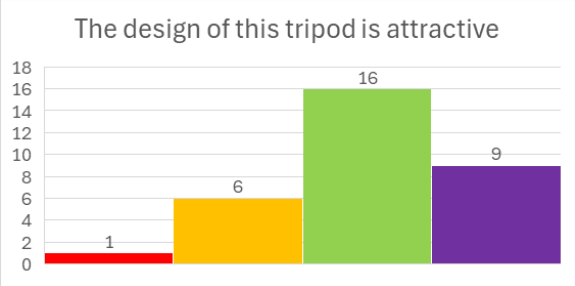


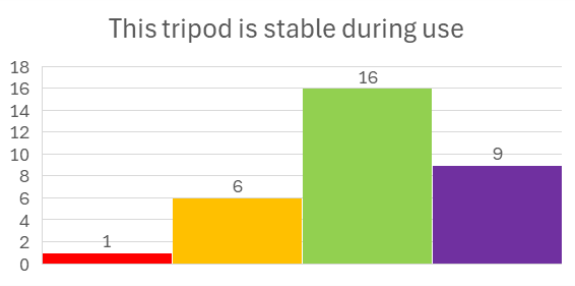
Most respondents indicated that they have prior experience using a survey tripod, which enhances the reliability of the feedback, as the responses were based on actual usage experience rather than assumptions.

II. Product Evaluation and Acceptance









	Strongly Disagree
	Disagree
	Natural
	Agree
	Strongly Agree

Figures above present respondent's perceptions of the proposed survey tripod based on four key evaluation criteria: ease of use, quality and durability, design attractiveness, and stability during use. Responses were measured using a five-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*.

For the statement "This tripod is easy to use," the majority of respondents expressed positive agreement. A total of 14 respondents agreed and 8 respondents strongly agreed, while only a small number disagreed. This indicates that the tripod is perceived as user-friendly and suitable for fieldwork where quick setup and operation are required.

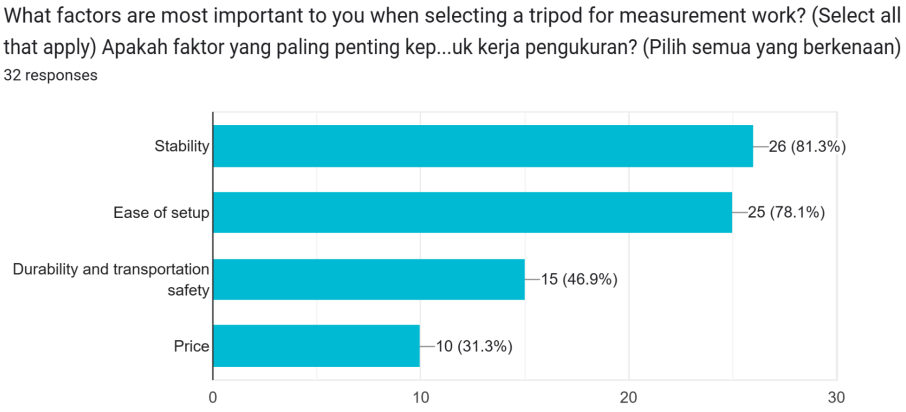
Regarding quality and durability, respondents showed strong confidence in the product. Most responses fell within the Agree (18 respondents) and Strongly Agree (9 respondents) categories.

This suggests that users perceive the tripod as robust and capable of withstanding repeated use in surveying environments.

The statement “The design of this tripod is attractive” also received predominantly positive feedback. A combined majority of respondents either agreed or strongly agreed, indicating that the product’s aesthetic design contributes positively to its overall appeal. Only a very small number of respondents expressed disagreement, suggesting minimal concern regarding appearance.

Similarly, responses to “This tripod is stable during use” were strongly positive. Most respondents selected Agree (16 respondents) or Strongly Agree (9 respondents), highlighting stability as a key strength of the proposed product. This is particularly important in measurement work, where stability directly affects accuracy and reliability.

Overall, the results demonstrate high levels of user satisfaction across all evaluated attributes, with particularly strong agreement on stability, ease of use, and durability. These findings confirm that the proposed tripod meets the practical and functional expectations of the target market, thereby supporting its readiness for commercialisation.

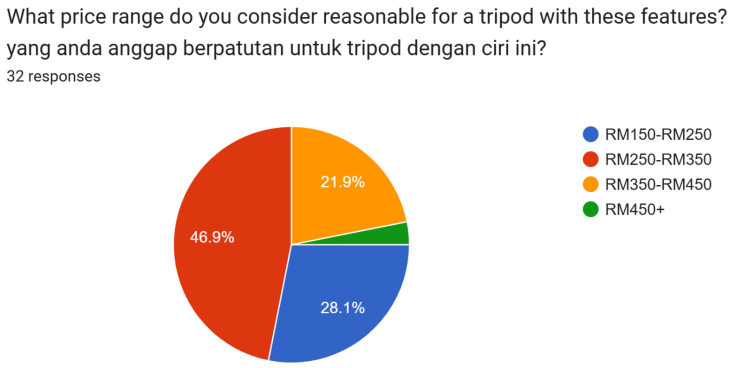


Based on 32 responses, stability emerged as the most critical factor, selected by 26 respondents (81.3%). This highlights the importance of firm instrument support in ensuring measurement accuracy, particularly during surveying activities conducted on uneven or outdoor terrain.

The second most important factor was ease of setup, chosen by 25 respondents (78.1%). This indicates that users highly value equipment that can be assembled quickly and efficiently, especially in time-sensitive fieldwork situations.

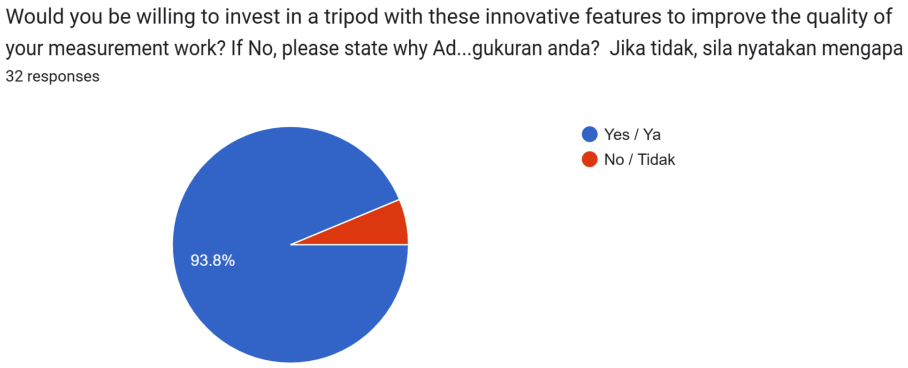
Durability and transportation safety were selected by 15 respondents (46.9%), suggesting that nearly half of the respondents consider long-term robustness and safe handling during transport to be important considerations when choosing a tripod. Meanwhile, price was selected by 10 respondents (31.3%), making it the least influential factor among the options provided.

Stability was identified as the most important factor when selecting a tripod, indicating that the proposed product features align well with user expectations and practical field requirements.

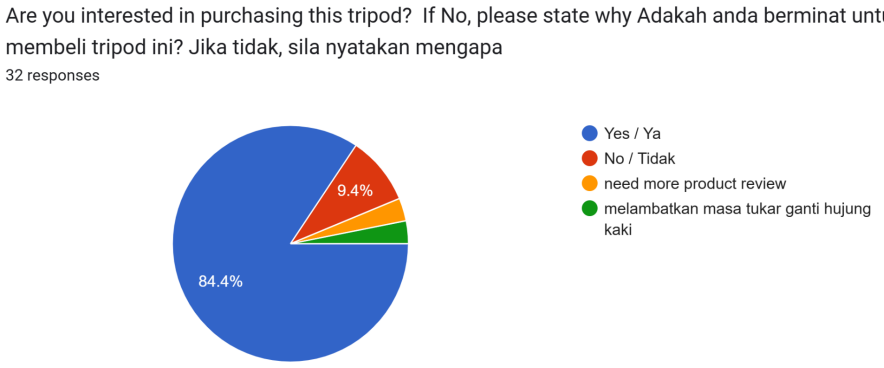


The largest proportion of respondents (46.9%) indicated that a price range of RM250–RM350 is reasonable. This suggests that respondents are willing to pay a mid-range price for a tripod that offers improved stability, durability, and ease of use.

III. Feedback and Suggestions



An overwhelming majority of respondents (93.8%) indicated that they are willing to invest in the proposed tripod. This strong positive response demonstrates high perceived value and confidence in the benefits offered by the product.



The results show strong market potential, with 27 out of 31 respondents indicating interest in purchasing the tripod. Only a small number of respondents expressed hesitation, citing reasons such as the need for further product reviews and concerns about the speed of replacing tripod foot components. These responses provide valuable insights for product improvement before commercial launch.

4.0 Conclusion

This report has presented a comprehensive analysis of the proposed innovative survey tripod using the New Product Development (NPD) framework. The product was developed in response to practical issues related to tripod stability, durability and usability commonly faced by surveying students and early-career professionals.

Based on the NPD stages including research and development, product design, concept testing, prototype development and test marketing the proposed product demonstrates strong feasibility and commercial viability. The test marketing results, supported by responses from 32 participants, reveal high levels of acceptance and purchase intention, indicating that the product effectively addresses user needs and provides clear value compared to existing alternatives.

In line with the principles of New Product Development outlined in ENT600 Unit 6, validating customer response prior to full scale launch reduces market risk and increases the likelihood of product success. The findings suggest that the proposed tripod is well positioned for commercialisation, particularly within educational institutions and surveying-related industries.

In conclusion, the innovative survey tripod has strong market potential. With minor refinements based on customer feedback such as improving durability and ease of component handling the product is suitable for further development and eventual market introduction.

References

Leica Geosystems. (2007). *Tripods and tribrachs: Accuracy begins at the base*. Leica Geosystems AG Technical Documentation.

Booz, Allen, & Hamilton. (1982). *New products management for the 1980s*. Booz, Allen & Hamilton Inc.

Ulrich, K. T., & Eppinger, S. D. (2016). *Product design and development* (6th ed.). McGraw-Hill Education.

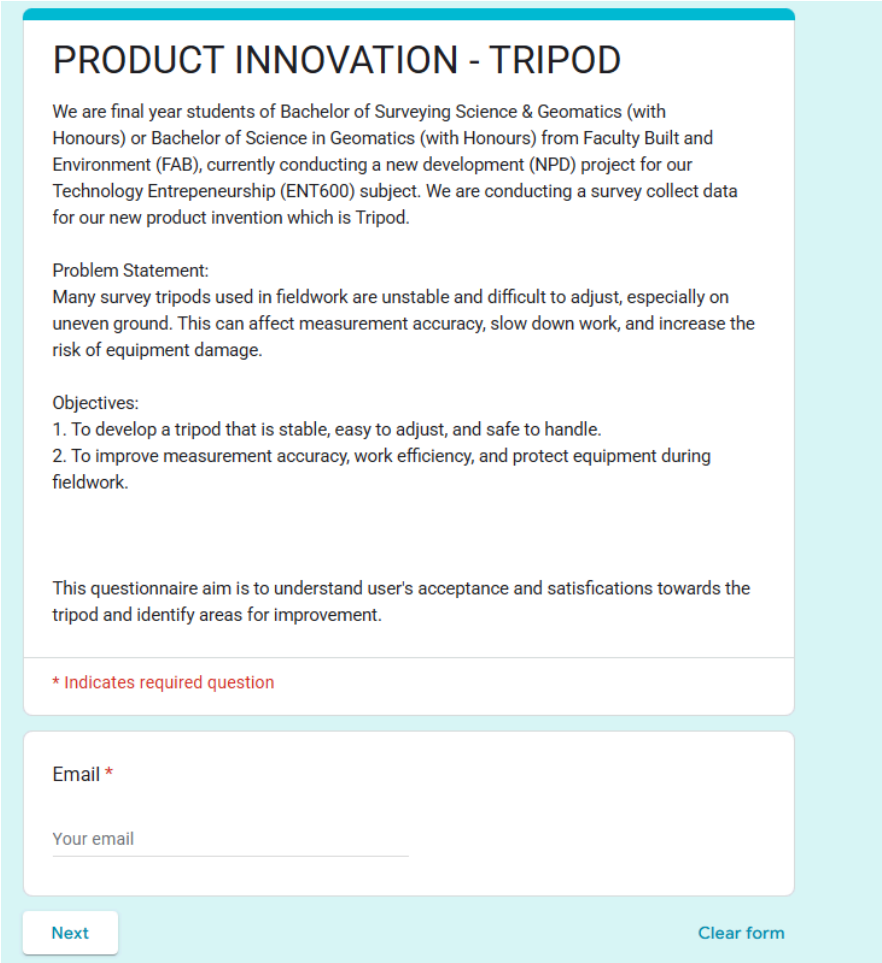
Wolf, P. R., & Ghilani, C. D. (2018). *Elementary surveying: An introduction to geomatics* (15th ed.). Pearson Education.

Eichhorn, A., Fabiankowitsch, J., & Nindl, D. (2009). Deformation Analysis of Tripods under Static and Dynamic Loads. *FIG Working Week 2009*, 1–13.

Entrepreneurship Department, Faculty of Business and Management (2009) *ENT600 Unit 6: New Product Development*. Shah Alam: Universiti Teknologi MARA.

Appendices

a. Google Form Survey



PRODUCT INNOVATION - TRIPOD

We are final year students of Bachelor of Surveying Science & Geomatics (with Honours) or Bachelor of Science in Geomatics (with Honours) from Faculty Built and Environment (FAB), currently conducting a new development (NPD) project for our Technology Entrepeneurship (ENT600) subject. We are conducting a survey collect data for our new product invention which is Tripod.

Problem Statement:
Many survey tripods used in fieldwork are unstable and difficult to adjust, especially on uneven ground. This can affect measurement accuracy, slow down work, and increase the risk of equipment damage.

Objectives:
1. To develop a tripod that is stable, easy to adjust, and safe to handle.
2. To improve measurement accuracy, work efficiency, and protect equipment during fieldwork.

This questionnaire aim is to understand user's acceptance and satisfications towards the tripod and identify areas for improvement.

* Indicates required question

Email *

Your email

Next

Clear form

PART A - DEMOGRAPHIC DATA

This part to collect general information of the respondents.

Age *
Umur

- ◯ 18-20
- ◯ 21-25
- ◯ 26-30
- ◯ 31 and above /31 ke atas

Occupation *
Pekerjaan

- ◯ Student/Pelajar
- ◯ Private Sector /Pekerja Swasta
- ◯ Government / Penjawat Awam

Back Next Clear form

PART B - PRODUCT USAGE

This part to know whether the respondents are use this product.

Have you ever used a survey tripod before ? *
Adakah anda pernah menggunakan tripod sebelum ini?

- ◯ Yes / Ya
- ◯ No / Tidak

How often do you used a tripod ? *
Kekerapan anda menggunakan tripod?

- ◯ Daily / Harian
- ◯ Weekly / Mingguan
- ◯ Monthly / Bulanan
- ◯ Rarely / Jarang

Back Next Clear form

PART C - PRODUCT DECSRIPTION

An extension that were added several features to tripod.

TRIPOD WITH SEVERAL FEATURES

Back Next Clear form

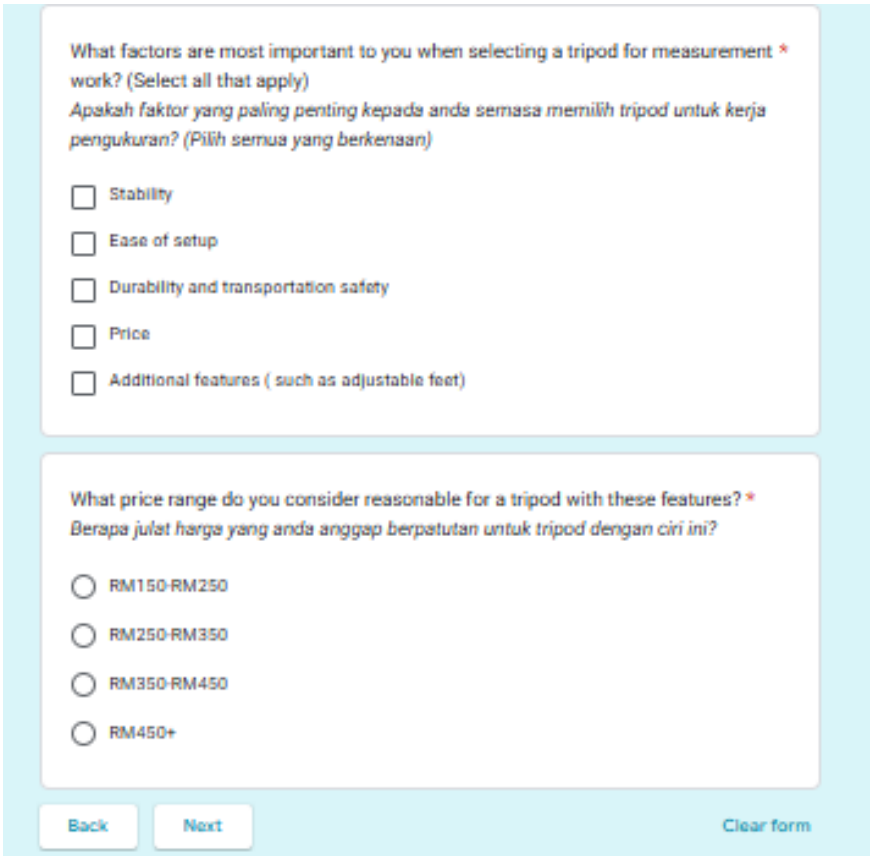
PART D - PRODUCT EVALUATION

This part to know whether respondent interest in our new development.

Please rate the following statements about the tripod based on your experience or opinion.
Use the scale below:
1 = Strongly Disagree
2 = Disagree
3 = Natural
4 = Agree
5 = Strongly Agree

*

	1	2	3	4	5
This tripod is easy to use	☐	☐	☐	☐	☐
This tripod has good quality and durability	☐	☐	☐	☐	☐
The design of this tripod is attractive	☐	☐	☐	☐	☐
This tripod is stable during use	☐	☐	☐	☐	☐



What factors are most important to you when selecting a tripod for measurement * work? (Select all that apply)
Apakah faktor yang paling penting kepada anda semasa memilih tripod untuk kerja pengukuran? (Pilih semua yang berkenaan)

- [ ] Stability
- [ ] Ease of setup
- [ ] Durability and transportation safety
- [ ] Price
- [ ] Additional features (such as adjustable feet)

What price range do you consider reasonable for a tripod with these features? *
Berapa julat harga yang anda anggap berpatutan untuk tripod dengan ciri ini?

- ◯ RM150-RM250
- ◯ RM250-RM350
- ◯ RM350-RM450
- ◯ RM450+

Back Next Clear form

PART E - FEEDBACK AND SUGGESTIONS

This part to know the feedback of respondents regarding our product.

Suggestion for improvement *
Cadangan Penambahbaikan

Your answer

Would you be willing to invest in a tripod with these innovative features to improve the quality of your measurement work? *
Adakah anda sanggup melabur dalam tripod dengan ciri-ciri inovatif ini untuk meningkatkan kualiti kerja pengukuran anda?

- ◯ Yes / Ya
- ◯ No / Tidak
- ◯ Maybe / Mungkin

Are you interested in purchasing this tripod *
Adakah anda berminat untuk membeli tripod ini

- ◯ Yes / Ya
- ◯ No / Tidak
- ◯ Maybe / Mungkin

Back Submit Clear form