



THE UNIVERSITY OF
SYDNEY

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CONFIDENTIAL EXAM PAPER

This paper is not to be removed from the exam venue

Computer Science

EXAMINATION

INFO5992 Understanding IT Innovations

For Examiner Use Only

EXAM WRITING TIME: 2 hours

READING TIME: 10 minutes

Sections	Mark
1	
2	
3	
4	

EXAM CONDITIONS:

This is a RESTRICTED OPEN book exam - specified materials permitted

Total _____

MATERIALS PERMITTED IN THE EXAM VENUE:
(No electronic aids are permitted e.g. laptops, phones)

None

MATERIALS TO BE SUPPLIED TO STUDENTS:

None

INSTRUCTIONS TO STUDENTS:

- Provide the answers within the box provided.
- Use the extra sheets at the end of this exam to provide further answers; use an appropriate pointer to the answer provided.

Please tick the box to confirm that your examination paper is complete.

Section 1 – Short Questions/Answers (25 Marks)

Question 1.1: What is the Product-Market Fit? How can the value proposition model help achieve a good Product-Market Fit? **(5 Marks)**

Product-Market Fit (PMF) is the degree to which a product satisfies a strong market demand. It means being in a good market with a product that can meet the needs of that market. Achieving PMF is critical before scaling because it ensures customers find real value in the product.

The Value Proposition Canvas helps achieve PMF by:

- Customer Profile: Identifying customer jobs, pains, and gains.
- Value Map: Designing products/services with pain relievers and gain creators.
- Fit: Aligning the value map with the customer profile so the product solves important problems and delivers desired benefits.

When the value proposition addresses key jobs, alleviates major pains, and creates meaningful gains, the product is more likely to achieve strong PMF.

Question 1.2: Explain why “Crossing the Chasm” is difficult for startups. Can the dominant design help make it easy for startups to make this transition successfully? Provide an explanation with reasons. **(5 Marks)**

Crossing the Chasm is hard because:

- Early adopters embrace risk, but the early majority demands proven, reliable solutions.
- Startups lack credibility, resources, and established channels.

Dominant Design helps by:

- Providing a standard that reduces uncertainty.
- Signaling stability and compatibility, making mainstream adoption easier.
- Enabling economies of scale and network effects.

Reason: Aligning with dominant design builds trust and lowers perceived risk, easing the transition.

Question 1.3: Imagine a startup (any industry adopting any technology) in the “Innovators” phase of the Technology Adoption Lifecycle Model and assuming the dominant design already exists; what factors should this startup consider when choosing the dominant design? **(5 Marks)**

When choosing a dominant design, a startup should consider:

1. Customer Acceptance - Does the design align with mainstream customer expectations and reduce adoption risk?
2. Compatibility - Works with existing infrastructure, standards, and complementary products.
3. Cost & Scalability - Affordable to produce and scale for mass market.
4. Performance & Reliability - Meets minimum performance benchmarks set by the dominant design.
5. Network Effects - Ability to leverage ecosystem partners and increase value as adoption grows.

(2 or 3 points with a brief description would suffice if related to the given scenario)

Question 1.4: What are the contributing factors for the startups to become coopetition instead of disrupting an existing market with new innovations? **(5 Marks)**

Startups may choose coopetition (collaborating with competitors) instead of pure disruption due to:

- High entry barriers - Costly infrastructure or regulatory requirements make partnerships attractive.
- Shared resources - Access to distribution channels, technology, or customer base of incumbents.
- Network effects - Collaboration accelerates adoption and ecosystem growth.
- Risk reduction - Reduces uncertainty and financial risk compared to full market disruption.
- Complementary strengths - Combining innovation from startups with scale and credibility of incumbents.

(2 or 3 points with a brief description would suffice if related to the given scenario)

Question 1.5: Imagine a startup that develops enterprise software for the finance industry. Explain how can open-source software contribute to the dominant design. (5 Marks)

- **Standardization** - Using widely adopted open-source frameworks (e.g., Linux, PostgreSQL) ensures compliance with industry norms, making integration with banks and financial institutions easier.
- **Interoperability** - Open-source APIs and libraries allow seamless connectivity with existing financial systems (e.g., payment gateways, regulatory reporting tools).
- **Community-driven innovation** - Global developer communities continuously improve security and performance, which is critical for finance applications.
- **Lower cost** – Reduces licensing fees, enabling the startup to allocate resources to compliance and scalability, which is key for enterprise adoption.
- **Trust and transparency** - Open-source code can be audited for regulatory compliance, building trust with financial institutions and regulators.

(2 or 3 points with a brief description would suffice if related to the given scenario)

Section 2 – Long Questions/Answers (35 Marks)

Question 2.1: Explain the difference between an organisation's Mechanistic and Organic structures. What cultural changes can be made to the structure of an organisation with the mechanistic structure to embrace innovation? **(6 Marks)**

An organisation's **Mechanistic structure** is characterised by high formalisation, standardisation, and centralised decision-making, with rigid hierarchies and clearly defined roles. This structure is efficient for stability and routine tasks but limits creativity and flexibility. In contrast, an **Organic structure** has low formalisation, decentralised decision-making, and flexible processes that encourage collaboration, adaptability, and innovation.

To make a mechanistic organisation embrace innovation, cultural changes can include **encouraging collaboration** through cross-functional teams, **reducing formalisation** to allow flexibility, and **promoting risk-taking** so failure is viewed as learning. Organisations can **allocate innovation time** (e.g., Google's "20% time"), **reward creativity** through incentives, and introduce **skunk works teams** - small, autonomous groups focused on disruptive projects. These changes foster an environment where new ideas can thrive even within a traditionally rigid structure.

Question 2.2: How can a startup create value during the Customer Development Process in the Value Proposition Canvas? Provide one real-world example from the past (any industry) or based on your assumption (for any industry adopting any technology) that will help create value in the value chain. **(6 Marks)**

A startup creates value by aligning its Value Map (products, pain relievers, gain creators) with the Customer Profile (jobs, pains, gains). During Customer Discovery, the startup identifies key customer problems and validates assumptions through interviews and prototypes. In Customer Validation, it tests whether the solution delivers real value and achieves product-market fit.

Example: A fintech startup developing a mobile payment app can create value by addressing customer pains (slow transactions, high fees) and offering gain creators (instant transfers, low cost). By iterating based on feedback, the startup ensures its value proposition resonates with the target segment, strengthening its position in the value chain.

Question 2.3: How can the Lead Users help sustainable innovation? What factors make normal users not so effective in IT innovation? Provide five reasons. (10 Marks)

Lead Users are early adopters who experience needs ahead of the market and often innovate solutions themselves. They help sustainable innovation by providing insights into future market needs, co-creating products, and accelerating adoption. Their feedback reduces uncertainty and improves design for scalability.

Why normal users are less effective:

1. **Lack of vision for future needs** - Normal users focus on solving immediate problems and rarely anticipate emerging trends, making their input less useful for long-term innovation.
2. **Limited technical expertise** - They often lack the knowledge to suggest advanced or disruptive solutions, resulting in feedback that is incremental rather than transformative.
3. **Lower risk appetite** - Normal users prefer proven solutions and avoid experimenting with untested technologies, slowing down radical innovation.
4. **Incremental feedback only** - Their suggestions typically involve minor improvements to existing products rather than proposing breakthrough ideas that redefine markets.
5. **Influenced by existing dominant designs** - Normal users are accustomed to current standards and interfaces, which biases them toward familiar solutions and discourages creative thinking.

Question 2.4: Explain the relationship between the Dominant Design and Technology Hype Cycle. (6 Marks)

The Technology Hype Cycle describes how new technologies evolve through five stages: Innovation Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment, and Plateau of Productivity. In the early stages, multiple competing designs emerge as companies experiment and respond to hype. These designs often reflect different visions of how the technology should be used.

As the hype fades and the market begins to understand the technology's real potential, a dominant design tends to emerge- usually during the Slope of Enlightenment or Plateau of Productivity. This design becomes the standard, offering a balance of usability, performance, and compatibility.

The emergence of a dominant design reduces uncertainty for both producers and consumers. It enables economies of scale, simplifies development, and encourages ecosystem growth. For example, in the smartphone industry, the dominant design of touchscreens and app ecosystems became standard after initial experimentation with various formats. This helped stabilize the market and drive widespread adoption.

Question 2.5: It is evident that the majority of startups fail in their early stages. What are the three major factors that cause startup failures? **(7 Marks)**

1. **Lack of Product-Market Fit** - Many startups launch products without validating real customer needs. This leads to poor adoption because the solution does not solve a significant problem or deliver enough value. For example, startups often overestimate demand for niche features without testing assumptions.
2. **Insufficient Capital** - Startups typically operate with high burn rates during development and customer acquisition. Without adequate funding or revenue streams, they run out of cash before achieving scale. This is common in hardware or deep-tech startups with long R&D cycles.
3. **Weak Business Model** - Even with a good product, startups fail if they lack a clear revenue model or cost structure. Mispricing, unclear monetization strategies, or over-reliance on future funding make operations unsustainable. For instance, many early sharing-economy startups collapsed due to unclear paths to profitability.

Other contributing factors include poor team dynamics, inability to pivot when assumptions fail, and intense competitive pressure. However, the above three are the most critical because they directly impact survival and growth.

Section 3 – Scenario-Based Questions (40 Marks)

“Blindsight is a proposed product from Neuralink that aims to restore vision to people who are blind and ultimately will be able to see in infrared and ultraviolet or radar wavelengths. The device would involve implanting a small, wireless device into the brain. This device would then stimulate the visual cortex, bypassing the eyes and directly sending signals to the brain that would be interpreted as images. While Neuralink has not yet released any specific details about the device or its capabilities, using brain implants to restore vision is a promising area of research. Blindsight could revolutionise the lives of millions of people with blindness. The potential breakthrough lies in developing blindsight technology through neural implants that bypass damaged visual pathways and directly interface with the brain’s visual cortex. This innovation could revolutionise the treatment of blindness, but it requires a shift from the company’s current focus and expertise in cognitive enhancement.”

Answer the following:

Question 3.1: What type of innovation is it? Provide an explanation and at least two reasons for your answer. (**5 Marks**)

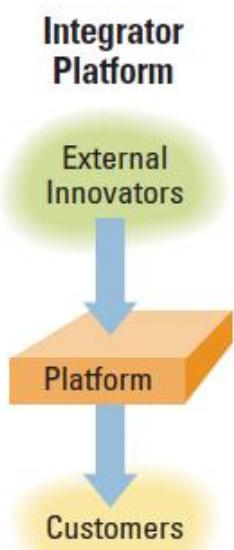
Blindsight is a **disruptive innovation creating a new market** because it introduces a technology that fundamentally changes how vision restoration is approached. Instead of relying on traditional optical aids or surgeries, it uses neural implants to bypass damaged visual pathways and directly stimulate the brain’s visual cortex.

- Reason 1 - Disruption: It challenges existing solutions like braille devices, screen readers, and optical correction tools by offering a superior alternative that could make these technologies obsolete.
- Reason 2 - New Market Creation: It opens an entirely new market for advanced neurotechnology in healthcare, not just for restoring vision but potentially for enhancing human sensory capabilities (infrared, ultraviolet vision). This creates opportunities for new ecosystems involving AI, medical devices, and rehabilitation services.

Question 3.2: Assume that Neuralink plans to provide a Platform ecosystem for sustainable innovation in the future. Make a diagram to explain the Platform ecosystem for this innovation. Identify important key players. (5 Marks)

Neuralink would create an ecosystem where it would have better control over the mediation between the consumers and providers, similar to the diagram below. This way, they could control the intellectual property rights and earn revenue in the long term.

(any other model with proper justification would also be acceptable).



Key Players:

- Device Manufacturers: Produce implant hardware, surgical instruments, and supporting equipment.
- Software Developers: Build vision-processing algorithms, apps for image enhancement, and sensory augmentation.
- Healthcare Providers: Hospitals, surgeons, and rehabilitation centers that perform implantation and provide aftercare.
- Regulators: Agencies ensuring compliance with medical safety and ethical standards.
- Data Partners: AI companies offering neural mapping, image recognition, and predictive analytics.
- End Users: Individuals with visual impairments, advocacy groups, and caregivers influencing adoption and feedback loops.

Question 3.3: Imagine that the company undergoes two iterations during the Customer Search. What are the important factors that you would like to consider during the following:

1. Customer Development (**2 Marks**)
2. Customer Validation (**3 Marks**)
3. How may the pivot look in the first iteration, and how would you address the concerns identified in the first iteration? Note that you must assume any concerns that may result in a bad customer experience. (**5 Marks**)

During Customer Development, the company should:

- **Form hypotheses** about the customer problem and solution.
- **Get out of the building** to engage with real users - people with visual impairment and medical professionals to understand their needs.
- **Test the problem** by using prototypes or wireframes to validate whether the proposed solution (Blindsight) addresses a real and valuable issue.
- **Ensure alignment** between the proposed value proposition and the actual customer segment (e.g., people with visual impairment, clinicians, caregivers).

In Customer Validation, the company should:

- **Build a high-fidelity MVP** (e.g., a working prototype of the neural implant or simulation).
- **Test sell** to early adopters-patients willing to try experimental treatments and clinicians open to new technologies.
- **Develop positioning** based on feedback: how should Neuralink describe Blindsight to different stakeholders (e.g., as a medical device, assistive tech, or cognitive enhancement tool)?
- **Verify scalability**: Is the business model repeatable and scalable across different markets (e.g., hospitals, rehabilitation centers)?

Pivot:

Assumed Concern: Users report discomfort or confusion due to unnatural image rendering (e.g., infrared or radar visuals are hard to interpret).

Pivot Strategy:

- **Refocus the MVP** to prioritise restoring basic grayscale vision before adding advanced features like infrared.
- **Simplify the interface**: Introduce adaptive visual filters that mimic natural sight more closely.
- **Improve onboarding**: Provide training modules or simulations to help users adapt to the new visual input.
- **Revalidate the problem**: Conduct deeper interviews to understand what “seeing” means to different users - some may value independence over enhanced perception.

Practice Exam

Question 3.4: A traditional model (such as the waterfall model) may not be a good choice for delivering an MVP. Justify your answer for selecting the Lean development methodology. **(10 Marks)**

Why the Waterfall Model is Not Suitable for MVP Development:

- **Linear and Rigid Process:** The waterfall model follows a strict sequence which makes it difficult to adapt to new insights or customer feedback during development.
- **Late Customer Feedback:** Customer validation only occurs after full development, which risks building a product that doesn't meet real user needs.
- **High Risk of Waste:** If assumptions are wrong, the entire product may need to be reworked, leading to wasted time and resources.
- **Not Designed for Uncertainty:** Waterfall assumes clear requirements upfront, which is unrealistic for innovative products like Neuralink's Blindsight, where both technology and user needs are evolving.

Why Lean Development is Better:

- **Build-Measure-Learn loop:** Encourages fast prototyping, testing, and learning from users.
- **Customer involvement:** Engages users early to ensure the product solves real problems.
- **Validated learning:** Tests assumptions before scaling, reducing risk.
- **Flexible and adaptive:** Supports quick pivots based on feedback.
- **Resource-efficient:** Focuses only on essential features, avoiding waste.

Application to Blindsight:

Neuralink can launch a basic MVP to restore grayscale vision, gather feedback from people with visual impairment, and iterate based on their experience. If advanced features like infrared cause confusion, Lean allows the team to pivot quickly and improve usability.

Question 3.5: Provide two examples for the following:

- What are the Customer Pains? (**3 Marks**)
- What are the Customer Gains? (**3 Marks**)
- What are the Customer Jobs? (**4 Marks**)

Customer Pains

- **Limited independence:** People with visual impairment may rely heavily on others for mobility and daily tasks.
- **Technology barriers:** Existing assistive devices may be bulky, expensive, or hard to use.
- **Social isolation:** Difficulty accessing visual information can reduce participation in social or professional activities.

Customer Gains

- **Improved autonomy:** Ability to navigate and interact with the environment independently.
- **Enhanced perception:** Access to visual data (e.g., infrared) could offer new capabilities beyond natural sight.
- **Confidence boost:** Feeling more capable and included in everyday life.

Customer Jobs

- **Navigating spaces:** Moving safely through homes, streets, or public areas.
- **Accessing information:** Reading signs, screens, or printed materials.
- **Interacting socially:** Recognising people, participating in conversations, or attending events.

Additional pages

Practice Exam

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END OF EXAMINATION