Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Case study: Wearable Technology – Kita Health Tech (KHT)

For use in May and November 2017

Instructions to candidates

- Case study booklet required for higher level paper 3 information technology in a global society examinations.

Foreword

The ITGS case study, *Wearable Technology – Kita Health Tech (KHT)*, is the stimulus material for the research investigation required for May and November 2017 higher level paper 3. All of the work related to the case study should reflect the integrated approach explained on pages 15–17 of the ITGS guide.

Candidates should consider *Wearable Technology – Kita Health Tech (KHT)* with respect to:
- relevant IT systems in a social context
- both local and global areas of impact
- social and ethical impacts on individuals and societies
- current challenges and solutions
- future developments.

Candidates are expected to research real-life situations similar to *Wearable Technology – Kita Health Tech (KHT)* and relate their findings to first-hand experiences wherever possible. Information may be collected through a range of activities: secondary and primary research, field trips, guest speakers, personal interviews and email correspondence.

Responses to examination questions **must** reflect the synthesis of knowledge and experiences that the candidates have gained from their investigations. In some instances, additional information may be provided in examination questions to allow candidates to generate new ideas.

Overview

The terms “wearable technology“, “wearable devices“, and “wearables” refer to electronic devices which are worn on the body or on clothes to collect and/or process information, usually without requiring any human interaction.

Kita Health Tech (*KHT*) is a technology company based in Jakarta, Indonesia. The company was founded by four friends who met while studying at university and graduated from different faculties (medicine, sport studies, computing and business). When they formed *KHT* in 2008, they decided that their mission would be to improve the lives of people using wearable technology in as many ways as possible.

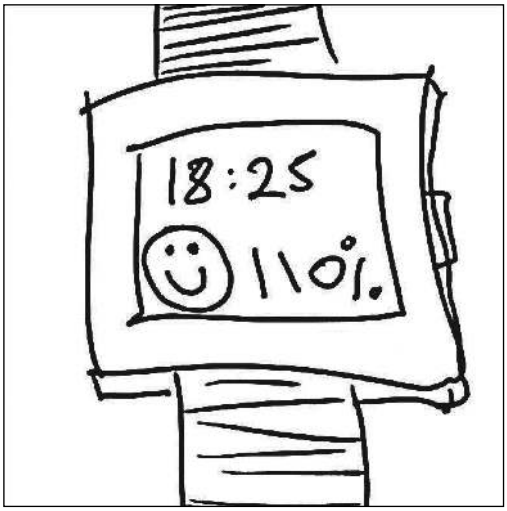
The current management team consists of the following original founding members:

- Mr Mika Harjanto, chief technology officer
- Ms Lily Adihusada, sports scientist
- Mrs Adel Astuti, health consultant
- Mr Fajar Salim, chief finance officer

The early years

The first *KHT* product was a watch that measured daily activity by counting the number of steps the user took. *KHT* worked in partnership with nutritionists, clinics and hospitals in Jakarta, and offered their watches to people who wanted to lose weight and improve their health by making sure they had a minimum daily level of activity. The watch measured movement with an accelerometer and displayed a percentage of the recommended daily activity on the screen along with the time of day. The watch also had a small memory and was able to record the total number of steps taken each day for the previous 14 days. This allowed doctors to see whether patients had followed their recommendations. The management team realised this was a limitation of the device, as the only way to get the data from the watch was by looking at its display within that 14-day time period. In **Figure 1** below, the time of day is 18:25 and the user has already surpassed the daily recommended activity by 10 %.

Figure 1 – An original concept sketch of the first *KHT* activity monitoring watch



As a result of the partnerships with healthcare organizations *KHT* was able to use penetration pricing to create a market for the watch. *KHT* also developed partnerships with pharmaceutical companies and national healthcare clinics which led to nationwide sales. The revenue obtained from these sales allowed the company to make improvements and release new versions of the watch. Later versions allowed data to be transferred from the watch to a smartphone wirelessly using the ANT+ protocol.

Current situation

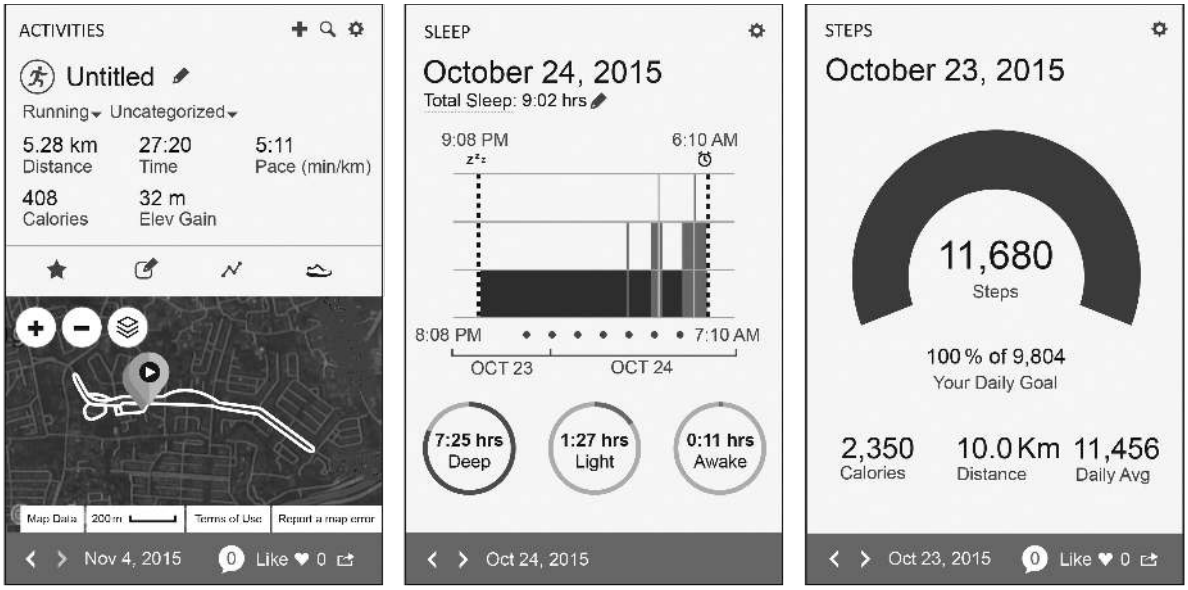
Since the first version of their product, the chief technology officer, Mika Harjanto, has continued to experiment with new programs and hardware by working on several "proof of concept" prototypes. The first of these used new protocols such as ANT+ to connect the watch to other fitness devices (*eg* heart rate monitors, bicycle power meters, gym cross trainers, *etc*) to record other data on the device. The second prototype synchronized data with several different fitness websites and cloud storage using various standard data formats, such as XML.

Mika decided to join a working group of other industry professionals who were interested in developing standards to ensure there would be interoperability between their products. His aim was to give *KHT*'s customers more choice because their devices would be compatible with other products. As part of this working group, Mike realized that it would be more cost-effective to aggregate and analyse data in the cloud rather than develop apps to do this.

Lily Adihusada, the sports scientist, saw many other opportunities in her field, such as skiing, tennis, golf, swimming, triathlon, hiking and even parachuting – although she realised that several of these would require additional and more specialized hardware. As part of her research, she visited an international sports technology exhibition in Germany and was amazed by the innovative products she saw, such as skin sensors to automatically measure calorie intake or hydration, the use of coloured light to measure heart rate without the need for a chest strap, and also wearable sports clothes that incorporated many sensors.

Lily was aware that there were many web-based services that could accept data from any device as long as it was in a standard format. However she also heard that some customers preferred to store and analyse their data on a local device only, rather than upload it to one of the many cloud services that were available. She presumed that this was because they wanted to personally monitor and study their activity, rather than get generic feedback from online services. Lily was also aware that there may be greater potential for growth if *KHT* diversified from the development of wearable technologies into the provision of services that gave their customers information to allow them to make better decisions about managing their own health and well-being. Lily was impressed by services such as "Garmin Connect". **Figure 2** shows a small selection of data available using this service.

Figure 2 – Example of data from the "Garmin Connect" service



[Source: www.runnerjames.com]

Many different programs and services exist to analyse data from wearable devices, both online and offline. Some of these are directly related to health considerations and others to general fitness and well-being, for example sleep pattern analysis.

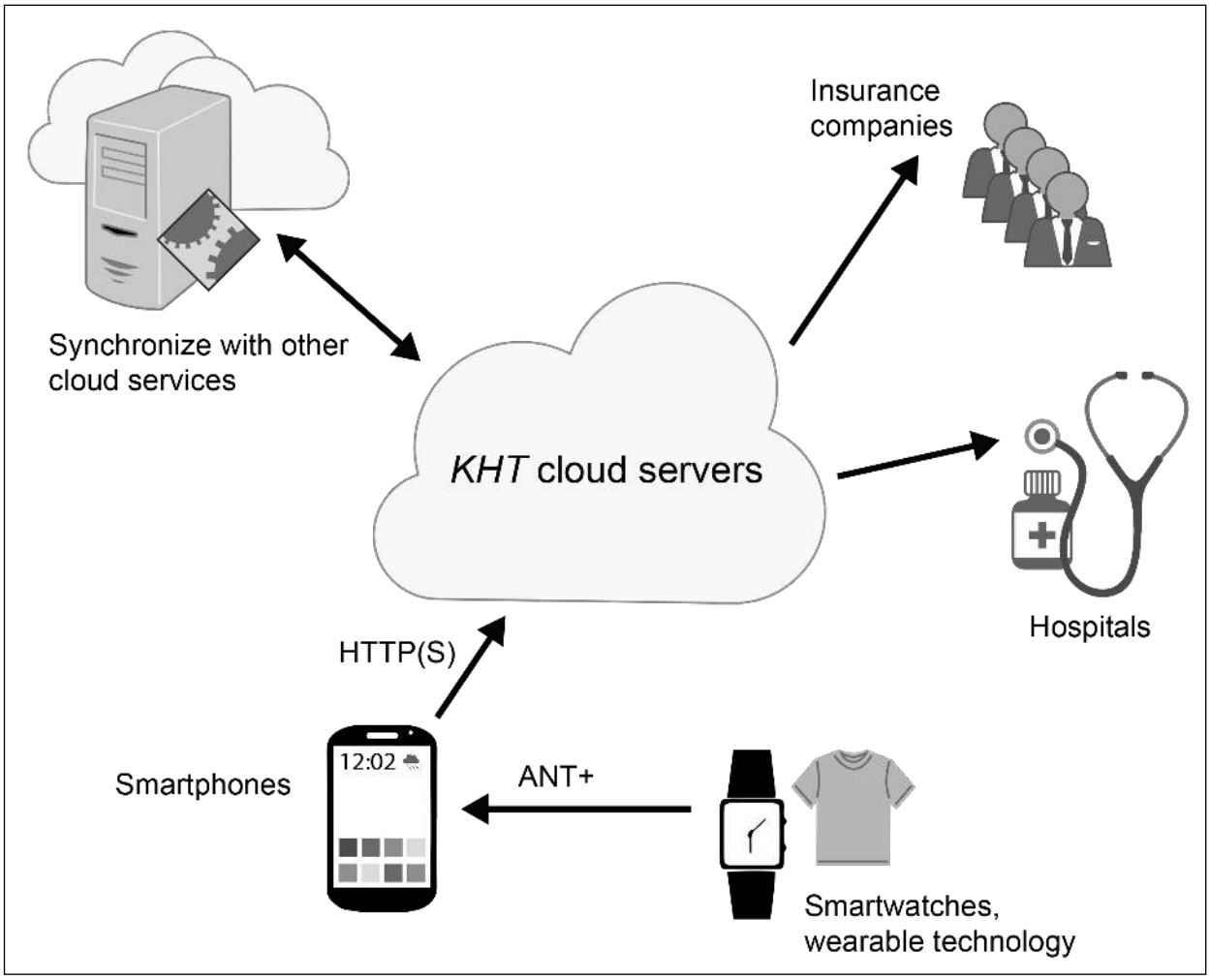
Fajar Salim, the chief finance officer, was always fighting against plans to develop advanced and innovative new software and hardware for the devices, as he thought it would take too much time, cost too much money, or require hiring a team of software developers when the company could make money in other ways. He was also concerned about protecting their technology and ideas from companies that might try to copy them and manufacture them more cheaply in other countries. However he saw the value of obtaining data from all the *KHT* customers, as it would provide opportunities for selling and sharing data with third parties such as insurance companies.

Adel Astuti, the health consultant, wanted to further develop *KHT*'s relationships with hospitals, health providers and insurance companies, who were keen to promote *KHT* products as long as they could provide access to more detailed information. She interviewed doctors about which data would be most helpful in their diagnosis and treatment of patients. From these interviews she found that, in addition to the calories burned by daily movement, doctors were interested in data such as sleep patterns, skin temperature, glucose levels, hydration and heart rate. Doctors were also keen for a future device that would be able to locate patients who frequently got lost, or were at a high risk of heart attacks, strokes, *etc*. Some discussions took place with insurance companies who were interested in using the data provided by *KHT* in their algorithms to set prices for health and life insurance policies. However she was concerned that the sharing of data with healthcare professionals and insurance companies could raise ethical issues that the company managers needed to address.

Due to the fact that Adel had completed her medical training both in Indonesia and the UK, where the funding and access to medical care varied, she was aware that there would be a need to customize wearable technologies to the needs of the different markets if they were to be sold globally.

Figure 3 below gives an indication of the flows of data in the *KHT* case study.

Figure 3 – Data flows in the *KHT* case study



Challenges faced

Mika, Lily, Adel and Fajar agreed that the road ahead for *KHT* seemed full of opportunities, but there were a number of challenges that needed to be considered.

Hardware and software

- Ensuring the software for communicating and storing data in new products is compatible with existing and future standards and protocols, such as ANT+ and XML.
- Investigating the different sensors available for wearable technology and how they might change in the future, as well as how practical it is to add them to items that customers wear (not just watches, but clothing, accessories, *etc*).
- Developing features that are not strictly health-related, but are useful for monitoring and managing a user's overall well-being.

End users

- Deciding whether to prioritise the development of new wearable technologies that can be customized to be more responsive to the needs of different users, such as elite sports people, scuba divers, golfers, young children and doctors. This might require modifications to the hardware or software of the existing products.
- Whether to develop products that can be adapted to the needs of the different users in a range of countries such as China, Russia, Thailand and Australia.
- Whether to develop products that claim to enable users to be able to manage their own health and well-being, such as by setting safe limits for the time spent exercising or setting upper limits for their pulse rate.
- Whether to develop different services, such as e-mail or text alerts, monthly bulletins, *etc*, for different user groups, for example sports professionals, people with medical conditions, elderly people or children.
- Deciding to develop downloadable software and special websites that can be used to interpret the data that is collected by the devices for particular exercise sessions and over time.

Data

- Managing the privacy and security of large quantities of *KHT* customer data. *KHT* is concerned that many of their customers may worry about their privacy and anonymity being compromised by sharing data with health authorities and insurance companies who have made such agreements with *KHT*.
- Ensuring there is an appropriate balance between the input from healthcare professionals and software developers in the development of algorithms so that users can trust the information provided. This information would come from downloadable software and a special *KHT* data analysis website.
- Developing ethical data gathering and sharing agreements with health authorities and insurance companies within and between countries that are not disadvantageous to certain groups of society.

Policies and practices

- Developing policies that are able to identify who is accountable should an item of wearable technology fail. For example, a customer's wearable tech fails to detect a heart rate that is considerably above the recommended maximum rate. Also, how this accountability is affected if a customer adapts the settings of the device to fit their personal requirements.
- Updating the services that *KHT* are offering, such as to trigger alerts when there are changes to health advice, to reflect different cultural perceptions about what constitutes a serious condition, or sending appropriate information to different groups of users.

Key terms associated with *Wearable Technology – Kita Health Tech (KHT)*

Algorithm
App
ANT+
Copyright
Data synchronization services (such as Tapiriik.com)
Difference between health and well-being
Insurance premium/policy
Interoperability
Patent
Proof of concept
Smartphone
Smartwatch
Standards and protocols
Wearable technology sensors
XML formats for exporting activities (such as GPX and TCX)

Any individuals named in this case study are fictitious and any similarities with actual entities are purely coincidental.