CHOU, Associate Professor Chun Tung, Private capacity

KANHERE, Dr Salil, Private capacity

Evidence was taken via teleconference—

CHAIR—Welcome. Would you like to make an opening statement?

Prof. Chou—We would like to thank the committee for inviting us to appear before this inquiry. We understand that the committee is interested to know more about the emerging technology of participatory sensing for price comparison. For price comparison we need price data. A method to collect price data is to get the retailers to tell us. Another method is to employ a team of people to collect the data. Another method we can use is participatory sensing. I will give you a quick example to explain the idea of participatory sensing.

When I drive past a service station I know how much the service station is selling the petrol for. If I involuntarily share this information with other people using my mobile phone then other people will know the price of petrol at that petrol station at that time. If a lot of people volunteer to do the same then we have a good idea of what the petrol prices are. What I have just described to you is a very rudimentary form of participatory sensing. The reason I used the word 'rudimentary' is that there is a lot of human involvement.

We are aware of a website in the United States called GasBuddy that is based on this concept. In 2008 the GasBuddy website was chosen by *Time* magazine to be one of the best 50 websites. According to *Time* magazine, the website had some 750,000 volunteers. Researchers want to develop technology in participatory sensing to make it more viable. We want to make the data collection process both automatic and transparent so that there is as little human involvement as possible. This means that people can go about their own daily routines and still be able to voluntarily collect and share information. Ultimately we want to turn participatory sensing to low-cost and less labour-intensive methods to collect information for the public.

We have been developing technology for participatory sensing for a number of years as part of our university research. We have come out with an automatic method to collect and share petrol prices. We have also come out with a semiautomatic method to collect prices of grocery items and homogenous goods. However, when certain new technologies are in place we will be able to make the method completely automatic. We believe this is the reason why the committee has invited us to come here today. We are pleased to help the committee with this inquiry. Thank you.

CHAIR—Thank you very much.

Senator PRATT—I note in one of the papers that you have written that you raise a number of technical and monetary barriers to participation in such participatory pricing schemes. Can you highlight those for the committee? How do you envisage they will be overcome?

Prof. Chou—There are currently a number of barriers. The first is that there is a course of doing this sort of data collection. What we are trying to do is make this technology transparent and easy to use. We want to make sure that there is little human involvement so that people can go about contributing data in their daily routine. We have managed to make automatic the method for collecting petrol prices. There are certain issues with accuracy at this stage. For the collection of grocery items, currently our method is semiautomatic but there is a way to make it automatic in the future. What we have described in the paper is asking people to take a receipt or docket of what they have purchased. From the shop's docket you can get a detailed description of the goods and their prices. If people take a picture of that receipt then the software on their phone can automatically extract the price information and share that. Possibly this requires too much human involvement, but we feel that paper dockets will one day disappear. Society is going paperless. Some of us are getting our bank statements by email. One day it is quite likely that we could opt to get an electronic receipt sent to our mobile phone. I do not want to go into the costs and environmental advantages of using electronic receipts. The key message for price collection is that when this happens we can collect prices and share that with other people in an automatic manner. This is but the first issue that we will have to overcome in order to make the technology viable. There are also issues with security and anonymity.

The first issue that I want to raise is about the coverage and the accuracy of the data. If we are talking about petrol prices, we see that we can cover quite well the service stations in built-up areas. For grocery items the coverage will be more of a difficult problem because of the number of different grocery items as well as the number of stores. I think that is a question that we really need to look into in the future.

The last issue I want to raise is that of incentives, given that participatory sensing relies on having enough contributions from people. For people to use participatory sensing, it may be possible to have new models for creating price comparisons at sites. There are two models we can consider. For the first model, the website can be run by a lone government organisation, with data collected using participatory sensing. As I said in my opening remarks, there is a website, GasBuddy, in the United States, which runs entirely on voluntary contributions, and the website has 750,000 volunteers. So that may be a viable alternative.

The second model we can consider when it comes to providing an incentive is to use a private company with data collected via participatory sensing, where the data will be made available to everyone. The private company can provide value-added services to the data—for example, data analysis, market trend analysis and services output to government and other public organisations and companies. The income can be used to pay for the collection costs of volunteers contributing data.

Let us do a simple sum, assuming that we can solve all the technical problems I spoke about earlier. The classic method is to employ people to go and collect data. Let us just say we are going to pay people $50 an hour to collect the data. Now, I get the information or the price data from the data company just for the cost of a mobile phone call. If you think about it, wages will be going up, and the price of a mobile phone call will be coming down. So I believe there is a business proposition here.

I want to point out that this type of arrangement is not unheard of in the software industry. Some software packages today are actually produced by private companies in collaboration with

a team of volunteers. The private company will give the software away for free, but the private company earns an income by providing value-added services—for example, technical support. So having a group of people contributing data means there is a new way to set up this type of grocery price comparison website, and I think that is something of interest to look into in the future.

Senator PRATT—Thank you. You have outlined a model that may not need government involvement. The government has recently tried to pursue policies that compel retailers to provide information so that it can be compared, and that has proven difficult. You have highlighted emerging trends for participatory price sensing. What kind of time line do you believe we are talking about here, to get these kinds of models up and running, and how could that be accelerated?

Prof. Chou—It depends on how perfect you want the technology to be. As I said earlier, if you do not mind having people contributing the data and if people are willing to go out of their way to contribute data by taking a picture of the docket or just ringing up a website to say, 'This is the price of petrol at this petrol station at this time,' then that can be done now. The cost is high and the human involvement is going to be high, and I speculate that it may not to be sustainable for a long time. When it comes to developing the technology, if we want to have good technology so that malicious users cannot infiltrate the system and introduce false data, we will need to do a bit more.

Senator PRATT—I think examples like Wikipedia show that, if consumers come across false information, provided there is a high level of participation they are likely to jump on and correct it quite quickly. Are you of that opinion, and how would you work out your participation thresholds to know that the information was generally reliable?

Prof. Chou—There are certain checks and balances that we can do. Basically, what you have said is correct. We can actually use a form of majority voting to determine whether the prices are correct or not. What the researchers—both us and many teams in the United States—are trying to is make sure that malicious users cannot infiltrate the system. In order to do that, we may need to add certain hardware capabilities to mobile phones. That is not too much, because these hardware capabilities that we are talking about can also be found in laptops and computers today. Given that the barriers between mobile phones and laptops are disappearing, we see that it is as just a matter of time before these new hardware capabilities are found on mobile phones. How long it will take is very hard to predict, and I could very well be wrong if I put a number to it. Perhaps in five or 10 years it might be ready. To sum up, if we want a very elementary form of participatory sensing, we have it now, but if we want technology that can deal with malicious users and ensure the certainty of the data then we will have to wait some time.

Senator PRATT—The problem with malicious users and a little bit of uncertainty about the data might have a higher level of significance, I suppose, if you have got a government that mandates a website and the like. But if consumers are putting that information forward for consumers it is not really a question of false advertising; it is a question of making sure that information that is incorrect is corrected as quickly as possible so that, in general, the information is reliable. Is that right?

Dr Kanhere—I might take this one. I would say that could be possible if, as Professor Chou mentioned, we had some basic checks and balances. If we have a large number of users contributing data, it will be reasonably easy to weed out malicious contributions because they will sort of stick out from the rest. So such basic checks and balances would work. There might be some errors when we do not have enough people contributing, but on a large scale it would probably work.

Senator PRATT—Comparing like with like, I suppose if something has a bar code attached to it then that enables you to make a fairly reliable comparison. Is there a way for consumers to create the links and compare what is actually like for like?

Prof. Chou—There are two issues here. One is the price and collection of the price data. That is the problem that is being dealt with by participatory sensing. The issue of price comparison is an entirely separate field of research or study. I agree entirely that it is very difficult to compare two heterogeneous items. It may be possible in the future to go and do that. I am not sure. I am going to speculate that maybe one day people will go into a supermarket, take a picture of the fresh vegetables and, based on the pictures and, with smart enough software, may be able to figure out if they are fresh or not so fresh. That is pure speculation. The point I want to make is there is a big difference between just collecting the prices and enabling the comparison of two heterogeneous items. If two items are totally homogenous then we can pretty much assume the quality will be the same and the difference will be the price. But for two heterogeneous items, comparing them will be difficult.

Senator PRATT—Clearly, the reason we want to have disclosure of prices is for two reasons: firstly, for an individual consumer to be able to make a choice about the cheapest product and, secondly, to create a competitive market that drives prices down in general. Can you tell me what evidence there is—or if there is none that you are aware of, let us know—of whether things like GasBuddy assist in creating competitive markets?

Prof. Chou—We know from economic theory that information is very important. We know that in the beginning of the internet economy, some people speculated that the internet would create a perfect economy and eliminate price dispersion because of the very small search costs. What we know is that it has not happened. Our goal here is not really to create a perfect economy but, with participatory sensing, to come out with a new method to collect information and to reduce the cost to collect it. What we know is there is price dispersion in the online market. There were studies done by economists and they found that there was a price difference of 15 to 17 per cent in the online market for music CDs.

In the online market, there are a number of price comparison websites. These economists have also studied using these price comparison websites and show that if people use these websites they can actually save about 15 to 17 per cent. The proposition here is this: there are price comparison websites for the online market and it would be good if we could get one for the brick-and-mortar stores. I see the main difficulty with this as being collapsing the information as it is unstructured.

Going back to your question about the effect on the market, from these studies we see that people can get a better deal by using price comparison websites online. Maybe by having price

comparison websites for brick-and-mortar stores people will be able to get better deals too. Lastly, I would like to point out that we are not experts in economics.

Senator PRATT—Clearly, there are any number of computer and mobile phone applications with user input and participation and that information is exchanged. That is now quite common. In relation to participatory price sensing, how quickly do you think this trend is going to emerge? Is it something that is just going to happen? Who is investing in it and why?

Prof. Chou—For online markets there are a number of price comparison websites. For offline markets we know there is an application called ShopSavvy that has won the Google application challenge. This application enables you to scan a barcode with a mobile phone. Based on this barcode, it will tell you how much the item costs in the online market, and it may also make a few suggestions and tell you how much the item will cost in a number of local stores. There are a number of teams of people developing applications in order for people to get a better deal by using their mobile phone to search for better deals.

Senator PRATT—If government is interested in using these kinds of technologies to help ensure better competition in the marketplace, what kind of approach should it take to these issues?

Prof. Chou—From my own speculation—because we are not experts in government policies—I see that there is a value in using participatory sensing to collect data. The data can be prices or other information, such as people working on sharing information about traffic conditions, air pollution, noise pollution and so on. Perhaps the government, when it wants to promote price comparison websites, may think about different models to set up these price comparison websites. I have spoken about some of them earlier. We can have a voluntary organisation, a non-government organisation, working with volunteers using participatory sensing to provide information. An alternative is that it may be viable for a private company to start a business based on price comparison and participatory sensing. What I see is that there are different models that we can explore to encourage these price comparison websites to sustain themselves. This is my answer, given I am not really an expert in government policy.

Senator PRATT—Thank you.

CHAIR—Thank you very much, Dr Kanhere and Professor Chou, for appearing today. That concludes your evidence.

Prof. Chou—Thank you.

Dr Kanhere—Thank you.