

Spectrum Allocation

A case study for use in teaching in Engineering Ethics

Abstract

This scenario examines the ethical issues surrounding the allocation of the radio spectrum to different services benefiting different groups of users.

Teaching Format

1-2 hour session, presentations and small group discussions

Practicalities

This session is aimed at students who have some experience of ethics.

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Spectrum Allocation

Ofcom is the watchdog for the communications industry. The role of Ofcom is encapsulated in its principal duty which is “to further the interests of citizens in relation to communications matters; and to further the interests of consumers in relevant markets, where appropriate by promoting competition”.

One of Ofcom’s main duties is to manage the radio spectrum. This means that they allocate portions of the spectrum to particular companies or services, and often there will be a number of companies or services requiring the same portion of the spectrum. The use of the spectrum is governed by a number of constraints set out by law. Ofcom are required to ensure that the electromagnetic spectrum is put to ‘optimum’ use, that a wide range of electronic communications services are available, that a wide range of varied & high-quality radio & TV services are available and that there are a sufficient number of providers of different TV & radio services.

The law also states that the different needs and interests of all people who might want to use the electromagnetic spectrum should be taken into consideration when thinking about spectrum allocation. This includes; the needs of persons with disabilities, the elderly and those with low incomes; the different interests of people throughout the UK such as different ethnic communities and people living in urban or rural areas.

Assignment

You are part of a team of advisors working for Ofcom whose job is to advise the executive board about potential allocations of the radio spectrum. In your team you should prepare and present your recommendations for the following case(s):

- **Case 1:** Ofcom has to decide whether or not to allocate part of the spectrum to a new nationwide radar guidance system to assist blind and partially sighted people. This will have the effect of drastically reducing the availability of wireless internet to users in North West England.
- **Case 2:** Ofcom has to decide whether or not to provide people in rural Shropshire, Cornwall and Herefordshire with broadband access. This will have the effect of reducing the coverage of a number of mobile phone networks.

Student Handout- The Assignment

Your task is to make recommendations about what Ofcom ought to do in this case. You will then present this case to the rest of the group in an oral presentation lasting no longer than 5 or 6 minutes. You can design the presentation however you like but the following guidelines may be useful:

- **Make your case.** You need to give a number of reasons why you are recommending a particular course of action. Don't just list these reasons but try and back them up with evidence and arguments.
- **Structure your argument.** You only have a short amount of time to get your point across. Make sure that your presentation is structured and clear. Run through each point in favour of your case and back each point up with evidence and examples.
- **Present clearly.** You will have to persuade others that yours is the best case. Sound interested in what you are saying and this will make others listen!

The facts listed below will be relevant to your group's discussion:

Population of UK: 60 million	No. of people in the UK with 'significant sight loss': 2 million
Population of NW England: 6.7 million	No. of people in the UK registered as 'severely sight impaired' or 'sight impaired' (formerly 'blind' and 'partially sighted'): 365,000
Combined population of Shropshire, Cornwall and Herefordshire: 960,000	No. of mobile phones in the UK: 50 million

Stuck for ideas? Here are some questions that might help you get started:

- Who will be affected by your decision? Who are the stakeholders in this case? ('Stakeholders' means everyone likely to be affected both long- and short-term.)
- What are the needs or interests of these stakeholders? How important are these needs or interests?
- What duties or responsibilities exist in this case? Are there responsibilities to look after the needs of one of the stakeholders in particular?
- What ethical principles are you drawing on to back up your arguments? How convincing are these principles? Could they be questioned?

You may also want to separate out the different kinds of issue that the case study raises, looking at the legal, practical and ethical aspects of the decision. You should focus primarily on ethical issues, but often the answers to ethical questions can be informed by answers to practical or legal questions:

- **Legal:** What does the law say?
- **Practical:** What will the practical consequences of your decision? How do these consequences affect what you think what ought to be done in this case?
- **Ethical:** What ought to be done, ethically speaking? Are there any moral responsibilities to fulfil? What are these responsibilities? Who are they to? Can all these responsibilities be fulfilled at once? If not, can they be 'prioritised'?

Tutor Notes

This case study provides a good framework for a general discussion about the ethical issues surrounding the allocation of resources. As the issues addressed in this case are far from straightforward, discussion can be less focussed and for this reason the session is aimed at students who have some experience of being taught ethics: more experienced students will be able to identify the ethical issues themselves and should be able to discuss them maturely.

To begin with, students should be given time to read the scenario and then split into small groups of 5-8 people to prepare their presentations. The 'Student Handout: Assignment' provides some background information relevant to each case which will help students in making their decisions as well as useful tips on preparing for the presentation. They should be given time to prepare, and then asked to present to the class. Alternatively, you may wish to allocate groups and hand out the assignment in advance of the session (perhaps the week before) and tell students to arrive with a fully prepared presentation.

Below is a suggested timetable to help you plan your session. Whether you have 1 or 2 hours, and whether you get students to prepare their presentations in advance of the lesson will affect how many presentations you are able to fit comfortably in your session so depending upon the number of students in your class, you will need to fix the length and nature of your session accordingly.

Suggested Timetables					
2 hour session (including preparation time)		2 hour session (no preparation time)		1 hour session (no preparation time)	
Preparation	45 minutes	Presentations (10-12 groups)	1 hr 15 minutes	Presentations (4-6 groups)	30 minutes
Presentations (6-8 groups)	45 minutes				
Discussion/conclusion	30 minutes	Discussion/conclusion	45 minutes	Discussion/conclusion	30 minutes

Each presentation should last for no longer than 5 or 6 minutes. There are two cases that can form the basis for presentations so if numbers are small then you may want to give each group both cases in order fill up the time. However, it is likely that each group will present only one case. After the presentations you should conclude by having a class discussion about the ethical issues raised by the presentations and/or talking through the handout ('Student Handout- Conclusion'). Below are some guidance notes on what kinds of answer to expect in relation to each case.

Case 1: Ofcom has to decide whether or not to allocate part of the spectrum to a new radar system which will help blind people. This will have the effect of drastically reducing the availability of wireless internet to users in North West England.

Relevant Facts: Introducing the radar system will benefit 365,000 people at best. Introducing the radar system will at worst deprive 6.7 million people of wireless internet access.

The key factors in this case are the relative merits of the radar system and wireless internet, along with considerations about the number of people who benefit (or who are not inconvenienced) by the introduction of the radar service and the groups of people affected.

Reasons in favour of introducing the radar service: The radar service will assist blind and partially sighted people by helping them navigate their way around public spaces and this could result in greater independence for this sector of the population. Independence is something that we value as human beings and possibly something that we even have a right to. The government and other public bodies also arguably has a duty to ensure that there is equality of opportunity; that people get the same chance to do things regardless of their physical capabilities. The fact that someone is blind or partially sighted ought not to entail that they should have fewer opportunities than those of us who are lucky enough to be sighted.

Reasons against introducing the radar service: Introducing the radar service will, however, deprive a large number of users access to wireless internet services. This need not mean that users lose access to the internet entirely as there could still be access via non-wireless connections. However, businesses may rely on wireless and so be put to expense and inconvenience if such services are removed. Leisure and retail facilities that have wireless hotspots may also suffer from reduced trade if they are no longer able to offer these facilities.

How do we weigh up these reasons?

Aggregate benefits: One way of helping to decide what to do is to calculate the aggregate benefits of installing the radar system and then to compare this with doing nothing. This demonstrates whether installing the system generates more benefit than not installing it.

Installing the system will benefit only 365,00 people but this benefit will be a large one with the potential to significantly increase the quality of life of those affected by giving them greater independence, mobility, opportunity to go out and socialise or engage in other enjoyable activities. While the number of people affected is quite small, relatively speaking, the degree to which these people's lives will be improved is large. Installing the system also potentially makes a difference to the lives of 6.7 million people, but this difference will be a negative one. The negative difference made to each individual may be quite small; a matter of minor inconvenience to those who now cannot access the internet at their local coffee shop, or may be more significant; a drop in takings for the owners of that coffee shop. It is probably correct to say, however, that the magnitude of the negative effect to any individual will not be as great as that of the positive effect that installing the radar system will have on any individual blind or partially sighted person. The pertinent question then is; does making the lives of 365,000 people significantly better justify inconveniencing 6.7 million people?

This kind of calculation is difficult to make for two reasons. Firstly, because it is difficult to predict the results of installing the radar system: Whilst we may reasonably predict that the benefits to the blind and the partially sighted will be significant this is not a certainty. Moreover, the negative effects of introducing the system may lie a long way off in the future and so more difficult to predict with any accuracy. If the benefits and negative impacts of installing the system cannot be known then it is virtually impossible to calculate the aggregate benefits (or costs). Secondly, even if one can predict the consequences of installing the system it is still difficult to work out whether doing so creates an aggregate benefit or not: How are we to compare the significant improvement in quality of life of a small group of people with the slight decrease in quality of life of a much greater number of people? There is no convenient measurement system (units of pleasure/happiness/quality of life) with which to make this comparison.

Democratic distribution of benefits: Even if we can confidently calculate the aggregate benefit of installing the radar system we may not think that this is a suitable criterion with which to make an informed decision about the allocation of scarce resources. We might think that creating more overall benefits may not be the only way an action can be judged good. We might, for example, think that the *spread* of welfare is important- not only should we ensure that benefit is created but that the benefits are shared amongst members of society and not just confined to particular groups. For example, if we can agree on a unit of benefit, it might be the case that improving the lives of a small number of people significantly confers a greater aggregate benefit than improving the lives of a larger number of people but to a lesser degree. We might think, however, that the action that benefits the greatest number of people is to be preferred, despite this not producing the greatest overall benefit.

Protection of minority interests: On the flip side, we might think that there are particular groups who deserve extra benefits because of their particular circumstances. Those with a disability could fall into this group; we have a duty to improve the lives of people who may have a reduce quality of life through no fault of their own. So while the number of people affected throughout society is important, this ideal should not be pursued at the expense of minority groups (it is not more important for the majority to be better off if this comes at the expense of minority interests). This demonstrates that the democratic path (doing what most people want) is not necessarily the just path.

Case 2: Ofcom has to decide whether or not to provide people in rural Shropshire, Cornwall and Herefordshire with broadband access. This will have the effect of reducing the coverage of a number of mobile phone networks.

Relevant Facts: Supplying broadband will benefit just under 1 million people at best. Supplying broadband has the potential to inconvenience all of the UK population by reducing their access to mobile phone networks as they travel around the country. Certain UK populations could also be seriously inconvenienced by losing coverage in their area.

Reasons in favour of introducing broadband: Supplying broadband will enable around 1,000,000 people to access the internet via a high speed connection rather than having to use a slower dial-up connection. This will greatly improve their internet access and while they may have had dial-up before, anyone who has used this knows that it is significantly slower and has limitations particularly with respect to applications such as online gaming or video conferencing for example. The people benefited will also be those living in rural areas and so they may be reliant on the internet to communicate with friends and family, to do their shopping and for entertainment in general. They may also use the internet for business purposes.

Reasons against of introducing broadband: Mobile phones are a valuable tool for everyone: They make communication much easier, allow people to conduct business wherever they are and add convenience to many people's lives. Mobile phones may be of particular value to certain businesses, such as small businesses. For example, plumbers and other tradesmen benefit hugely from being contactable wherever they are, as they conduct most of their business outside of an office.

How do we weigh up these reasons?

Aggregate benefits: Supplying broadband has the potential to improve the lives of just under 1 million people fairly significantly by enabling those living in rural areas to use the internet for communication, business and entertainment purposes. It also has the potential to inconvenience a large percentage of the population by reducing their mobile phone coverage. This will affect people differently according to their network; they may find that they are unable to use their phone in areas where previously they could, they may find that areas they travel to do not give reception, some may be barely affected. It is difficult to weigh up the overall benefits given the complexity of calculating the inconvenience to the huge number of mobile phone users in this country.

Democratic distribution of benefits: It is clear that advocating the installation of broadband is undemocratic in that it is not for the benefit of the majority of the population. The inconvenience (although it may be a minor one) affects a significant section of the population compared to the small minority that would benefit from the installation of broadband. However, it could be argued that the benefit of broadband is at present distributed undemocratically give that it is largely concentrated in urban areas.

Protection of minority interests: It is clear that installing broadband will protect the interests of minority group; those living in rural areas. It could be argued that people in rural areas deserve broadband because they are on the whole likely to receive fewer services, be further away from shops, schools, hospitals, libraries, leisure facilities and all the other benefits that members of the population enjoy. For this reason, their interest should be put first when coming to a decision in this case.

Student Handout- Conclusion

This case got you to think about the ethical issues concerning the allocation of the radio spectrum. In each case you were asked to consider what would constitute putting the spectrum to optimum use. 'Optimum', however, just means 'most advantageous' and so it is difficult to decide what the most advantageous use of the spectrum is: is it the one that reaches the greatest number of people? Is it the one that ensures the widest spread of services overall? Is it the fairest use of resources? With respect to each case there were three different ways we could make the decision:

- **Aggregate benefits**

We could look at the overall benefits produced by each course of action and so choose the course of action that produces the most overall benefits. This can be worked out with a simple calculation:

(No. of people benefited X Magnitude of benefit per person) – (No of people harmed X Magnitude of harm per person)

However, this kind of calculation is difficult to make. Firstly, it is difficult to predict the results of a course of any action and so difficult to say for certain what the benefits and harms are. Secondly, even if one can predict the results of a course of action it is still difficult to work out whether doing so creates benefit or not: How are we to compare the significant improvement in quality of life of a small group of people with the slight decrease in quality of life of a much greater number of people, for example? There is no convenient measurement system (units of pleasure/happiness/quality of life) with which to make this comparison.

- **Democratic distribution**

Even if we can confidently calculate aggregate benefits we may not think that this is a suitable criterion with which to make an informed decision about the allocation of scarce resources. We might, for example, think that the *spread* of welfare is important- not only is it important that benefit is created but that the benefits are shared amongst members of society and not just confined to particular groups. For example, it might be the case that improving the lives of a small number of people significantly (giving all residents of Leeds luxury flats, personal slaves and substantial salaries) confers a greater overall benefit than improving the lives of a larger number of people but to a lesser degree (Improving the train services throughout Yorkshire). We might think, however, that the action that benefits the greatest number of people is to be preferred, despite this not producing the greatest overall benefit.

- **'Just' or 'fair' distribution**

We might think that there are particular groups who deserve extra benefits because of their particular circumstances. For example, those who are disadvantaged in some way might deserve special treatment. So while the number of people affected throughout society is an important factor in any decision, this ideal should not be pursued at the expense of minority groups (it is not more important for the majority to be better off if this comes at the expense of minority interests). This demonstrates that the democratic path (doing what most people want) is not necessarily the just path.

Further Reading

Resource Allocation

- Harris, J. (2006) 'The Value of Life' in Kuhse and Singer (eds.) *Bioethics: An Anthology*, Oxford: Blackwell, 428-447.
- Lockwood, M. (2006) 'Quality of Life and Resource Allocation' in Kuhse and Singer (eds.) *Bioethics: An Anthology*, Oxford: Blackwell, 451-464.

Justice and Disability

- Becker, L.C. (2005) 'Reciprocity, Justice, and Disability', *Ethics* **116**: 9-39.

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