

# Journal of Business Systems, Governance & Ethics





# **Journal of Business Systems, Governance & Ethics**

**Jointly Published By**

**Centre for International Corporate Governance Research  
Victoria University**

**Victoria Graduate School of Business  
Victoria University**

Vol 1, No 3, 2006  
ISSN 1833-4318

Copyright © Victoria University, 2006

Victoria University  
PO Box 14428  
MELBOURNE VIC 8001  
AUSTRALIA

**Editor**

Arthur Tatnall

**Editorial Board**

Professor Anona Armstrong, Paul Darbyshire, Professor Ronald Francis, Dr Ron Kluvers, Professor Elaine Martin, Associate Professor Arthur Tatnall, Dr Andrew Wenn, Professor John Zeleznikow

The *Journal of Business Systems, Governance and Ethics* is published four times a year by Victoria University in online format for no charge. Printed copies are available, for a fee, upon request.

All articles published in this journal were subject to a process of blind peer review by at least two reviewers before selection for publication by the Editorial Board.

Submissions are welcome for research articles of between about 5,000 and 10,000 words in any area relevant to the journal's coverage. Potential articles should, in the first instance, be sent to: Kate Hill at the Victoria Graduate School of Business: [Kate.Hill@vu.edu.au](mailto:Kate.Hill@vu.edu.au)

**Copying for educational purposes**

The *Journal of Business Systems, Governance and Ethics* is published in both online and print formats. Educational and non-profit institutions are granted a non-exclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the publisher. For details of the CAL licence for educational institutions please contact the Copyright Agency Limited at [info@copyright.com.au](mailto:info@copyright.com.au).

# Journal of Business Systems, Governance and Ethics

Vol 1, No 3, 2006

## Contents

---

|                        |          |
|------------------------|----------|
| <b>Editorial .....</b> | <b>v</b> |
|------------------------|----------|

*Arthur Tatnall*

|                                                                                          |          |
|------------------------------------------------------------------------------------------|----------|
| <b>The Coffee House Conversations:<br/>Socio-Technical Turtles All the Way Down.....</b> | <b>1</b> |
|------------------------------------------------------------------------------------------|----------|

*Andrew Wenn*

|                                                                                                 |           |
|-------------------------------------------------------------------------------------------------|-----------|
| <b>What Works and What Does Not:<br/>An Analysis of Application Frameworks Technology .....</b> | <b>17</b> |
|-------------------------------------------------------------------------------------------------|-----------|

*Wusheng Zhang and Mik Kim*

|                                                                                                  |           |
|--------------------------------------------------------------------------------------------------|-----------|
| <b>The No 'Ought' From 'Is' Argument:<br/>Faulty Thinking in Ethics and Social Science .....</b> | <b>29</b> |
|--------------------------------------------------------------------------------------------------|-----------|

*James Doughney*

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| <b>Corporate Governance in State-Controlled Enterprises.....</b> | <b>43</b> |
|------------------------------------------------------------------|-----------|

*Xinting Jia*

|                                                                                               |           |
|-----------------------------------------------------------------------------------------------|-----------|
| <b>Three Questions To Guide Study and Practice<br/>in the Information Systems Field .....</b> | <b>51</b> |
|-----------------------------------------------------------------------------------------------|-----------|

*JuanQiong Gou and Arthur Tatnall*





# Editorial

---

Articles for the third issue of the *Journal of Business Systems, Governance and Ethics* again span a wide range of business-related research issues that reflect the interests of academic staff and doctoral students at Victoria University. This issue has articles relating to sociology, ethics, information systems, economics and corporate governance. As with previous issues these articles cover issues in both Australia and Asia.

In the first article: *The Coffee House Conversations – Socio-Technical Turtles all the Way Down*, Andrew Wenn makes use of dialogue and photographs to explore the socio-technical nature of the apparently straightforward act of providing parking spaces for cars, and shows that this is in fact anything but straightforward. Wenn's analysis reveals that a wide variety of social and technical artefacts including batteries, clocks, computers, data, economics, engineering compromises, gatekeepers, humans, politics, procedures and standards configured into a complex network, must be taken into consideration when trying to understand this process. He ends by developing a simple graphical metaphor that enables us to better understand the heterogeneous nature of such structures.

A study by Wusheng Zhang and Mik Kim in an article entitled: *What Works and What Does Not – an Analysis of Application Frameworks Technology*, suggests that application frameworks technology does support large-scale reuse by incorporating other existing reuse techniques such as design patterns, class libraries and components, but that the methodological support for building and implementing application frameworks is inadequate. Their study indicates that application frameworks technology may increase the quality of software in terms of correctness and reusability, but that there is no guarantee of increasing the extendability and interoperability of software systems.

An article by James Doughney: *The No 'Ought' From 'Is' Argument – Faulty Thinking in Ethics and Social Science*, explores why the dichotomies engendered by the 'positivist' approach – fact/value, positive/normative and descriptive/evaluative – are false. The main reason, the paper argues, is that the fundamental principle underlying the approach fails. This principle, the 'no ought from is argument', is the formally structured argument that a value (ought) cannot logically be derived from a fact (is). The paper rejects this argument and, especially, its iconic status in economics.

Xinting Jia next makes an international comparison of *Corporate Governance in State Controlled Enterprises*, focusing on corporate governance in Telstra in Australia and China Telecom in China. By comparing and contrasting corporate governance in these two companies the article explores practices and mechanisms in partially listed state controlled enterprises under the dramatically different socio-economic environments manifested by these two countries.

In the final article, *Three Questions to Guide Study and Practice in the Information Systems Field*, JuanQiong Gou from Beijing Jiaotong University and I investigate the various influences on MIS curriculum and some of the conventional approaches to curriculum design, selection and organisation of teaching materials. The paper then offers an alternative approach by presenting a three question framework for understanding and explaining the IS field, and argues that these three questions can be used to guide the study, teaching and practice of MIS.

All papers in the journal have been subjected to a process of blind peer review by at least two reviewers. Articles were then only accepted after appropriate changes and corrections had been made by the authors. We hope that you find the content of this issue both interesting and readable.

Arthur Tatnall

Editor





# The Coffee House Conversations: Socio-Technical Turtles All the Way Down

Andrew Wenn

Victoria University, Australia

---

## Abstract

*Through the use of dialogue and numerous photographs, this paper explores the socio-technical nature of the seemingly simple act of providing parking spaces for cars. Using empirical data, the analysis reveals a wide variety social and technical artefacts including batteries, clocks, computers, data, economics, engineering compromises, gatekeepers, humans, politics, procedures, standards and so on. All configured into a complex network.*

*As a result of the analysis, we encounter and examine ideas of infrastructure, and socio-technical networks. From this, we develop a simple graphical metaphor that enables us to better understand the heterogeneous nature of such structures.*

## Keywords

*Actor-Network Theory, information systems research, sociology of technology, infrastructure*

## Preface

Often analysis of technology is conducted using cases where failure is present. Whilst I am in favour of studies of this type and I will not offer any critique of them, I thought it would be interesting and informative to study an application of technology where there is no underlying failure. The application I chose was carparks and parking. It is a commonplace activity for drivers the world-over to park their cars in designated parking spaces or lots, it can be studied as an application that is both successful and divorced from any historical context. And as I will show there are numerous design decisions that have to be made. Also, whilst the citing of parking areas may at times be controversial it can be said that in the large majority of cases the provision of car-parking facilities are accepted as the norm in this driven society.

Having long been a fan of Douglas Hofstadter's (1980) book *Gödel, Escher Bach*, where he uses dialogue as a vehicle to explore many issues, I have also attempted to do this here feeling that it will allow me more flexibility in the exploration (see also Wenn 2004). Just how successful this is I will leave up to you, the reader, to judge.

Copyright © 2006 Victoria University. This document has been published as part of the Journal of Business Systems, Governance and Ethics in both online and print formats. Educational and non-profit institutions are granted a non-exclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the

---

*April 2005. Lucy and Robin are once again to be found in their coffee shop-this time though they are in the sunlight courtyard out the back isolated from the hustle and bustle of the traffic and the pedestrians on the main street. Lucy, who has just come from teaching a research methods class to*

*a group of Information Systems (IS) students, is excited about a small success she has had using a new example to illustrate the complexity of the world we live in ...*

Lucy: ... you should have seen their faces, it was as if the lights had been turned on and were illuminating the world anew. In fact, one of the class said, “I have never thought of it like that. I didn’t realize there was so much technology or so many social influences involved in such a simple thing. Something that we take for granted.”

Robin: That’s great. I find it quite exciting when that happens to in a class, even if it is only a few of the students. What was the example you used?

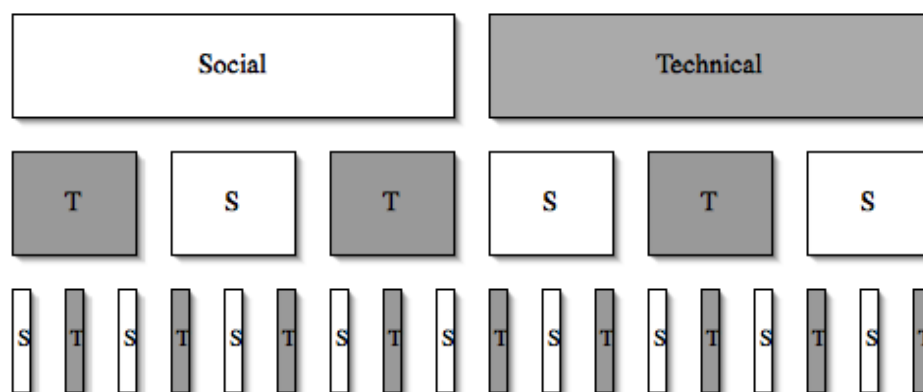
Lucy: Well, this was a group of IS students, many of whom are more interested in technology and tend to think that technology drives most, if not all, the changes that we see in the world. The example I wanted was one that included some information technology, yet was also something that people encountered their every day lives. Something that doesn’t appear, at least on the surface, to be high-tech, that in many ways could be considered a mature system—in other words something mundane, ordinary.

Robin: You wanted to do some sociology on a mundane artefact? A la Latour (1992)?

Lucy: Yes, I thought about that article of Latour’s later on. What I really had in mind when I was thinking about it were those draft chapters by Law and Mol (1994a; 1994b) you gave me ages ago. You remember the one where they use the fractal metaphor to describe the nature of social and technical interactions and the other, the heterogeneous nature of aircraft design.

Robin: Yeah, I remember them, especially the fractal one because I often think of it as the use of a metaphor gone wild. In a way it implies, especially when they use that diagram of the social and technical interactions [he quickly scribbles it on a scrap piece of paper that is amongst the pile of books on the table—see

**Figure 1**], that the division between the social and the technical is very regular.



**Figure 1.** Law and Mol (1994) see the social (S) and the technical (T) as being similar to this fractal diagram. If we focus on a technical (T) aspect of technology and increase the magnification then we see that it too is made up of more social (S) and technical aspects. This magnification may be continued to an indefinite degree.

Lucy: But, it does show the complexity and the multi-layering of the social and the technical in any system. It also shows that we have to be careful when using metaphors.

The other thing about this type of model is that it doesn’t really show us individual actors or the nature of the interactions that place. For instance as my simple example shows there are humans and non humans that must work together and a particular technical component may have a number of influences on the social just the same as a variety social effects may influence a particular technology or its implementation.

Robin: Agreed, it doesn’t show or even indicate the interactions that exist between the social and the technical. In fact it implies a couple of things: that the social and the technical can be fairly

neatly compartmentalized and it always appears to me to be driven from the top down. It's too simple. Bruno Latour (1992), in that article we just mentioned warns of this when he says something along the lines of us not being faced with just humans and non-humans or just social and pure technology; what happens is that we observe situations where actions may sometimes be assigned to humans whilst in other cases it may be the technology that performs the task.

Lucy: Such as the door closer or 'groom' as he calls it or a doorman (1992).

Robin: Yes. But enough about that. Tell me about the example you used.

Lucy: Well as I said, it was to be an everyday "thing" if you like. Not overtly technical or social, something we almost take for granted. Something the students would have encountered at some stage. Anyway, as I was parking the car the other day, I thought 'That's it'.

Robin: What? Car-parking?

Lucy: Yes, just think about it for a while. I know you don't drive, but you have at least been in my car when I have parked somewhere.

Robin: Hmm, well it does seem rather mundane, pretty boring actually. Wait, I see what you mean, especially if you think about parking around the university. Really it's the same when I park my bike around here. You know, I was told off once for locking it to a pole outside the entrance to our building. Supposedly it looked too untidy. Appearance, a social thing. Well, cultural really but let's call it social.

Lucy: Yes, that's the idea. Anyway what I did, was one day I grabbed the camera and went around taking photos of parking areas and even a commercial car park. I got a few strange looks I can tell you. I then used these with the class so we could deconstruct 'parking a car'. Look I have the photos here.

*Lucy flossicks around in her bag and pulls out a wallet of photos, plonking them on the table while she puts her bag back down. Robin meanwhile is polishing his glasses and talking.*

Robin: I'm with you. Actually I recall reading an article recently by Paul Edwards (2003) where he argues that much of our technology resides in the background as part of our everyday lives and practices. We only notice it when it fails.

*The photos are taken out and Lucy spreads several out (Figure 2-6) on the table in front of her. Her excitement about sharing this idea is palpable. She points to Figure 2 which is just a photo of a sign attached to a pole.*

Lucy: This is where I started. If we take a semiotic approach, "What indications of technical and social artefacts do you see in this rather simple sign?"

Robin: Well, I could ignore the obvious, that is, that it is a man-made sign. But I assume you want things that relate this artefact to performance or consequences (Manning 1987).

Lucy (interrupting): Well, man-made with the aid of technology...

Robin: ... the obvious social property is that performs a regulatory function. It doesn't regulate as such, but it is an inscription that informs people wishing to park in this area of the regulations. It designates the length of time they may park for (2 hours) between certain times and on certain days. It also informs us that some special people, residents of the area, who hold a permit, are exempt from these regulations.

Lucy: Right. So it is, if I interpret Latour (1996) correctly, a delegate for a set of municipal council regulations that are presumably accessible at the council offices. From that simple street sign we can find evidence of many things. And we could branch off into many areas. For instance, I could have gone to the council offices and hunted out the parking by-laws. We could look at

the measurement of time—temporal regulation is also important, or we could study the immediate vicinity of the sign to see how parking is arranged.



**Figure 2:** The first of Lucy’s photographs was of a parking sign attached to a council patrolled on street parking site.

Robin: Hold on ... there is something more even before we leave the sign. In fact there are a number of things: 1) these signs are of a standard size and colour. Even across the City of Melbourne; and 2) this is the more interesting thing; these signs are coded in a standard way. See that ‘2P’ or the use of the arrows, the abbreviation of the names of the days. These are coded to a standard—this allows the authorities to impose a universal understanding on car drivers.

Lucy: Impose?

Robin: Well, maybe not. I suppose at the dawn of the development of car parking regulations there was probably a committee that came up with a recommendation. [Slightly cynically] Probably someone even had to go on an overseas trip to see what other parts of the world were doing. But these days, the meaning attached by the general populous to the standard signifier of ‘2P’ for instance is so widespread across the state if not all of Australia that it would seem to have been imposed.

When were the first parking regulations introduced in Melbourne? Do you know?

Lucy: Well, I did try to find out, but the best the Reference Librarian at the State Library could do was to tell me that parking meters were introduced in 1955. He just said “I assume that parking regulations were in force when Melbourne was first settled”.

Robin: Not particularly helpful. But then you don’t have to collect all the historical details for this type of deconstruction anyway.

Lucy: Yes. So you see even with this everyday artefact we find a myriad of social (political, regulatory, legal) and technical (measurement, both spatial and temporal) things attached. And maybe a second level of semiotic meaning, that of the use of a standard coding for the signs.

Robin: Yes, I see what you are driving at (if you will forgive the pun).

Lucy: Just this once. Well the next photo I took was actually in a privately run carpark (Figure 3). You know one of those that companies construct so that people can have the privilege of parking their car under cover, but I'll return to that aspect later on. What I really wanted to focus on here is the factors that might determine the size and designation of the space. I should add that the site where I took the first photo (Figure 2) also used lines to designate the space where each car should be parked. So I guess this is also a universal signifier. I asked the class if they had any thoughts about that.

Robin [getting into the swing of things]: Ah, well. It's mathematics isn't it? The most fundamental of all the sciences (Arianrhod 2003; Dewdney 1999). If we take Pitt's (2000) definition of technology as being "humans at work" then this is a technical factor. Even at a guess I would imagine that the size of each parking lot was determined at one stage by taking the measurements of a number of cars and then calculating an average size, thereby arriving at an "ideal size" for a parking spot. That is, applying mathematical techniques to a real world problem.



**Figure 3:** Most car parking allotments whether privately run and owned or established by the municipal council have painted lines designating the legal allotted parking space. Think about the factors involved in determining the size of each space and its subsequent designation.

Lucy: I would guess even though I haven't investigated it that there are economic factors at work also, especially for the private car-parking companies. They have to make sure they get the maximum number of spaces possible so that they can maximise their returns.

Robin: Well, I guess that goes without saying.

Lucy: Now, look at this next photo (Figure 4). Most of my students thought of the ticket machine as being purely and simply a piece of machinery. They actually saw it as just a ticket dispenser. However, when we looked more deeply into it, there are several more aspects to it.

Robin: Well, the most obvious thing to me is that it is acting like Cerebus, the mythical three-headed dog that is the gatekeeper to Hades.



**Figure 4:** Technology is very much foregrounded here. By performing the correct script and receiving a coded ticket, the barrier (a gatekeeper?) responds by opening. Notice, though the signs which both instruct the driver and highlight some of the regulations.

Lucy: Yes, that's true. When the driver once again performs the correct actions (that is, stop the car, put a hand out of the window, press the button, take the ticket) a ticket is issued and the barrier further down the driveway opens. So there is a script to be performed, but in response to the driver pressing the button, on the front of the machine, a ticket is issued and the time and date of entrance to the carpark is printed on the ticket (Figure 5). And it is also encoded or to borrow a term from Akrich and Latour (1992) an inscription is written to the magnetic stripe on the ticket. This, of course requires the use of a machine to retrieve the information at some later stage.

*Whilst Lucy was explaining this Robin has been studying the next couple of photos thoughtfully.*

Robin: It is amazing, when you think about it, how many sociotechnical aspects are embedded in this piece of card. He points at the next photograph (Figure 6). See here, there is some text that summarises the company's legal liability and also, it has inscribed on it as required by the Commonwealth Government regulation (under the taxation act) the ABN (Australian Business Number) as issued by the Australian Taxation Office.





**Figure 5:** The parking ticket issued by the machine (Figure 4) contains a number of inscriptions. Some such as those encoded in the magnetic stripe, above the company logo, are only visible to other technologies; the printed date and time are for human consumption.



**Figure 6:** The reverse side of the ticket contains the ABN as required by the Commonwealth Government and summary of the company's legal liability.

Lucy: Yes. But the chain of interactions continues. For whilst some commercial car parks are designed so that the driver can simply insert the ticket and the required payment, in the case of this car park, the intervention of a human is required before it is possible to exit (Figure 7). The attendant is required not only to put the ticket into a machine that can read the magnetic stripe; when it does this it calculates the payment due and the attendant accepts the money and proffers change and a receipt if required.





**Figure 7:** Not a handshake, but a handing-over of the parking ticket —human intervention along with a suitable currency transaction is required to exit the car park. Only when the operator has passed the ticket through a suitably configured reader and received the correct payment will the barrier be raised.

Robin: Is that all he or she does?

Lucy: No. My observations show that the attendant also is an actor in the surveillance network installed in the carpark. The drivers like to have the reassurance, the text about legal liability printed on the ticket notwithstanding, that their vehicles are more secure than those parked on the street.

Robin: So there is a social pressure on the carpark operators?

Lucy: Yes.

Robin: And some form of technology is involved in the surveillance?

Lucy: Yes. They have video cameras installed and the attendant can monitor each level of the carpark from the booth you can see in the photo (**Figure 7**).

Robin: So once again we see the co-construction of modes of control (Lyon 2003) as the interaction between the carpark users and their desire for secure parking, the cameras and monitors, and the attendant?

Lucy: Yes.

Robin: But talking about surveillance did you take any photos of Parking Inspectors who patrol the Council Operated car parks?

Lucy: No. But I did take one of a ticket dispenser used in an on street parking situation (Figure 9) as well as the sign that directs drivers to the appropriate machine (Figure 8). It really is a variation on the first one I showed you (

Figure 1). Except this time we see a five minute parking designation as well as the designation informing the driver of the fact they are required to pay for parking and where the appropriate machine is. Thus once again we see a non-human directing a human as to the required behaviour. So I followed the directions and went to the machine and took this photo (Figure 9).



**Figure 8:** Back to on-street parking—this time to a ticketed area. Notice also the Area No 81. In this case there are different areas instructing the driver which machine they must by a ticket from.



**Figure 9:** ‘The Ticket Machine’ prominently displays the algorithm or script the user must follow to be legally parked. As the user inserts coins the window above the sign displays how much time they have paid for.

Robin: Ah look! It even has a little script on it to tell the person requiring a ticket how to perform.

And it’s very strict too—no change given. I can’t see does this one accept 50c pieces?

Lucy: Yes it does. But as you hinted at other ones don’t.

Robin: This really is a little information system all on its own isn’t it?

Lucy: The funny thing is though not many people see it that way. Yet in effect it has quite a deal of technology inside it. And presumably council by-laws for parking are encoded into it somehow.

Lucy: Well, that’s what I wanted to discuss next. As Mackenzie (1998) has shown, there is a whole sociology surrounding the design of computer chips, not only in terms of proving that they work correctly but also how these chips handled the very numbers and calculations that are part and parcel of a chip’s everyday life.

For the first time, in my presentation to the students, I delved further into the technical issues of chip design. I dug deeper into what the normal citizen who just desires to park her car regards as a simple piece of technology.

Now [she says mischievously] rather than pull one of the parking meters apart, something I am sure there are social strictures against, laws covering vandalism etc. I went searching on the Internet.

Robin: And what did you find?

Lucy: Well I found one site for a manufacturer of microchips, which had issued a press release in 2001 (Sells 2001) ...

Robin: Again, some more evidence of the social effects.

Lucy: ... yes it was to keep design engineers informed of improvements in their embedded 'Flash' memory devices. These are chips that can be programmed and then reprogrammed remotely. They are used in many types of applications that require [and here she pulls out the article she has printed from the Internet and reads from it]:

remote field upgrades and Internet connectivity, especially in applications such as automotive subsystems, networked home appliances, home medical appliances, remote controls, parking meters and vending machines. (Sells 2001)

Robin: I bet the article is encoded with a lot of engineering expressions.

Lucy: Yes you really have to be a member of the community of practice (Lave and Wenger 1991) to fully understand the language. It talks about PMOS Electrically Erasable Cell (PEEC), EEPROMs, a Fowler Nordheim tunneling region, 20Mhz, 2.0V to 5.5V VDD ranges, ISO 9001, and says it is good for "5 million ERASE/WRITE cycles and more than 40 years of data retention" (Sells 2001). Just as well I have a background in engineering.

Robin [looking at his watch]: I'd better get going soon, I have a meeting to go to.

Lucy: O.K. There really is only one more photo to look at. Figure 10 really is an information system.

Robin: Yes, I have seen these signs popping up everywhere. A good idea, as it informs people as to where they can go to find parking.



**Figure 10:** An 'Information System'.

Lucy: When they work! According to the carpark attendant they are none too reliable.

The one outside the carpark was last week. He just dismissed it as "council responsibility". But they are supposedly connected to the computer systems in the commercial car parks. Scope for plenty more investigation there.

Robin: You know what you're really looking at here is infrastructure.

Lucy: Yeah, but the trouble is most people, especially IS people, think of infrastructure as being just technology. They talk about network infrastructures and Information Technology infrastructures. So I didn't really want to go down that path.

Robin: Well I think you should. It would open their eyes.

I was reading a paper by Seltzer the other day and he quoted Pitt (1995) as defining technological infrastructures as sets of "mutually supporting artifacts and structures which enable human activity [including scientific activity] and [providing] the means for its development" (Pitt, J. as quoted in Seltzer 1998, p. 47). And he adds "With this definition, Pitt means to include more than merely machines, as in the traditional notion of technology. As he [Pitt] argues, this definition 'automatically includes the people, artifacts, institutions and networks which constitute the environment within which work occurs.' " (Pitt, J. as quoted in Seltzer 1998, p. 47). Infrastructure is a system that has become accepted into daily use.

Lucy: So it emphasises the sociotechnical nature.

Robin: Yes. And it has the co-construction element that you are after. Now, you are not talking about work, so perhaps the idea of defining infrastructure as being "those systems without which contemporary societies cannot function" (Edwards 2003, p. 187) is a better way to go.

Lucy: Well I can't imagine Melbourne, or for that fact, any modern city functioning without some sort of control over where and for how long cars are parked. You know there is a lot more to this than we have looked at here.

Robin: I'm sure there is.

Lucy: I haven't even touched on the negotiations and the work involved in deciding what sort of parking, free, metered, commercial or otherwise designated zones are established. The interesting thing here is that I have got hold of some planning documents for a reworking of the car-parking around Carlton where I conducted the data collection (City of Melbourne 2003). That reveals many other things as well, such as the collection of statistics, seeking the involvement of residents and the shopkeepers, strategic plans. The list goes on. Then there are other things such as parking meter design and patents (Kroll n.d.).

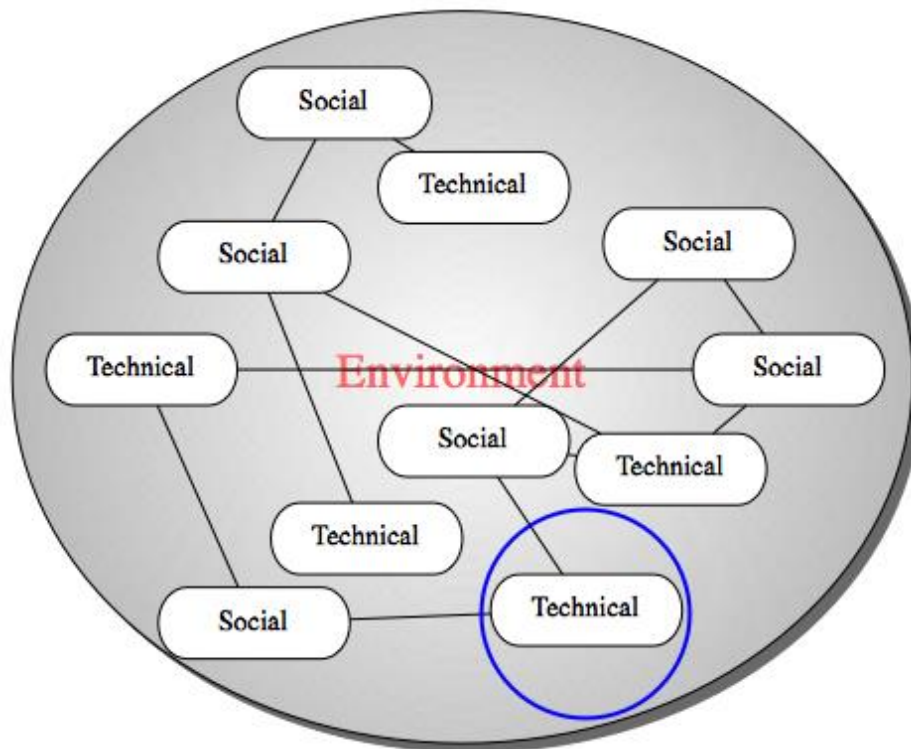
Robin: Well of course the whole area of patents and the granting of them involves all sorts of sociotechnical processes. But what I really like about your study is the way it reveals the macro and micro aspects of an everyday phenomenon. The heterogeneity, the complexity of it all. The co-construction of the technical and the social.

Lucy: Yes. That's what I wanted to do. But as I said once I started it was easy to get carried away. I found that we could broaden the network of things to consider; just like using a wide-angle lens to take a photo. On the other hand, I could go deeper into the artifacts just as I did with the parking meter—that is use a telescopic lens. No matter where I focussed I found that complexity. Really I had to agree with Joseph Pitt here. There is no technology *simpliciter* and to that I would also add there is no society *simpliciter*.

That is why I think that the Law and Mol diagram (Law and Mol 1994b) in

**Figure 1** would best be drawn as this: She grabs Robin's pencil and his diagram and sketches the following two figures (Figure 11 Figure 12).





**Figure 11.** Lucy's view of the ST world. Social and technical artifacts (the ovals) are related to each other in many ways. The lines depict these relationships. The circle shows the artifact that is to be examined in more detail (see Figure 12).

Lucy: You see we have a system that we wish to study which also will include possible environmental influences, hence the background.

Robin: Well really nothing can be considered as completely isolated from the world.

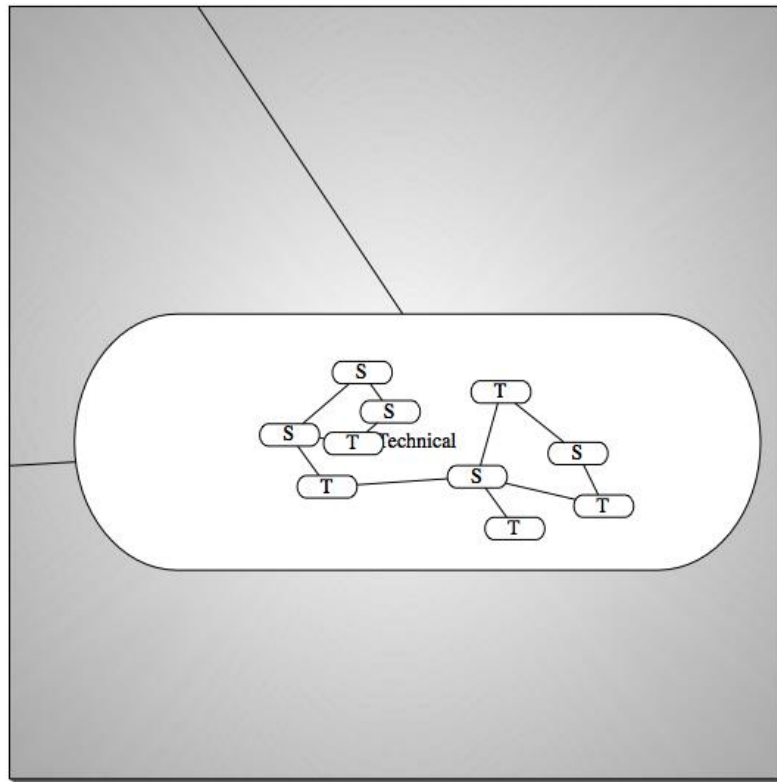
Lucy: That's right. If an actor from the environment becomes important then it is seen as a part of the system we want to study.

Robin: You seem to be implying that these social and technical things form a network that can be both delved into more deeply or examined more broadly almost as though one were using a wide-angle lense.

Lucy: That's right. The network idea is a legacy of you telling me about ANT (Wenn 2004) and making me do all that reading [she smiles]. The important thing, I think, is that the pair of figures suggest that we can zoom in (see Figure 12) and see the social and technical networks that co-construct another artefact.

However, as you point out we can also view it as a spreading network of sociotechnical influences. It really suggests that these networks are three dimensional even many layered. Though perhaps the idea of layers implies too much order and organisation.





**Figure 12.** Applying the magnifying glass to the artifact in Figure 11 reveals a whole new set of ST relationships.

*With that, they get up and pay the bill pat Cerebus, the coffee shop dog on the head and exit. Meanwhile we leave you, the reader, to ponder on the nature of a car parking space next time you use one. Remember it is not just some simple lines on the ground but a whole series of sociotechnical artefacts configured into a complex many layered network.*

## References

- Akrich, M. and Latour, B. 1992, 'A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman Assemblies.' in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, eds Bijker, W. E. and Law, J., The MIT Press, Cambridge, Mass, pp. 259-264.
- Arianrhod, R. 2003, *Einstein's Heroes*, University of Queensland Press, St Lucia, QLD.
- City of Melbourne 2003, *The Carlton Access and Parking Strategy*, City of Melbourne, [Online. internet], Available: <http://www.melbourne.vic.gov.au/info.cfm?top=140&pa=1196&pg=1198>, Accessed 7 May 2005.
- Dewdney, A. K. 1999, *A Mathematical Mystery Tour: Discovering the Truth and Beauty of the Cosmos*, John Wiley, New York.
- Edwards, P. N. 2003, 'Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems', in *Modernity and Technology*, eds Misa, T. J., Brey, P. and Feenberg, A., The MIT Press, Cambridge, MA, pp. 185-225.
- Hofstadter, D. R. 1980, *Gödel, Escher, Bach: An Eternal Golden Braid*, Penguin, London.
- Kroll, M. I. n.d., *Parking Meter Key Chain Timer*, Michael Kroll, [Online. internet], Available: <http://www.invention.com/goldberg546.htm#link2>, Accessed 7 May 2005.
- Latour, B. 1992, 'Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts', in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, eds Bijker, W. E. and Law, J., The MIT Press, Cambridge, Mass, pp. 225-258.
- Latour, B. 1996, 'Social Theory and the Study of Computerized Work Sites', in *Information Technology and Changes in Organizational Work, Proceedings of the IFIP WG8.2 Working*

- Conference, Dec. 1995*, eds Orlikowski, W. J., Walsham, G., Jones, M. R. and DeGross, J. I., Chapman & Hall, London, pp. 295-307.
- Lave, J. and Wenger, E. C. 1991, *Situated Learning: Legitimate Peripheral Participation*, Cambridge University Press, Cambridge.
- Law, J. and Mol, A. 1994a, *On Hidden Heterogeneities: The Design of an Aircraft*, Unpublished draft ms,
- Law, J. and Mol, A. 1994b, *What Is Social Context? A Note on Boundaries, Fractals and Technologies*, Unpublished draft ms,
- Lyon, D. 2003, 'Surveillance Technology and Surveillance Society', in *Modernity and Technology*, eds Misa, T. J., Brey, P. and Feenberg, A., Cambridge, MA, pp. 161-183.
- MacKenzie, D. A. 1998, *Knowing Machines: Essays on Technical Change*, MIT Press, Boston, MA.
- Manning, P. K. 1987, *Semiotics and Fieldwork*, Sage Publications, Beverley Hills, CA.
- Pitt, J. 2000, *Thinking About Technology: Foundations of the Philosophy of Technology*, Seven Bridges Press, New York, NY.
- Sells, E. 2001, *Unique Process Technology Eliminates Traditional Flash MCU Design Barriers; Opens Many New Markets, Applications*, Microchip Technology Inc, [Online. Available: [http://www.microchip.com/stellent/idcplg?IdcService=SS\\_GET\\_PAGE&nodeId=2018&mcpam=e013516](http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=2018&mcpam=e013516)], Accessed 7 May 2005.
- Seltzer, M. 1998, 'The Technological Infrastructure of Science: Comments on Baird, Fitzpatrick, Kroes and Pitt', *Philosophy and Technology*, vol. 3, no. 3, pp. 47-60.
- Wenn, A. 2004, 'A Coffee Shop Conversation - Socially Responsible Information Systems Research', in *Proceedings of Information Resources Management Association Conference 2004*, ed. Khosrow-Pour, M., Idea-group, Hershey, PA, pp. 683-685.



# What Works and What Does Not: An Analysis of Application Frameworks Technology

**Wusheng Zhang**  
Victoria University, Australia

**Mik Kim**  
RMIT University, Australia

---

## Abstract

*Advocates of application frameworks claim that this technology is one of the most promising, supporting large-scale reuse, increased productivity and quality, and reduced cost of software development. A number of its advocates suggest that the next decade will be a major challenge for the development and deployment of this technology. This study investigates the theory and practice of application frameworks technology to evaluate what works and what does not in systems development. The evaluation is based on quality criteria developed by the authors. The result of the study suggests that application frameworks technology does support large-scale reuse by incorporating other existing reuse techniques such as design patterns, class libraries and components. It also shows that the methodological support pertaining to building and implementing application frameworks is inadequate. Furthermore, it indicates that application frameworks technology may increase the quality of software in terms of correctness and reusability with some penalty factors but there is no guarantee of increasing the extendability and interoperability of software systems. There are still obstacles that restrict the potential benefits claimed by the proponents of application frameworks.*

**Keywords:** *application frameworks technology, systems development, evaluation*

## Introduction

Software development markets expect developers or development companies to deliver quality products at an affordable price within a required time frame. Developers and management alike are looking for technologies that can be used to increase the productivity and quality of software products. Mature engineering disciplines such as automobile design, have proven that reuse is the best way to increase the quality and productivity of products. However, despite the efforts of decades-long research the result of software reuse is still limited to code or class reuse (also known as small-scale), and developers are still 'reinventing the wheel'. Application framework is a technology anchored in this situation to promote reuse in terms of not only the code or class but also the module and architecture (also known as large-scale) of the reusable software artefacts to increase software productivity and quality. The notion of application frameworks appeared at the end of the 1980s. MacApp is one of the first user interface application framework designed specifically for implementing Macintosh applications in later 80s

(Fayad, 2000b). Application frameworks has become a popular research topic during the 1990s. Numerous frameworks have been defined including domain independent frameworks such as Java Swing, Microsoft Foundation Class (MFC), graphical editors such as HotDraw and domain specific frameworks such as IBM's San Francisco framework.

Copyright © 2006 Victoria University. This document has been published as part of the Journal of Business Systems, Governance and Ethics in both online and print formats. Educational and non-profit institutions are granted a non-exclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the

The purpose of the study was to investigate the theory and practice of application frameworks technology to evaluate this technology in relation to the quality of software developed from application frameworks. In this paper the authors first discuss definitions and various classifications of application frameworks. Next are discussed the theoretical foundations of application framework technology including object technology and other reuse technologies that have an important role in the development of application frameworks. Then, the quality criteria constructed by the authors will be introduced to evaluate application frameworks more systematically. After that the results of the evaluation will be illustrated.

## What is an Application Framework?

The common sense of the word of framework appears to be “a skeleton of another structure”, which has been well adopted into the context of modern information systems development. Booch, Rumbaugh and Jacobson (1999) define a framework as “an architectural pattern that provides an extensible template for an application within a domain”. In this context a framework is essentially a design skeleton that allows systems developers to create part of a system in the first place, and add design details when necessary. Johnson (1997) states that the definitions of frameworks vary, but the one used most is that “a framework is a reusable design of all or part of a system that is represented by a set of abstract classes and the way their instances interact”. Another common definition is “a framework is the skeleton of an application that can be customized by an application developer”. The former concerns the structure of a framework while the latter describes the purpose of the framework. Lewis (1995) argues that a framework is more than a class hierarchy. Fayad (1997) claims that a framework is a reusable, ‘semi-complete’ application that can be specialised to produce custom applications. Zamir (1999) defines “an object-oriented framework as the reusable design of a system or subsystem implemented through a collection of concrete and abstract class and their collaborations. The concrete classes provide the reusable components, while the design provides the context in which they are used.” The concepts of frameworks and application frameworks are often used interchangeably in the context of systems development.

Although the definitions by different researchers vary, some of them are more abstract and concerned more with the analysis and design phase, while others are more interested in the design and development phase. The different emphases does not conflict each other but rather enrich and enlighten further research issues related to the field of application frameworks technology. An application framework initially is a semi-completed application with architectural structure, which can be implemented and customised by application developers to develop application software. Application frameworks design can be bottom-up and pattern driven or top-down and target driven (Schmid 1995, Szyperski 1997 and Fayad 2000). The bottom-up design works well where an application framework domain is already well understood. Starting from proven patterns and working one’s way up has the advantage of avoiding idiosyncratic solutions in the small, problematic solutions that should be replaced by application of an established pattern. A top-down and target driven approach is preferable where an application framework domain has not yet been sufficiently explored but where the target domain to be served by the framework is well understood.

## Classifications of Application Frameworks

The application frameworks can be domain independent such as a graphical user interface (GUI) framework, or domain dependent or specific such as a CIM framework. Here, the word *domain* refers to business areas being applied for implementing the application frameworks. For example, if the application frameworks are used in a domain from the financial sector the application frameworks are domain specific to the financial application, or if the application frameworks are used in a domain of the manufacturing sector the application frameworks are domain specific to the manufacturing application. They can also be classified according to the scope, reuse perspective, the control aspect and the development process of application frameworks. **Figure 1** shows A summary of different classifications

used in current literature. It illustrates classifications from different perspectives. According to the scope of application frameworks, Fayad (2000) proposes to classify this into three categories namely: system infrastructure frameworks such as graphical user interface (GUI) and Microsoft Foundation Class (MFC); Middleware integration frameworks such as BEST and JAWS; and Enterprise

| From the perspective of | Classifications                   |
|-------------------------|-----------------------------------|
| Domain                  | Domain independent                |
|                         | Domain dependent or specific      |
| Scope                   | Infrastructure frameworks         |
|                         | Middleware integration frameworks |
|                         | Enterprise application frameworks |
| Reuse                   | Whitebox                          |
|                         | Blackbox                          |
|                         | Greybox                           |
| Control                 | Callable framework                |
|                         | Calling framework                 |
| Development process     | Analysis framework                |
|                         | Design framework                  |
|                         | Implementation framework          |

**Figure 1:** The classification of frameworks

application frameworks such as SEMATECH CIM, OSEEFA and PRM. He claims (1999a) that the application frameworks are generally domain specific applications such as computer-integrated manufacturing frameworks, distributed systems, networking and telecommunications, or multimedia collaborative work environments.

From the perspective of reuse the application frameworks can be classified into whitebox, blackbox, and greybox frameworks (Szyperski 1997, Fayad, 2000). A whitebox application framework is a framework customised by subclassing existing framework classes and providing concrete implementations. To implement a whitebox framework, application developers use more inheritance and polymorphism. Application specific functionality is expressed by inheritance and new implementations. Implementation inheritance tends to require knowledge of the superclasses' implementations. In the last few years the application frameworks researchers are more interested to develop blackbox application frameworks which rely more on composition rather than inheritance. In the blackbox frameworks approach, the extendability of the framework is achieved by defining an interface for components that can be plugged into the framework using composition. Object composition is based on forwarding rather than delegation, merely relying on the interfaces of the involved objects. In a blackbox framework (Fayad 2000), an application developer selects from the set of subclasses provided by the framework as the blackbox components and binds it to the hot spot (plug in point). Thus, the developer may create an application without programming, merely by selecting, configuring, and parameterising framework components. A greybox approach is a combination of both the whitebox and the blackbox frameworks.

In view of taking control, the application frameworks can be classified as callable frameworks and calling frameworks (Fayad 2000). A callable framework allows the application to retain the thread of control and provides services when the application calls the frameworks. A calling framework provides a control loop that calls application-provided code at appropriate times. From a development process perspective the application frameworks can be divided into analysis frameworks, design frameworks, and implementation frameworks. The analysis frameworks typically focus on analysis level constructs, without making any commitment. They are typically the product of domain analysis. Most current application frameworks are either a design framework or an implementation framework. Largely the application frameworks are domain specific such as a financial application framework or a manufacturing framework. An application framework domain is a set of rules and roles and their semantic models codified in the framework itself. It provides a generic incomplete solution to a set of



similar problems within an application domain. Fayad (2000) states that an application framework embodies generalised expertise in the domain based on analysis and synthesis of a wide range of specific solutions. He argues that analysis and synthesis of a wide range of specific solutions will help to understand a design of the proposed application framework. It is shown that the research community has more understanding in some domains such as financial, manufacturing, communication and networks and social welfare than others (Eliens 2000, Fayad 2000).

## Object Oriented Technology in Application Frameworks

The development of the application frameworks research is related to the development of object technology although there is no evidence that the framework technology is exclusive to object technology. However, the majority of the researchers in the area of application frameworks and most current application frameworks are object-oriented. Object-oriented technology is one of the fastest growing technologies of the last two decades promising better quality, productivity and interoperability through software reuse. Coad and Yourdon (1990) define “an object is an abstraction of something in a problem domain, reflecting the capabilities of the system to keep information about it, interact with it or both”. In that sense objects are used to model an understanding of the application domain, which concerns the system and abstraction. Deitel (2003) defines “Object technology is a packaging scheme that facilitates the creation of meaningful software units”. He explains that these units are usually large and focused on particular application areas and most of them can be reused (Deitel 2003). For example, there are data objects, time objects, audio objects, video objects, file objects, record objects and so on.

Iterative and incremental development approaches adopted in object-oriented technology have been the main development methodology supporting the development of application frameworks (Fayad, 1999a). Although the research of application frameworks is not exclusive to the object-oriented community, object-oriented technology has been the main driving force in the area of application frameworks. Advocates of application frameworks claim that the technology is one of the most promising technologies supporting large-scale reuse, increasing the productivity and quality, and reducing the cost of software development. Fayad (2000b) suggests that the primary benefit of object-oriented application frameworks stems from the modularity, reusability, extendability, and inversion of control they provide to developers. Many researchers and academics (i.e., Lewis et al, 1995, Eliens 2000, Fayad & Johnson, 2000, Due 2002) have argued that a major challenge for the next decade will be to develop and deploy application frameworks that operate in areas such as finance, medical care, insurance and telecommunication and networking. On the contrary, one survey (Cockburn 1997) shows that object-oriented approaches at frameworks development have failed more often than they have succeeded.

The central idea of object-oriented technology subsumes abstraction, modularity, encapsulation, inheritance and polymorphism - concepts that, on the face of it, lend themselves to reuse. The notable development of the technology consists of a comprehensive set of object-oriented modelling methods for analysis, design, and implementation, designed to realise the concepts mentioned above. Object-oriented technology has led to the development of patterns, components and application frameworks and object-oriented concepts have been applied in the process of developing and implementing application frameworks. Fayad (1999a, 1999b, 2000) stresses that frameworks build upon object-oriented concepts, which provides a conceptual base for more complex programming constructs and reusable implementation structures for large systems application. Eliens (2000) states that an object oriented approach will pay off when we have arrived at stable abstractions from which we have good implementations that may be reused for a variety of other applications. Accordingly, it can be said that application frameworks is a technology aimed to achieve large-scale reuse by applying object-oriented concepts. In the following sections some of the object-oriented concepts and principles will be discussed in relation to application frameworks and systems development.

### Abstraction

Abstraction is one of the principal concepts of object-oriented technology and aims to reduce details required for implementing software systems. Microsoft Encarta Dictionary (2001) defines abstraction as

“to develop a line of thought from a concrete reality to a general principle or an intellectual idea; a concept or term that does not refer to a concrete object but that denotes a quality, an emotion, or an idea.” A closer working definition defined by Graham (2001) is that “representing the essential features of something without including background or inessential detail.” It stresses separation of the essential features and details. Abstraction is a powerful tool available to software developers and most of modern object oriented languages support the notion. For example, in the Jade language, a pure object-oriented development environment has an abstract class called *object*, which can be inherited by application developers to add their own classes. An abstract class, such as the *object class*, denoted with no instances, is often used to represent abstract concept, whose concrete subclass may add its structure and behaviour by implementing its abstract method. Within an inheritance hierarchy, it is likely that some of the topmost classes may contain features whose definitions are differed from the subclasses. In other words, there are no implementation details for these features within the super class. This type of class is subsequently known as an abstract class. Szyperski (1997) states that an abstract class is a class that cannot be instantiated, that is, no object can be a direct instance of an abstract class. An abstract class can have unimplemented methods/abstract methods. Concrete classes inheriting from an abstract class have to implement all such abstract methods. An ideal abstraction should encapsulate all the essential properties of an object, including data and processes. The main benefit of an abstraction is the design expertise embodied in it, ready for reuse (Szyperski 1997). Application frameworks are designed for the purpose of supporting large-scale reuse, therefore abstraction is a built-in notion in the application frameworks development paradigm.

### **Generalisation and specialisation**

Generalisation describes the logical relationship between elements that share some characteristics or say it describes the grouping of objects that have a common set of properties and operations. Fowler (1997) defines generalisation as a taxonomic relationship between a more general element and a more specific element that is fully consistent with the general element and that adds additional information. Specialisation is the refinement of an abstraction by adding additional features. Generalisation and specialisation hierarchy is one of the most powerful tools of abstraction used in object-oriented modelling, which allows representing taxonomic relationships among classes (Bruehl, 2002). The relationship between generalisation and specialisation allows us not only to classify objects, but also to use the generalisation and specialisation hierarchy. An object oriented approach uses generalisation and specialisation techniques to realise abstraction. An application framework is a skeleton of the structure for a system, and the classes within the framework contain a common set of properties and operations for the domain area described by the framework. It is a generic solution for a business domain. An application developed by implementing an application framework is a specialisation of the framework in which the application developers specialise the classes in their intended applications by inheritance or composition.

### **Modularity**

Zamir (1999) defines a model as a distinctively named and addressable element of software used as a building block for the physical structure of a system, and modularity as the characteristic of a system decomposed into a collection of cohesive and loosely coupled modules, typically a goal of systems analysis and design. Modularity has been the principle for many matured engineering disciplines. The importance of modularity has been emphasised in many of the writings of software theoreticians. Meyer (1988) and Graham (2001) state that a good model should have decomposability (- refers to the software engineering and project management requirement where systems be decomposable into manageable chunks so they can be changed more easily and so that individuals or teams can be assigned to coherent work packages), composability (- refers to the property of modules to be freely combined even in systems for which they were not developed), understandability (- helps people to comprehend a system by looking at its parts prior to gaining an understanding of the whole), continuity (- in a system implies both that small changes made to it will only result in small changes in its behaviour, and that small changes in the specification will require changes to only a few modules) and protection (- the criterion of modular protection insists that exception and error conditions either remain confined to the

module in which they occur or propagate to only a few other closely related modules). Fayad (1999a) states that modularity is one of the main benefits that application frameworks can offer to application developers. He argues that application frameworks enhance modularity by encapsulating volatile implementation details behind stable interfaces. He (Fayad 2000) also suggests that extensive data coupling in a whitebox framework may break sound modularity and therefore, encourage people moving towards blackbox frameworks or greybox frameworks.

### **Encapsulation**

This is one of the important concepts and the mechanisms to support the need for software reuse and security. Zamir (1999) defines encapsulation as the mechanism by which related data and procedures are bound together within an object. In effect, an object is a software capsule that functions as a blackbox, responding to messages from other objects and dispatching messages of its own in ways that do not reveal its internal structure. Encapsulation is the practice of hiding the data structure that represents the internal state of an object from access by any other than the public methods of that object. This can ensure that objects cannot change the internal state of other objects in unexpected ways, minimising the complexity of putting together modules of code from different sources. This is a programming facility used in object-oriented programming practice. Encapsulation is the technique for packaging the information in such a way as to hide what should be hidden and make the visible what is intended to be visible. The use of encapsulation is a powerful means of maintaining control over an object's data and state. It allows an object to determine whether and how data may be changed. This makes it possible to modify or enhance an object's implementation while keeping its exposed interfaces consistent, preventing backward-compatibility problems as the programs develop. Encapsulation promotes modularity, meaning that the object must be regarded as a building block of a complex system. Once a proper modularisation has been achieved, the implementer of the object may postpone any final decisions concerning the implementation at will. Application frameworks relies on the capability of encapsulation, in which the framework can hide the internal structures but allows application developers to use the functions defined via interfaces.

### **Polymorphism**

Graham (2001) defines polymorphism as the ability to use the same expression to denote different operations. Many modern programming languages support polymorphic behaviour. Sometimes polymorphism is referred to as dynamic binding or runtime binding of function calls. Object-oriented programming languages derive most their power from inheritance and runtime binding of function calls. Application frameworks, especially whitebox frameworks, rely on polymorphism (dynamic binding) and inheritance to allow application developers to implement the framework.

Most current application frameworks apply object-oriented concepts and principles. Many notable projects in the application frameworks area are based on object-oriented technology such as San Francisco, OSEFO and SEMATECH CIM. Schmid (1996) argues that the primary benefit of an object oriented approach for application frameworks stems from the emphasis on modularity and extendability by encapsulating volatile implementation details behind stable interface and enhancing software reuse. Application frameworks is built upon the objects technology that is more likely to provide a conceptual base for complex programming constructs and reusable implementation structures. Additionally, object oriented technology provides the mechanisms needed for application frameworks such as inheritance, encapsulation and polymorphism.

## **Other Reuse Techniques and Application Frameworks**

Application frameworks is a reuse technology aimed at large-scale reuse and it has a close relationship with other reuse techniques used in software engineering. An application framework can be seen as a collection of components, a generic solution for a class of problems, a frame of mind for solving problems and a set of architectural constraints. It integrates and concretises a number of patterns to a degree required to ensure proper interleaving and interaction of participants involved. An application

framework can also be seen as a kind of library, which provides reusable objects for applications. But in contrast to ordinary software class libraries, frameworks may at times take over control when the application runs. From a reuse perspective the application frameworks technology is closely related to other reuse techniques. Application frameworks use those reuse techniques to achieve the goal of large-scale reuse. As the reuse techniques have an important role in developing frameworks technology, understanding the specific technology is a stepping-stone for grounding evaluation criteria. Following, the foundational techniques (i.e., architecture, class libraries, patterns, and components) are explained:

### **Architecture**

Software architecture is the foundation of system construction. Graham (2001) points out that software architecture deals with abstraction, with composition and decomposition, and also with style and aesthetics. Bass (1998) describes the software architecture of a program or computing system as the structure or structures of the systems, which comprise software components, the externally visible properties of those components and the relationships among them. Szyperski (1997) depicts system architecture as a means to capture an overall generic approach that makes it more likely that concrete systems following the architecture will be understandable, maintainable, evolvable, and economic. It is this integrating principle, covering technology and market that links software architecture to its great role model and justifies its name. Despite the different concentration of the definitions, software architecture is about an overview of a system. Generally speaking, software architecture can be seen as a set of rules, guidelines, interfaces, and conventions used to define how components and applications communicate and interoperate with each other. Recent software development experience has shown that sound software architecture for the software systems is necessary as software systems are more complex than before. Szyperski (1997) stresses that architecture prescribes proper frameworks for all involved mechanisms, limiting the degree of freedom to curb variations and enable cooperation. Architecture needs to be based on the principal considerations of overall functionality, performance, reliability, and security. Software engineers have learnt from practice such that architecture is needed in any system if they seek for guiding rules for design and implementation.

Architecture needs to create simultaneously the basis for independence and cooperation of systems. Independence of the systems aspect is required to enable multiple sources of solution parts. Cooperation between these otherwise independent aspects is essential in any no-trivial architecture. System architecture is the structure of a software system which provides a platform for application developers to build the system. It may be as concrete as providing detailed implementation requirements, to as abstract as giving a generic idea of how the system should be implemented. Application frameworks technology promises reuse of not only the frameworks source codes, but also more importantly, architecture (Fayad 1999a). A standardisation structure allows a significant reduction of the size and complexity of codes that application developers have to write.

### **Class libraries**

These are a set of reusable classes, often defined as part of the implementation or design environment (Zamir 1999). Many programming languages have some ready usable classes embedded and available to application developers especially in visual development such as VB Studio.Net and J2EE. Class libraries in general offer static inheritance facilities but frameworks are more likely to support dynamic, run time binding facilities. Application frameworks defines 'semi-complete' applications that embody domain specific object structures and functionality. It can be viewed as extensions to object oriented class libraries. In contrast, class libraries provide a smaller granularity of reuse. For example, class library components like classes for strings, complex numbers and arrays are typically low-level and more domain-independent. Fayad (2000b) states that class libraries are typically passive and frameworks are active and exhibit 'inversion of control' at runtime.

### **Patterns**

Classes and interaction structure of object-oriented designs may become fairly complex, and consequently difficult to develop and understand, which has led the study and development of patterns.

Design patterns are standard solutions to recurring problems, named to help people discuss them easily and think about design. Design patterns can be used as a micro-architecture that applies to a cross-domain design problem such as linked list and other classical data structure design. A design pattern describes a concrete solution to an architectural problem that might arise in a specific context. The solution proposed by the patterns is typically a way of structuring a cluster of objects and their interaction (Brugali et al. 2000). Schmid (1995) states that the repetitive use of design patterns created an overall architecture though each design pattern represents a micro architecture. He argues that design patterns give a better performance with more concrete guidance on how to realise a framework. Patterns are abstract, therefore they are not ready-made pluggable-solutions. They are most often represented in object-oriented development by commonly recurring arrangements of classes and the structural and dynamic connections between them. Graham (2001) argues that patterns are most useful because they provide a language for designers to communicate in. In particular, design patterns have proven their value in structuring the variable parts, called hot spots (allowing plug in software artefacts) of a framework (Pee, 1994). Fayad (2000) defines patterns as a conceptual solution to a recurring problem. Schmid (1995) argues that design patterns are an excellent means to describe the details of object and class interactions but they are not suited to give an overall picture. Design patterns are reusable architecture, object template, or design rule that has been shown to address a particular issue in an application domain (Zamir 1999). Most design patterns come either as a static description of a recurring pattern of architectural elements or as a rule to apply dynamically for when and how to apply the pattern. The majority of software patterns produced to date have been design patterns at various levels of abstraction but Fowler (1997, Graham 2001) introduces the idea of analysis patterns as opposed to design patterns. Fowler's patterns are reusable fragments of an object-oriented specification model generic enough to be applicable across a number of specific application domains.

Both patterns and frameworks facilitate reuse by capturing successful software development strategies. The primary difference is that frameworks focuses on reuse of concrete designs, algorithms, and implementations in a particular programming language. In contrast, patterns focus on reuse of abstract designs and software architectures. Frameworks can be viewed as a reification of families of design patterns. Likewise, design patterns can be viewed as the micro architectural elements of frameworks that document and motivate the semantics of frameworks in an effective way (Fayad, 2000b). Design patterns have been used extensively in developing application frameworks. Many researchers (Schmid 1995, Fayad 1999a, Fayad 2000) have suggested using as many patterns as possible for developing application frameworks because the abstractness and design expertise are embedded in patterns.

### **Components**

Szyperski (1997) points out that component technology is standalone, which has gone beyond object orientation. He defines software components as binary units of independent production, acquisition, and deployment that interact to form a functioning system. In this definition a software component is best thought as a unit with well-defined interfaces that has explicit context dependencies. He explains that insisting on independence and binary form are essential to allow multiple independent vendors and robust integration. Components are not just a big object. Eliens (2000) notes that components usually consist of a collection of objects that provide additional functionality that allows components to interact together. Szyperski (1997) states that a component is a unit of independent deployment, a unit of third party composition, and it has no persistent state. By contrast, an object is a unit of instantiation, which has a unique identity, it has state, which can be a persistent state, and an object encapsulates its state and behaviour. A component is likely to come to life through objects and therefore would normally consist of one or more classes or immutable prototype objects.

Component and application frameworks have a close relationship. Components in a framework provide a generic architectural skeleton for a family of related applications, and complete applications could be composed by inheriting from and/or instantiating framework components. A component has well-specified functionalities with standard interface and behaviours, and a concrete implementation of an area of the system. Atkinson (2002) states that there are two types of relationship between component

instances that are important at runtime. The first is composition, which captures the idea that one component is a part of another. The key aspects of the composition relationship are:

1. Composite objects are responsible for the creation and destruction of their parts
2. The parts of a composite object take their identity from their composite object; and
3. Composition is transitive.

The other one is the client/server relationship. A client/server relationship between two component instances defines a contract between them. For components to be independently deployable, their granularity and mutual dependencies have to be carefully controlled from the outset. Many application frameworks use Common Object Request Broker Architecture (CORBA) to increase the interoperability among each part of the framework. CORBA, a big component essentially has three parts: a set of invocation interfaces, the Object Request Broker (ORB), and a set of object adapters. For invocation interfaces and object adapters to work, two essential requirements need to be met. First, all object interfaces need to be described in a common language. Second, all languages used must have bindings to the common language (Szyperski 1997). Fayad (2000b) states that frameworks can be used to develop components. Equally, components can be used in blackbox frameworks.

## The Evaluation of Application Frameworks Technology

The literature survey indicates that building application frameworks is hard and implementing application frameworks is as hard as building application frameworks (Fayad 1999, Fayad 1999b, Fayad 2000, Lewis 1995, Pree et al 2000), and that building and implementing application frameworks still need more methodological support (Fayad 1999a, 1999b, 2000). According to a survey (Fayad, 2000) the minimum time spent in developing an application framework was 0.5 person month and the maximum time to develop an application framework was 1000 person months. The average time to develop an application framework was about 21 person months. An application framework conventionally consists of the core classes of an application, and one has to understand the basic architecture of a particular application type to be able to specialise the framework (Pree et al, 2000). Using an application framework may simplify application developers' life since a framework provides generic solutions for a particular application domain. However, average learning time is a big factor in establishing the cost of the final application. The application developers have to understand what solutions the framework provides, and to comply with the rules imposed by the framework. Current literatures also indicate that application frameworks lack standards. For example, there is a suggestion that reusable components and frameworks must be accumulated in a standardised format (Chen 1999). Most researchers agree that the classification structure of an application framework must be appropriate and manageable. Application developers will have difficulties with understanding the framework if the structure of the framework is not clear and standardised.

Based on the literature analysis, this study proposes quality criteria to evaluate the quality aspects of application frameworks. The main purpose of proposing the quality criteria is to evaluate application frameworks more systematically. The quality criteria consist of four elements including correctness, extendability, reusability and interoperability drawn from various studies concerning software development and evaluation (i.e., Meyer 1988, Graham 2001 and Paul 2002). Correctness denotes that output is true and meets the specification correctly within the application domain. Correctness is one of the most important quality characteristics of software systems. In the context of software systems, correctness implies that the applications should reach certain requirements defined by users. Extendability means that applications should be easy to evolve and extend as requirements alter. Extendability is essential to ensure timely modification and enhancement of services and features (Schmidt, 1996). Technology evolution is even faster than before and the systems developed today must meet the challenge of tomorrow. It is vital that the systems developed today can be extended when user requirements change. Reusability denotes that applications should be built into reusable modules. Reusability is essential to leverage the domain knowledge of expert developers to avoid re-developing

and revalidating common solutions to recurring requirements and software challenges. It is one of the proven ways to increase product quality as the reusable modules of the software can be tested before release. Interoperability: means that applications should be readily compatible with other systems. Internet, distributed systems and networks development have made the information systems more complex than before. It is often required for a system to communicate with other systems or integrate with legacy systems.

## **The Results of the Evaluation**

### **Correctness**

This is the single most important quality aspect for any software systems from a systems testing point of view. McConnell (1993) finds that industry average experiences are about 15 to 50 errors per 1000 lines of codes, the application division at Microsoft experiences about 10 to 20 defects per 1000 lines of new developed codes during in-house testing and 0.5 defects per 1000 lines of codes in released product. So the reduction of the lines of code written by application developers may be one way to reduce the potential errors of applications. From the perspective of implementing application frameworks the applications developers who use application frameworks will reduce the new lines of codes required because the application framework itself is a semi-completed application. If the framework is well tested then the correctness of the application building upon the framework will increase because the application developers write less code. In other words, the application developers could reuse the codes and the structure of the framework. It is possible to reduce the potential errors caused by application developers if the lines of codes requested for an application is reduced. However, the initial cost for development of the application frameworks would be high (Fayad, 2000) because of the complex nature of developing and implementing frameworks. Fayad (2000d) also argues that a framework can produce higher quality because of the demands of a wide customer base and the fact that commercial frameworks will have successfully completed lengthy beta software programs. Frameworks technology uses class libraries, design patterns and components, which are well tested. Thus, the use of the technology will potentially increase the correctness of applications, which was built upon class libraries, patterns and components.

### **Extendability**

Objects technology promotes extendability by utilising the concepts of abstract, inheritance, encapsulation and polymorphism. Application frameworks supports extendability by providing hot spots that allow applications to extend their stable interfaces (Fayad, 1997). However, with excessive data coupling (i.e., high inheritance coupling in whitebox frameworks approach breaks the modularity principle) the framework loses its flexibility and it is difficult to combine with other frameworks. Furthermore, it has been noticed that updating components is difficult and problematic (Fayad, 2000) for applications developed by implementing frameworks. It is not easy to achieve low coupling in practice although an idealised framework component should have clean interfaces, be cohesive and have little data coupling.

### **Reusability**

Application frameworks technology promotes large-scale reuse through the architecture, the module and the code. Application developers not only reuse the code but also design expertise embedded in application frameworks when they implement the frameworks. Despite the difficulties of developing and implementing, the application frameworks approach has shown great potential in terms of capturing the domain knowledge, architecture, patterns, components, and programming mechanisms in the context of systems development.



| Criteria         | Result                 | Reasons                                                                                                                                                                                                                                                                                                                            | Penalty factors                                                                                       |
|------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Correctness      | High                   | <ul style="list-style-type: none"> <li>- Application developers write less code.</li> <li>- Class libraries, design patterns and components technology</li> </ul>                                                                                                                                                                  | <ul style="list-style-type: none"> <li>- High initial cost</li> <li>- Difficult to test</li> </ul>    |
| Extendability    | Depends (could be low) | Depends on the nature of the framework: <ul style="list-style-type: none"> <li>- Excessive inheritance coupling may reduce the flexibility and make difficult to combine with other frameworks.</li> <li>- Also, updating component is difficult and problematic for applications developed by implementing frameworks.</li> </ul> | <ul style="list-style-type: none"> <li>- High initial cost,</li> <li>- Increase complexity</li> </ul> |
| Reusability      | High                   | <ul style="list-style-type: none"> <li>- Architecture, module and code reuse</li> </ul>                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>- High initial cost</li> <li>- Difficult to use</li> </ul>     |
| Interoperability | Depends (could be low) | Depends on the nature of the framework: <ul style="list-style-type: none"> <li>- The nature of reversion of control</li> <li>- With legacy systems</li> </ul>                                                                                                                                                                      | <ul style="list-style-type: none"> <li>- High initial cost</li> <li>- Increase complexity</li> </ul>  |

**Figure 2:** Evaluation result

### Interoperability

Applications developed using frameworks may have problems to interoperate with other applications since sometimes the frameworks take control of the operation, which potentially increases the difficulty of interoperation with other systems including legacy systems (thread dispatch becomes difficult to manage the construction of applications by combining two or more frameworks because the individual frameworks assumes it has the main control of the application). Thus it is possible to have a low interoperability of an application developed by implementing frameworks. The summarised result of the evaluation is shown in **Figure 2** above.

## Conclusions

The experiences accumulated by the research community indicate that application frameworks apply object-oriented concepts, aimed at large-scale reuse likely domain specific and can exist in any development stage. Applications developed by implementing application frameworks may increase quality in terms of correctness and reusability with some penalty factors. The extendability and interoperability may be reduced due to the high inheritance coupling nature of the application developed from application frameworks. The study also shows that the methodological support concerning building and implementing application frameworks is inadequate. Application frameworks technology is still immature and not yet to be another silver bullet but potential is imminent.

## References

- Booch, G., Rumbaugh, J. & Jacobson, I. (1999). *The unified modelling language user guide*. Addison-Wesley.
- Bruel, J.M., & Bellahsene, Z.(eds. 2002) *Advanced object-oriented information Systems*, OOIS 2002 workshops Montpellier, France, September 2, 2002
- Brugali, D... et al (2000). *Frameworks and pattern languages: an intriguing relationship*, [ACM Computing Surveys](#), Volume 32, 2000.
- Chen, D. J., Koong, C. S., Chen, W. C., Huang, S. K., and Van Diepen. N.W.P (1999). *Integration of reusable software components and frameworks into visual software construction approach*. Journal of Information and Science and Engineering 2000.
- Coad, P. & Yourdon, E. (1990). *Object oriented analysis (2<sup>nd</sup>)*, Englewood Cliffs, NJ: Yourdon Pres: Prentice-Hall.
- Cockburn A. (1997). *Surviving object-oriented projects: A Manager's Guide*. Addison-Wesley.
- Deitel, H.M (2003). *Visual Basic.net For Experienced Programmers Developer series*. Upper Saddle River, NJ: Pearson Education.

- Due, R.T. (2002). *Mentoring object technology projects* NJ07458: Prentice Hall PTR.
- Eliens, A. (2000). *Object-oriented software development*, 2<sup>nd</sup> ed. England: Pearson Education.
- Fayad, M.E., & Schmit, D.C. (1997). *Object-oriented applications frameworks*. Communication of the ACM, Oct 1997 v40 n10, 32.
- Fayad, M. E., Schmidt, D. & Johnson, R.E. (1999a). *Building application frameworks: object-oriented foundation of framework design*. New York: John Wiley & Sons.
- Fayad, M. E., Schmidt, D. & Johnson, R.E. (1999b). *Implementing application frameworks: object-oriented framework at work*. New York: John Wiley & Sons.
- Fayad, M. E., & Johnson, R.E. (2000). *Domain specific application frameworks: frameworks experience by industry*. New York: John Wiley & Sons.
- Fayad, M. (2000b). *Introduction to the computing surveys' electronic symposium on object oriented application frameworks*. [ACM Computing Surveys](#), Volume 32, No.1, March 2000.
- Fayad, M. (2000d). *Enterprise Frameworks: Guidelines for selection*. [ACM Computing Surveys](#), Volume 32, 2000.
- Fowler, M. (1997). *UML Distilled*, 2<sup>nd</sup> ed, Harlow, England: Addison-Wesley.
- Graham, I. (2001). *Object-oriented methods principles & practice (3rd)*. London: Addison-Wesley.
- Johnson, R (1997). *Frameworks for object-oriented software development*. Communication of the ACM, Oct 1997 v40 n10, 39
- Lewis T., Rosenstein, L., Pree, W., Weinand, A., Gamma, E., Calder, P., Andert G., Vlissides J.& Schmucker, K. (1995). *Object-oriented application frameworks*. Greenwich: CT Manning.
- McConnell, S (1993). *Code complete : a practical handbook of software construction* Redmond, Washington: Microsoft Press.
- Meyer, B. (1988). *Object-oriented software construction*. Englewood Cliffs NJ: Prentice Hall.
- Paul, C et al (2002). *Evaluating software architectures methods and case studies*. Addison-Wesley.
- Pree, W. and Koskimies, K (2000). *Framelets- small and loosely coupled frameworks*. ACM Volume 32, Number 1es, March 2000.
- Schmidt, D. C. (1996). *Lessons learned building reusable OO telecommunication software frameworks*. Lucent Labs Multiuse Express magazine, Vol. 4, No. 6, December, 1996.
- Schmid, H, A. ( 1995). *Creating the architecture of a manufacturing framework by design patterns* OOPSLA 95 Austin.
- Szyperski C. (1997). *Component software: Beyond object-oriented programming*. Addison-Wesley Longman.
- Zamir, S. (1999). *Handbook of object technology (ed.)*. CRC Press LLC.

# The No 'Ought' From 'Is' Argument: Faulty Thinking in Ethics and Social Science

James Doughney  
Victoria University, Australia

---

## Abstract

*According to Hilary Putnam, the 'moral is clear: when we are dealing with any important value disagreement, we assume facts are irrelevant at our peril. No convincing logical reason can be given for the logical irrelevance of fact to value judgements, even if we accept the positivist conception of what a "fact" is.'* (2002, p. 78) This paper explores why the dichotomies engendered by the 'positivist' approach – fact/value, positive/normative and descriptive/evaluative – are false. The main reason, the paper argues, is that the fundamental principle underlying the approach fails. This principle, the 'no ought from is argument' (or the NOFIA), is the formally structured argument that a value (ought) cannot logically be derived from a fact (is). The paper rejects the NOFIA and, especially, its iconic status in economics. Using criticisms of the NOFIA by John Searle, Amartya Sen, Hilary Putnam, Vivian Walsh and Julius Kovesi, as well as the critical realist method of explanatory critique, the paper argues for a form of moral realism.

## Introduction

Value judgements, generations of students have been told authoritatively, are both non-factual and about ends such as social policy.<sup>1</sup> Social scientists *should not* concern themselves with such matters in their day jobs. In their other lives they would, of course, have values: political, religious, social or whatever. However, these values are *best* left at the door of science, like muddy shoes and wet raincoats. Values have no place within objective social scientific research. To be scientific, social research *must* deal exclusively with facts and with the means of achieving ends that are given or assumed. We have heard this story many times before, with each discipline giving it a little twist to suit its subject matter and house lexicon. Ironically this core tale is normative. My italics above merely highlight the unreflective 'oughts' and 'ought nots' in the standard expositions.

A classical statement of the position is Lionel Robbins's 1932 *An Essay on the Nature and Significance of Economic Science*. Other social sciences have their equivalents but, because mainstream economics

Copyright © 2006 Victoria University. This document has been published as part of the Journal of Business Systems, Governance and Ethics in both online and print formats. Educational and non-profit institutions are granted a non-exclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the

is so vivid an example, I will quote Robbins here. I will also continue to use economics as an example in this paper. Robbins argues that it is not:

*... in the least implied that economists should not deliver themselves on ethical questions ... On the contrary, it is greatly to be desired ... since only in this way*

---

<sup>1</sup> The author expresses appreciation to two anonymous referees for correcting errors and making helpful suggestions. The usual caveat, of course, applies.

*will they be in a position to appreciate the implications as regards **given** ends of problems which are put to them for solution ... Now, as regards the first type of difference [about given ends themselves], neither Economics nor any other science can provide any solvent. If we disagree about ends it is a case of thy blood or mine – or live and let live, according to the importance of the difference, or the relative strength of our opponents. But if we disagree about means, then scientific analysis can often help us to resolve our differences ... Surely ... it is worth while delimiting the neutral area of science from the more disputable area of moral and political philosophy.* (Robbins 1935 [1932], pp. 149-51; original emphasis)

This long quotation is useful because it clearly delineates the three dichotomies engendered by mainstream approaches in the social sciences. First facts (descriptions, evidence, data etc.) are the raw material of social science. They are not the raw material of ethics (morals, political philosophy, policy etc.), though they might inform ethical deliberations. Second values are the raw material of ethics, and facts ultimately have no purchase here. As Robbins said above: ‘If we disagree about ends it is a case of thy blood or mine – or live and let live, according to the importance of the difference, or the relative strength of our opponents’. Milton Friedman also put it bluntly in his influential essay, ‘The methodology of positive economics’. Where arguments rested on ‘fundamental differences in basic values’ they were of a kind ‘about which men [sic] can ultimately only fight’ (1953, p. 5). Ipso facto values are not the raw material of social science and, though we all have values of some sort or another, we must quarantine them from our work. Third ends and means must be separate: values and ends go together, as do facts and means.

It is all very neat. The problem is that it is wrong, as I will show. Worse still, because it faulty, the approach leads to some very unsavoury outcomes. One of these is that supposedly neutral disciplines – again economics is emblematic – are chock full of values dressed up as facts. Another is the illicit moral absolutism supposed by carving off ends into the separate domain of values. ‘Don’t blame me guv, I’m just workin’ to giv’n ends!’ A third unsavoury outcome is in the domain of values itself, and it arises because the approach carves off facts. This is the problem of ethical or value relativism. Once we designate opinions as ‘value judgements’ it is as if they are given a warrant to be out of cognitive reach. Evidence is insufficient in evaluating value judgements per se. Any one person’s opinion, despite being palpable nonsense or ethically dangerous, is as good as any other’s. Values and preferences are relative to the person who holds them: ultimately they must be incommensurable.

Why are the dichotomies engendered by the mainstream approach flawed? One reason, the subject of this paper, is that the fundamental principle underlying the approach fails. This principle is the ‘no ought from is argument’, or the NOFIA as I will call it from now on. The NOFIA will stand for the formal structure of the argument that a value (ought) cannot *logically* be derived from a fact (is). I will take the is-ought, fact-value, descriptive-evaluative and positive-normative pairs to state the same things here, despite there being subtle differences between each.

It is important to note that I will not discuss the separate problem of how social scientists’ perspectives (and their values) may be secreted (ostensibly ‘naturalised’) within theories, explanations and statements. That is, I will not deal with the familiar argument (right so far as it goes) that social scientists necessarily select their data, the segment of their subject matter that they study, the aspect or direction of their approach and the methods and, perhaps, methodology they deploy. This is close to Max Weber’s argument (see e.g. Parsons 1964 [1947], pp. 8-29).

We know, too, at a much cruder level, that social scientists insert their own perspectives, interpret data wilfully and reconstruct evidence within preconceived categories. At a more sublime level we also recognise that none of us are tabula rasa: we interpret our subject matter and our experiences through theories, concepts and language. We form theories of the world based on what has gone on before in thought, even when we are rejecting this thought because of better evidence or canner insights. We think using language. The point I want to stress here is that these are not ‘value problems’ per se. These problems are both epistemic and sociological (i.e. contained within the domain of sociology of knowledge). Nor are these problems confined to the social and human sciences and ethics. In fact much

of our knowledge of these problems of knowledge was generated by investigations in the philosophy of science (see e.g. Kuhn 1957, 1996 [1962]).

Instead of pondering these separate questions I will focus exclusively on the structure of the NOFIA, which we will see is the ultimate ground of the fact-value dichotomy. David Hume assumes the seminal – indeed almost iconic – position in the NOFIA tradition (MacIntyre 1966, p. 246). In fact it goes by the names Hume's Law, Hume's First Law, Hume's Guillotine or Hume's No-bridge Principle. Sometimes the phrase 'naturalistic fallacy' is used to describe the error committed by those who break Hume's Law. However, this is not quite correct, though there are some similarities. The naturalistic fallacy was, in GE Moore's *Principia Ethica*, the error committed by those who endeavoured to define 'good' in specific, natural (factual) terms.

At any rate a brief passage from Hume's 1739-40 work *A Treatise of Human Nature: Being An Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects* (Book III Part I Section I) is given pride of place. Karl Popper for one was in no doubt about its significance:

*Perhaps the simplest and most important point about ethics is purely **logical**. I mean the impossibility to derive nontautological ethical rules – imperatives; principles of policy; aims; or however we may describe them – from statements of facts. Only if this fundamental; **logical** position is realized can we begin to formulate the real problems of moral philosophy, and to appreciate their difficulty.* (Popper 1948, p. 154; my emphasis)

## The NOFIA: a formal statement of the 'no ought from is argument'

I will now try to set out the NOFIA formally. At bottom it includes three classes of statements, with each containing two clauses (I will use letters and numbers to make identification easier). Moreover I will include post-Hume adaptations to arguments within the tradition, such as not restricting the notion of fact to the Humean 'sense impression'. These then are the basic propositions on which the NOFIA rests:

- F1 Descriptions of the states of affairs, events and relations in the world state facts; *and*
- F1.1 Facts provide cognitive material (are objects of thought, inference, reason, may be judged true or false etc.); *and*
- F1.2 Facts are reducible to experiences expressible in concrete physical terms; *and*
- V1 Values express sentiments, feelings, preferences and attitudes and imply imperatives, prescriptions etc.; *and*
- V1.1 Values are non-cognitive; *and*
- V1.2 Values may be factored out from facts that we can experience (and theoretical terms) by a recursive process of radical decomposition; *and*
- D1 A value cannot be derived from facts alone; *and*
- D1.1 The NOFIA is a 'demonstrative' or deductive argument; *and*
- D1.2 Whatever exists in the conclusion must exist in the premises (principle of conservation); *therefore*
- C1 For a value to be derived from an argument presupposes that its value clause has done the logical work; *and*
- C2 Given that ends are values, reasoning that does not fall foul of the NOFIA must be about means.

This is a fair rendition of the argument. I have tried pre-emptively to plug holes and counter-arguments with the subordinate clauses under F (fact), V (value) and D (deductive structure). For example, under V1.2 we can expand the notion of fact to admit 'theoretical terms'. These were terms admitted as devices by positivist philosophers of science to describe unobservable or non-experientable entities (e.g.

gravitational or magnetic fields, atoms, sub-atomic particles etc.) but that in themselves were not necessarily regarded as being real (or factual).

I must confess to having struggled to fit a *general* moral argument constructed according to the NOFIA into a simple symbolic form of deductive logic. Take the *general* modus ponens form, in which we might imagine P and Q as functions or algorithms that strip down (decompose) the complex structure of propositions in our natural language to plain F1.2 brute facts and V1.2 brute values:

$$\begin{array}{l} P(F) \\ \hline P(F) \rightarrow Q(V) \\ \hline \rightarrow Q(V) \end{array}$$

Note that this works only because the statement of implication is conditional. The statement  $P(F) \rightarrow Q(V)$  cannot be general because it would allow facts to entail (or imply or lead to) values from the start. However, the NOFIA seems to work for conditional statements: ‘if P then Q’. For example, we might translate this into a plain language form:

*Mistakes have been found in the draft of this paper [P(F)]*  
*If errors are found [P(F)] then errors should be corrected [Q(V)]*  
*The blunders ought to be corrected [Q(V)]*

Note that the form of deduction is not the problem. The same would be true of, say, a syllogism: *If P(F)  $\rightarrow$  then Q(F) & if Q(F)  $\rightarrow$  then R(F); given P(F)  $\rightarrow$  R(F)*. Note also that it is possible to insert a ceteris paribus clause into the structure to allow for contingencies. That is,  $P(F) \rightarrow Q(V)$  CP would mean that errors should be corrected, other things being equal. Thus errors should be corrected unless they were deliberate; unless doing so would mean that you would miss a doctor’s appointment that would save your life, etc. The structure also suggests that the argument seems to work when its content (semantics) involves following rules, obeying commands, honouring commitments, keeping promises and adhering to principles (i.e. in situation X do Y). I will return to this point below.

Now it seems to me that the content of the argument belies our actual experience of working out what is right to do, what to value and how to live. It actually contradicts what we do: the reality of practical reason. It seems absurd to think that our moral judgements can be radically quarantined from the facts of the world in which we live and from the way in which we consider ethical questions. Yet this is precisely what the argument does. Facts participate in the argument, but their role is curtailed. As Kovesi put it, ‘the relevant facts of the situation are not given as reasons for one’s acts or for one’s decisions. The relevant facts of the situation serve only to enable us to recognize that there is a case that falls under a principle’, rule, command or obligation (1967, p. 101; see also pp. 77, 97-98, 110, 114, 142-43).

Typically, in contrast, when posed with a moral judgement we consider the problem in its various aspects. In most situations we face it is simply insufficient to rely on received moral principle. Straightforward cases such as crimes might permit a moral principle to be deployed, but even so we are often required to ponder our judgements (e.g. ‘murder’ by victims of domestic violence). Typically we reason: argument, evidence and data assist our thinking and shape our conclusions. In many instances we think the issues through ‘publicly’, with family and friends or socially. We often face criticism and we reply to it.

Moreover we are active agents in our moral lives and not mere automatons who typically fall back on higher authority or lurch forward from some predetermined bio-evolutionary disposition. The ‘fall back’ position arguably describes the approach of those who defer, for example, to authority. The ‘lurch forward’ position I take to be Hume’s view roughly expressed: we are predisposed to follow the moral rules that have evolved over time and that ‘conduce to utility’. In both cases there seems an underlying pressure to conform to a model of deductive reasoning. What is missing in both instances is the appeal to reasons, arguments and facts. Yet if we think about what we actually do in exercising practical reason, the missing elements are essential.

Unfortunately I fear that these evidentiary arguments from the practice of making 'ought' judgements and decisions will be insufficient to satisfy the doubters. Therefore I will set out my reasons for rejecting the NOFIA formally and, in the following sections, I will explore two cases. The first will be the position presented by John Searle that oughts can be and are commonly derived from facts describing the world. The second will be a position associated today with the critical realist school of philosophy, namely that the notion of explanatory critique of false views demonstrates how normative conclusions can be derived directly from facts about the world. Before I do so, however, I will make a few remarks in the next section about means-ends reasoning (see C2 above) and the status of non-cognitivism (see V1.1).

## Means, Ends and Non-Cognitivism

Logically there is no valid reason that 'ought' judgements cannot be about ends: e.g. coming to a conclusion such as 'we ought to think that X is a good end for human development', 'we ought to pursue X as an end', etc. Indeed an economics that did not consider ends, as proposed by Robbins, is an oxy-moron. There is always an end, and enacting *any* set of means (value free or not) is instrumental in producing and reproducing – in fact embodying – the 'given' ends. We cannot simply ignore the moral implications of means by forbidding ends from playing an active part in our *economic* thinking. Hiving the 'ends question' off to another domain will not help. The problem we continue to face is a version of the familiar question: 'do the ends justify the means?' We will still be called to account by some or other theory of ethics to justify the means: either consequentially or in themselves. Otherwise what was Nuremberg, to use an extreme example, all about?

We surely cannot bifurcate our lives into value-free and value-active domains, and it is odd that we ought even to try to do this with our lives as social scientists (e.g. separating talk about economic matters from talk about the non-economic). Sen parodies this split in his paper 'Description as choice', which was first published in 1980:

*The debunking of welfare economics that can be seen in such works as Lionel Robbins' **The Nature and Significance of Economic Science** kept prescriptive studies somewhat immersed in a pool of apology from the mid-thirties until relatively recently. Welfare economics was for a long time the 'untouchable' in the community of economics and when economists spoke 'qua economist' – to use that lovely expression brought into circulation by positivism – they tried to speak in a value-free 'scientific' language, with 'expletives' deleted. Welfare economics was seen as the subject, if not of expletives, at least of emotive utterances, which the cool positivist scientists found 'meaningless' in terms of their narrow theory of meaning. (1982 [1980], p. 443)*

The alternative that Sen has pursued is, at a very fundamental level, to posit enquiry into the grounds of human flourishing as a core (factual) research endeavour: ' "...ascertain the function of man" and then proceed to explore "life in the sense of activity" as the *basic building block of normative analysis*' (1999, p. 73; see also 1993). Now if the 'function' of human beings (what we are and what we need to flourish) becomes our P(F) and our *end*, and if we proceed by establishing that, in the lives we lead ('in the sense of activity'), certain valued capabilities are required for P(F), then we are well on the way to having derived our Q(V) (see also Bhaskar 1994, pp. 110-14). Deriving values from an objective enquiry into human ends is what Sen has done in general terms and what Martha Nussbaum (inter alia 2001, 2000, 1999, 1993), in particular, has proposed in a more specific list of 'central human capabilities'.

Note that, having set out the argument in this way, our value statements – statements of central capabilities and rights such as freedom, nourishment, shelter, security and the like – are framed as means of facilitating the human function and its flourishing. What this says is that nothing is inherent about means that renders them value free and factual and therefore amenable to reason. Nor is there anything inherent about ends that make them the opposite. The fact that most ethical arguments seem to concern the rightness of means corroborates this point of view.



A contingent inference from V1.1 in the formal statement of the NOFIA is that values are relative to their holders. I have noted this earlier. The argument that non-cognitivism implies relativism can be made plausibly. Supporters of the NOFIA may balk at the inference or, like Hume and Friedrich von Hayek (see e.g. 1972 [1960], p. 63), may present alternative grounds for holding a non-relativist position. However, it is a predicament within the received view (Putnam 2002, pp. 41-45; Walsh 2000, pp. 6-9). Walsh and Putnam explain that, in philosophy, the grounds for supporting the fact-value dichotomy have shifted in recent years, and they have shifted in ways that make them more relativist.

This is especially so of Bernard Williams's arguments. Putnam asks 'just what sort of dichotomy the new dichotomists *do* offer'. He notes that a statement such as 'Peter is cruel', for Williams, 'can be true "in the very same sense in which 'snow is white' is true, while still being an ethical utterance"'. Putnam points to the key, which is that statements in ordinary language, such as 'snow is white' or 'grass is green', are not regarded by philosophers such as Williams 'as possessing the highest kind of "truth"' (2002, pp. 41-42). Walsh argues:

*[I]f I say that grass is green, for example, I certainly speak the truth; but I do not speak what he [Williams] calls the absolute truth. I do not describe the world as it is 'anyway', independently of any and every 'perspective'. The concept 'green' (and possibly the concept 'grass' as well) are not concepts that finished science would use to describe the properties that things have **apart from any 'local perspective'**". (Walsh 2000, p. 8; citing Putnam 2002, pp. 41-42 (originally Putnam 1993); my emphasis)*

According to Putnam, Williams 'does not deny that ethical sentences can be true or false'. This clearly represents an advance on traditional positivism. However, what Williams denies is that ethical sentences 'can be true or false *nonperspectively*'. Thus the position Williams defends has been renamed: instead of "noncognitivism" it is called "relativism".' (2002, p. 41)

Hand in hand with a relativist approach to values, Williams and those like him have a fundamentalist approach to facts. This is that the ultimate facts Walsh mentions are those expressed in the language of physics. Where this language gets us in the social sciences, or in navigating our respective ways through the problems of daily life, is anyone's guess. Some very real (factual) and important things simply get lost in descriptions that try to factor out the social and a fortiori ethical world we inhabit. Try, for instance, to convey the horror of war in the language of physics. You will not remotely be able to achieve the task without using value words descriptively. Horror is just one such word.

## Formal statement of objections to the NOFIA

What then are the formal arguments against the NOFIA (whether it concerns ends or means)? I will present seven and relate them to the alpha-numerical outline of the NOFIA above. The objections are:

- O1 The NOFIA presents an impoverished and reductionist view of facts and values (re all Fs and Vs):
  - O1.1 Descriptions of the world can state values and not just facts, such as 'Paula is cruel' or 'to do x and y in circumstances z is murder' (F1, V1);
  - O1.2 Facts and values are entangled, and decomposition of fact-value terms is wrongly eliminative: i.e. it eliminates essential features of the object to which the term refers (F1.2, V1.2);
  - O1.3 Facts and values can both provide cognitive material, which is to say that they are objects of thought, inference, reason and may be judged true or false etc. (F1.1, V1.1);
  - O1.4 Some facts, like values, are abstract entities irreducible to experiences expressible in concrete physical terms (F1.2, V1.2);
- O2 Some factual events or states of affairs (of the rule, command, commitment, promise and principle kind) create desire (value) independent reasons for action that in themselves imply imperatives (D1, C1);

- O3 A commitment to truth, as a supervening epistemic value, permits values to be deduced from facts in arguments employing explanatory critique (C1); and
- O4 The form of the NOFIA is false because ‘ought’ judgements in moral, practical reasoning are analogically ‘abductive’ (to use Charles Sanders Pierce’s term) not deductive or, for that matter, inductive (D1.1).

It is important to recognise that all but O4 of these objections do not concern the form of the NOFIA. They are about its content. There is a very sound reason for this. It is to emphasise that premise D1.2, the principle of conservation (‘whatever exists in the conclusion must exist in the premises’), if treated as a mere rule of logic, gives only trivial results at best. At worst it is no proof at all. John Searle makes this argument very strongly in his *Rationality in Action*, stressing that logical ‘validity does not derive from the rules of logic ... in real-life reasoning it is the semantic content that guarantees the validity of the inference, not the *syntactical rule*’ (2001, pp. 19-21). In other words, using the modus ponens again, only if the statements permit the inference will the statement be valid. Any nonsense can be made to fit the modus ponens form. Putnam comments similarly that the NOFIA:

*... turns not on any feature of the form of the statement but rather on an understanding of its content. Nor did Hume himself (or any of his readers) understand the claim as one about the canons of formal inference. Rather, Hume assumed a metaphysical dichotomy between ‘matters of fact’ and ‘relations of ideas’ ... What Hume meant was that when an ‘is’ judgement describes a ‘matter of fact’ then no ‘ought’ judgement can be derived from it. Hume’s metaphysics of ‘matters of fact’ constitutes the whole ground of the alleged underivability of ‘oughts’ from ‘ises’. (2002, pp. 14-15)*

Therefore it is appropriate to concentrate on the content of the NOFIA: its metaphysics, as it were. We can be clearer about its substantive grounds if we do so. We can also say that it fails if any of its particular grounds are incoherent (i.e. such as covered by objections O1.1-1.4 and O2) or if general objections are successful (O3 and O4). Grounds fail and objections are successful if instances either fail or succeed, respectively.

## Searle’s ‘How to Derive “Ought” From “Is”’

I will discuss O2 in this section and then move on to consider O4 and O3 in that order. In 1964 John Searle published ‘How to derive “ought” from “is”’ in the *Philosophical Review* (1964, pp. 43-58; 1967 [1964], pp. 101-14). While I will take some liberties with Searle’s argument my presentation is faithful to his intent. In essence it is an argument from performative utterance, namely that to utter certain words actually creates or performs the act in question. No additional conditions need to be satisfied for the act to have been performed in fact.

For instance, to say to a waiter in a coffee shop ‘please get me a coffee’ is to perform the act of requesting coffee. It is, more formally, to order coffee: i.e. to perform the act of ordering. In contrast for the waiter to say ‘I get you a coffee’ is not, in fact, to get a coffee. The difference between the two statements is reflected in the awkward grammar of the second. We need a different form of the verb in order to make sense of it. ‘I will get you a coffee’ or ‘I got you a coffee’ are statements we can understand. Correcting the grammar amounts to inserting a condition of factual verification or falsification into each statement. In Searle’s terminology, we have changed the verb to create ‘conditions of satisfaction’ of the proposition, statement or sentence. That is, it might or might not be true that the waiter will get or got the coffee. In any case neither statement in itself constitutes the act of making coffee in the way that performing the speech act ‘Please get me a coffee’ constitutes the act of making an order or a request.

With an understanding of performatives we can better appreciate Searle’s argument. The particular example he uses is the statement of fact that ‘Jones uttered the words “I hereby promise to pay you,

Smith, five dollars”<sup>4</sup>. Intentional acts such as promising, making contracts and so on create constitutive obligations. That is, they constitute or entail obligations merely by becoming facts. To make a promise by stating it (an ‘is’), other things being equal, is to create an obligation (an ‘ought’). This obligation exists whether or not the promise is honoured. We do not need an additional value statement such as ‘Promises ought to be honoured’ in order to create the obligation. The reason is that the commitment (the ‘ought’) exists independently of its conditions of satisfaction.

Just as we can readily understand the notion of an unsatisfied order or request for a coffee we can understand the fact of an unfulfilled promise to make us one. That is, the ‘ought’ is entailed in the promise itself not in its execution or in a meta-statement that ‘the execution ought to be executed’. Indeed were the latter to be true we would get an infinite regress: that ‘the execution ought to be executed’ ought to be executed, and so on. In short just to promise is to perform an act of commitment. An act of commitment is an ‘ought’.

Note that performative mis-statement is covered by the *ceteris paribus* clause. To declare falsely ‘I promise to tell the truth, the whole truth and nothing but the truth’ in a Nazi court arguably would create no obligation, if to be truthful would condemn Jewish, social democrat and communist acquaintances to the camps. I distinguish such instances from those in which it is manifestly necessary to break a promise because observing another conflicting moral principle is more important. A doctor is right, other things being equal, to break a promise to take her son to a rock concert in order to save the life of a patient. ‘Other things being equal’ here might include ‘unless an equally competent practitioner were on hand to save the patient and the doctor volunteered merely to avoid the loud music’. In any case the doctor had an obligation and broke it, irrespective of whether or not she was right to do so.

Significantly, because of their public character, which is inherent in their being spoken or written in a language, we invest many performatives with social, normative and ethical status. Some, in Searle’s vocabulary, become ‘institutional facts’ that often entail binding commitments. Therefore to state a fact, such as ‘Earlier this week I promised that I would finish a paper and bring along 25 copies to the History of Economic Thought Society of Australian Conference’, is sufficient for me to acquire the obligation that ‘I ought to finish this paper and bring along 25 copies’. In that peculiar part of the social world inhabited by academics, operating as it does under its own sub-set of social and institutional norms, a promise to ‘deliver a paper’ attracts certain rights and obligations. The rejoinder that my promise already contained a ‘valuey’ word that implies an ‘ought’, namely ‘promise’, is precisely the point. It is gratuitous to add another clause that says something like ‘promises ought to be kept’, because the mere fact that I promised is what creates the commitment to honour that promise. In the academic world my commitment attracts additional institutional status.

Note that for the ‘Searle’ and ‘conference paper’ arguments to hold deductively it is entirely sufficient that I promised to complete this paper and that Jones promised to pay Smith five dollars. The ‘ought’ conclusions make specific in each case the general statement that promises entail commitments. Note also that, while the words ‘promises’ and ‘commitments’ are ethical words, the general statement ‘promises entail commitments’ is, to my mind, neither a value judgement nor a tautology. It is a factual statement of the meaning of the word promise. Moreover that Jones and I promised are facts entailing commitments irrespective of our subsequent desires: me, as I type while I have a pounding headache, and Jones as he squanders his means of repayment in a slot machine and utters a torrent of expletives, including ‘damn you Smith, I take it all back!’

Perhaps I should let Searle speak for himself, for the following quotation will be useful later when we discuss explanatory critiques:

*... the ability to perform speech acts ... [contains] the potential for desire-independent reasons for action, indeed it inevitably has the requirement of desire-independent reasons for action, because just about every speech act involves a commitment of some kind or other. The famous examples are speech acts like promising, where the speaker is committed to carrying out a future course of action, but asserting commits the speaker to the truth of the proposition asserted, and orders commit the speaker to the belief that the person to whom he*

*or she gives the order is able to do it, to the desire that he or she should do it, and to permitting the hearer to do it ... The bizarre feature of our intellectual tradition, according to which no set of true statements describing how things are in the world can ever logically imply a statement about how they ought to be, is that the terminology in which the thesis is stated refutes the thesis. Thus, for example, to say that something is true is already to say that you ought to believe it, that other things being equal, you ought not to deny it. (2001, pp. 147-48; see also pp. 29, 182-83)*

This just touches the surface of Searle's arguments. For example, Searle's purpose above has not been to suggest that the deductive model is appropriate. Rather he uses it to point out problems with the NOFIA model (1967 [1964], p. 102 n. 1). Indeed Searle thinks that there cannot be a deductive model of practical reason (2001, chapter 8). Here I can only point readers to a number of recent works (see e.g. Searle 2001, 1999, 1997, 1995).

Similarly to substantiate my objection at O4 – namely that the form of the NOFIA is false because 'ought' judgements in moral or practical reasoning are analogically 'abductive' (to use Charles Sanders Pierce's term) not deductive or, for that matter, inductive – would require much more space than I have. It is a case in which saying less is likely to be clearer, so I ought to say less, save to quote Pierce briefly:

*[Induction] can never originate any idea whatever. No more can deduction. All the ideas of science come to it by the way of Abduction. Abduction consists in studying the facts and devising a theory to explain them. Its only justification is that if we are ever to understand things at all, it must be in this way. (1867, vol. 5, par. 145; see Lawson 1997, p. 294 n. 14)*

Nevertheless let me touch on the subject by opening with these questions: Does your ethical thinking and practical reasoning follow a logically valid deductive form? Is it of the kind referred to above that sequesters oughts from facts and proceeds to deduce imperatives from antecedent moral principles alone? If you are like me and find this account intuitively false, you will still be likely to need more meaty argument. Thus I offer the following brief reasons:

*O4.1* To use the word 'abductive' in this context is analogical. In theoretical and scientific reasoning, 'abduction' means that we opt for the explanation that might best explain the facts ('inference to the best explanation'). To do so a scientist would consider the facts and 'draw heavily' on pre-existing theories, experiences, beliefs and perspectives (Lawson 1997, p. 212). Analogically we can say that we make our practical moral decisions in ways that best fit the circumstances. In doing so, we appraise both the facts and our moral thoughts and sensibilities. First, in applying moral principles, we have to analyse the circumstances to see whether they apply in fact. Second, and this is much more common, we operate in circumstances in which moral principles and attitudes conflict and in which the facts are complex. In other words we operate in open systems. We are forced to weigh evidence, see whether this or that principle applies and engage in critical argument with ourselves and with others. 'The arguments from facts to values are more like evidential or scientific arguments than deductive arguments – unsurprisingly, for values exist in open systems, and value-judgements are normic, always (or almost always) holding *other things being equal*.' (Collier 1994, p. 170; see also Collier 1998 and Searle 2001, pp. 253-54)

*O4.2* In real life we do not have the luxury of *ceteris paribus* to absolve us of decision making responsibility. Relying on strict observance of moral principles as moral rules – as, perhaps, in extreme forms of deontological ethics that privilege certain rules over others – in effect imposes a form of closure on the open systems in which we operate. Only in a closed system that avoids O4.1 type problems might a deductive argument apply strictly. Similarly Searle's argument above regarding commitments, if interpreted strictly and without a *ceteris paribus* clause, imposes closure.

*O4.3* 'There are few such "moral principles", at least fewer than one might expect. Their form is "X is right (or wrong)" or "X ought (or ought not) be done" ... Of course we can judge an unlimited number of actions right or wrong if we state the relevant facts of the situations in which they are performed. Without that the act may or may not be right. What we mean by saying that the act may or may not be

right is that its rightness depends on the relevant facts of the situation in which they are performed.’ (Kovesi 1967, p. 104) Kovesi goes on to explain that the fact that we do have moral conflicts and dilemmas means that we have to have reasons for our judgements. This ‘illustrates the fact that moral reasoning is not deductive ...’ (Kovesi 1967, p. 114).

In each of the above points we can see that facts play a very active role. Indeed value terms such as murder describe facts: indeed value terms are abstractions constituted by but not reducible to the facts they describe. Fact-value entanglement is only part of the story. Fact dependence of values is the other. To make this point I will summarise O4.1-O4.3 somewhat differently. For this it will be sufficient to consider an additional practical question: What accounts for the fact that in our practical moral deliberations we are, in effect, always asking ourselves ‘why’ about the ‘ought’ statements?

The answer to this question is straightforward. Contra both Hume and the particular rule following ‘rationalists’ against whom he appeared to be arguing there is a need to justify our actions with reasons. Our actions are not derivatives of disposition, nor are they deductions from pure reason. Moreover our actions must be justified in a particular way: they cry out for reasons based on factual grounds. We ask ‘why?’ when we are told we ought to follow a certain moral principle because we first must judge whether the principle is apposite to the facts of the situation. We ask ‘why?’ because the facts will often be prescriptively unique, in the sense that they will constitute states of affairs and events that are, by analogy with antecedents, qualitatively different and distinct.

Of course, this is to say more than merely to acknowledge that every new set of facts will be unique. We never step into the same river twice, as Heraclitus is supposed to have said. In contrast to prescriptively unique situations some circumstances will be analogically of a kind with antecedents such that it is appropriate to apply a given moral principle or principles. Yet the question will always be the same, ‘why?’ How are we to know one way or the other? The answer is that we must be able to describe the facts in a sufficiently complete way in order to be able to make a judgement whether the situation is analogically of a kind or is prescriptively unique.

Clearly, in prescriptively unique situations, we ask more than just why a given principle is applicable or not. Here we must work out what to do, or what to prescribe, in the face of facts that challenge existing moral notions. Given principles might not apply, apply only partly or apply inadequately. Such situations are exponentially more complex because existing principles may conflict and conflict with developing notions. We must reason our way out of these dilemmas, which are themselves fact dependent: i.e. the new terrain of facts on which we find ourselves has created them. This tells us also that even complete moral notions that have become moral principles are never strictly *a priori*, however long they may have been with us. They have histories and origins in the world we inhabit. That such principles have the power to affect our actions attests to their vivacity and their relevance to the world we inhabit. Irrelevant moral notions wither. The test of relevance is essentially factual (Kovesi 1967, *passim*).

To conclude this section I will say a few words on why John Searle argues that there can be no deductive logic of practical reason. As above I will label this objection:

*O4.4* Unlike ‘theoretical reason’, which is about beliefs, practical reason does not and cannot provide an entailment relation between the premises and the conclusion(s) of a deductive argument. There is a ‘gap’ between premises and conclusion. We may choose to act otherwise than a valid argument suggests we ought to act. A ‘person with a desire is not committed to the satisfaction of that desire in the same way that a person who holds a belief is committed to the truth of the belief’ (Searle 2001, p. 266-67). Similarly ‘a person who has an intention is not committed to intending to achieve all of the consequences of the achievement’ of her or his intention (2001, p. 267).

Partly this is because our practical reasoning occurs in open systems. Alternative premises exist and conflict, as do alternative actions. Partly it is to do with the problem of ‘akrasia’, or weakness of will, and no amount of logic can entail that we will act under its direction (see also Putnam 2002, pp. 43,

71). Searle's argument is convincing (2001, chapter 8), and it further undermines the NOFIA because it removes its deductive structure.

## **Explanatory Critique: Truth as Supervening Epistemic Value**

This final section will explore the objection to the NOFIA depicted at O3 above, namely that a commitment to truth, as a supervening epistemic value, permits values to be deduced from facts in arguments employing explanatory critique. This means of overcoming the fact-value dichotomy comes principally from the work of Roy Bhaskar, though there are antecedents in the work of Marx and Maurice Dobb in economics (see esp. Dobb 1973, chapter 1). Bhaskar's argument from critique is in various works by himself, his collaborator Andrew Collier and others from the critical realist school. In addition some critical realist writing can be opaque and rely upon an esoteric vocabulary. Therefore I will draw from the clearer expositions, which can be found in Archer et al. (1998).

An explanatory critique starts by observing a set of prevailing ideas or ideas that tend to be dominant in society. In the process of studying these ideas we necessarily study what the ideas or theories refer to or are about. In the following the 'transitive dimension of knowledge' (i.e. knowledge, belief or theory) refers to or is about 'the intransitive dimension of knowledge' (i.e. the world of experiences, actual events and states of affairs and the underlying mechanisms that generate them). The last point can be stated forcefully in reverse and applied to the study of society: to study society (the intransitive dimension) will necessarily involve studying the intransitive dimension (theories, knowledge and beliefs). This follows necessarily because we approach the world through the body of pre-existing language, concepts, beliefs and theory.

This, of course, does not warrant the extreme epistemic relativist conclusion that theories ipso facto are incommensurable and that no rational basis exists for choosing one theory ahead of another. It makes no sense to think that theories about different external subject matters will conflict. However, it is equally hard to imagine that theories that do clash, and thus are about something similar, do not have some common referents with at least some common or translatable empirical dimensions (irrespective of their different languages). At the very minimum it is rational to choose the theory that explains more of the empirical evidence more adequately. Post Keynesian and neoclassical economic theories, for example, do compete because they have something to compete about and against which their empirical adequacy can be evaluated and compared. Against Freud's theory of infantile sexuality both are truly incommensurable.

Now three possibilities present themselves, perhaps in order of their immediacy. First a set or subset of important prevailing ideas may be especially causally influential in shaping society or, at least, a significant part of it. We know that social scientific theories become part of their own object (society) and have reciprocal causal interactions with it. Thus the supposed 'crisis of Keynesianism' of the late 1960s to early 1970s gave sustenance to market liberal theoretical views such as those of Friedrich von Hayek and Milton Friedman. These theories in turn were influential in shaping the small government agenda in various countries, the consequences of which we now see in decentralised labour markets, privatised public services and infrastructure and fiscal conservatism.

Second studying ideas (ideologies) and society can expose how aspects of society necessarily depend for their reproduction on forms of false consciousness (or fetishism, to use Marx's term). That is, a set of false beliefs, if exposed as false, would also expose the aspects of society they concern and the wider society itself to criticism. This criticism consequently would lay the foundation for transformation of society or aspects of it. Were it shown that property right, as understood in British common and statutory law, were neither part of the natural order nor necessary for, say, democratic rights to be exercised, then public ownership of essential economic resources may well become a realistic proposition. The obverse (negative or absence) of this second possibility constitutes the third possibility. If it is possible to demonstrate that false ideas actually prevent transformation of the aspects of society to which they refer then those ideas can be said to affect this aspect of society by reinforcing it, buttressing it and absenting it from change.

Given all that has been said above about the interdependence of ideas and their external objects, the fact that we can or have expose(ed) the falsity of ideas and explain(ed) their function as ideology means that we also necessarily criticise society. This is the essence of explanatory critique. In addition a further move is implied. If the dominant set of ideas about society is false, and society itself is thereby found wanting, then critique must suggest that society be transformed to remedy what is wrong about it. Thus, from facts about ideas and society ('is') a value ('ought') has been derived. The argument from facts to values is grounded entirely in the factual accuracy of the explanatory critique. From the fact that ideas about society are shown to be wrong, and because these false ideas and beliefs are interdependent with society itself, then society should be transformed accordingly.

Now this takes us to the heart of the argument, which I will summarise in the phrase 'the prescriptive force of truth'. It recalls the quotation from Searle (2001, pp. 147-48) above. In the words of Bhaskar and Collier:

*It might be said that the view that one ought to believe what is true is a value judgement. In one sense it is – it clearly has prescriptive force. But it is not an optional value judgement ... it makes no sense to say 'that is true, but I do not believe it' ... So to be induced to believe something which is false does not just often cause other harm, it always is harm. Not of course by any means necessarily the worst harm that can befall a person, but harm none the less ... The theory of explanatory critiques is very far-reaching philosophically. Once we have a single valid fact-to-value (or is-to-ought) argument, the claim that such arguments are necessary fallacious falls, and the motive for resisting other sorts of fact-to-value argument is removed. Arguments from the conditions of human flourishing (one might add: not only human flourishing) come into their own. (1998, pp. 387–89)*

The conclusion Bhaskar and Collier draw from the power of explanatory critique is 'the possibility of extending realism into the realm of values and morality, finding an "intransitive dimension" underlying moral thought and moral change' that parallels the intransitive (real) dimension underlying 'scientific thought and scientific change'. Their aim is to reinforce 'a moral realism which is naturalistic in the sense that it does not look for real values in a Platonic world of ideas or a Kantian world of Noumena, but in the real world which we all inhabit' (1998, pp. 387–89).

At this point I wish to raise a problem I see in the way Bhaskar and Collier have argued their case. If we recall the three possibilities presented earlier showing how ideas and society are interdependent, we can note that Bhaskar and Collier hang their argument on the latter two. More precisely they stress the ability of society necessarily to generate false ideas as well as to depend on this process. This narrows their argument and seems to make its supports potentially a bit thin. It is sufficient in my view that society and false ideas are causally interdependent, from the level of our daily activity to the realm of social theory and practice. Therefore if the reproduction of existing social relations can be shown to depend on the false ideas, the falsity of these ideas implies a need to change society accordingly.

A related problem is whether it is possible that societies can indeed generate false consciousness *necessarily*. We can show that society can depend on false consciousness necessarily, but this is not the same as saying that it generates false consciousness necessarily. What it generates is the appearance upon which false consciousness depends. Consciousness is false in so far as our ideas do not correspond with the reality of social relations. The role of explanatory critique is intimately bound up with exposing (refuting) the way society often appears on the surface. It does this by exposing (revealing) the reality underlying how things appear. In the process we show that false consciousness is not necessary, though the appearance on which it depends might well be for the existing social relations to continue.

This distinction can be illustrated using a number of familiar appearance-reality contradictions. Perhaps the most common of these is the appearance that the Sun travels across the Earth's sky, rising and then setting. We may even infer from this appearance that the Sun orbits the Earth. Of course, we know that this is not true. However, neither in this nor other cases of appearance-reality contradiction do the real structures or relations of reality actually generate mistaken thoughts or theories. Rather, they generate an outward appearance to us: seen from our inadequate or flawed physical or intellectual perspective.



This appearance can be entirely misleading, but it is we who do the ‘work’ in perceiving, in generating the perception. Similarly it is the work of humans that takes social appearances, such as the appearance of a free exchange between equal individual parties in labour markets, to be the limit of knowledge. This then becomes theory and contributes to the set of false beliefs about society (some of which are institutionalised in legal statute and judge-made law) that comprise its ideology.

I also wish to raise another problem. Critical realists tend to overstate the case for the originality of their approach to explanatory critique. I have already mentioned Marx (as do they) and Maurice Dobb. The latter’s *Theories of Value and Distribution Since Adam Smith: Ideology and Economic Theory* (1973, esp. chapter 2) explores the roles of fact, value, concept and abstraction in economic thought and foreshadows forms of explanatory critique. Amartya Sen (1987) remarks that Dobb’s work is thick with ‘rich description’, which captures essential features of the world and its events in factual yet evocatively moral ways. Sen also offers fascinating insights into the question of ‘Positional objectivity’ (2002 [1990], chapter 15; see also Putnam (2002) and Walsh (2000) on Sen and Dobb). Sen’s essay, published in the recent collection *Rationality and Freedom*, considers ideas such as those in the preceding two paragraphs and approaches a subject that looks suspiciously akin to explanatory critique.

## Conclusion

This paper has explained why the traditional fact/value, positive/normative and descriptive/evaluative dichotomies maintained by the ‘positivist’ approach are false. This approach has impoverished both ethics and (social) science as a result. The main reason, as the paper has attempted to demonstrate, is that the fundamental principle underlying the dichotomies, which is the formally structured argument that a value (ought) cannot logically be derived from a fact (is), is wrong. The paper also offers reasons to think that a moral realism, of a kind that combines facts and values in a common factually-grounded enterprise, is possible.

## References

- Archer, M, Bhaskar, R, Collier, A, Lawson, T & Norrie, A 1998, *Critical Realism: Essential Readings*, Routledge, London.
- Aristotle 1985, *Nicomachean Ethics*, trans. T. Irwin, Hackett Publishing Company, Indianapolis.
- Bhaskar, R 1998, *Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences*, Routledge, London.
- \_\_\_\_ 1994, *Plato Etc.: The Problems of Philosophy and Their Resolution*, Verso, London.
- Bhaskar, R & Collier A 1998, ‘Introduction: Explanatory critiques’, in M Archer, R Bhaskar, A Collier, T Lawson & A Norrie eds, *Critical Realism: Essential Readings*, Routledge, London.
- Collier, A 1998, ‘Explanation and emancipation’, in M Archer, R Bhaskar, A Collier, T Lawson & A Norrie eds, *Critical Realism: Essential Readings*, Routledge, London.
- \_\_\_\_ 1994, *Critical Realism: An Introduction to Roy Bhaskar’s Philosophy*, Verso, London.
- Dobb, M 1973, *Theories of Value and Distribution Since Adam Smith*, Cambridge University Press, Cambridge UK.
- Foot, P, ed. 1967 [1958-59], *Theories of Ethics*, Oxford Readings in Philosophy, Oxford University Press, Oxford.
- Friedman, M 1953, ‘The methodology of positive economics’, in M Friedman, *Essays in Positive Economics*, University of Chicago Press, Chicago.
- Hayek, FA 1960, *The Constitution of Liberty*, Gateway Editions, South Bend, Indiana.
- Hume, D 1739-40, *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects*, 3 vols, 1748, *An Enquiry Concerning Human Understanding*, 1751, *An Enquiry Concerning the Principles of Morals*, various edns, see e.g. ‘Bibliography’, in D Fate Norton 1993, *The Cambridge Companion to Hume*, Cambridge University Press, Cambridge UK, pp. 357-59.
- Kovesi, J 1967, *Moral Notions*, Routledge & Kegan Paul, London.

- Kuhn T 1996 [1962], *The Structure of Scientific Revolutions*, 3<sup>rd</sup> edn, University of Chicago Press, Chicago.
- \_\_\_\_ 1957, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, Random House, New York.
- Lawson, T 1997, *Economics and Reality*, Routledge, London.
- MacIntyre, A 1966 [1959], 'Hume on "Is" and "Ought"', in VC Chappell, ed., *Hume: A Collection of Critical Essays*, Anchor Books, New York, pp. 240-64.
- Nussbaum, MC 2001, *Upheavals of Thought: The Intelligence of Emotions*, Cambridge University Press, Cambridge UK.
- \_\_\_\_ 2000, *Women and Human Development: The Capabilities Approach*, Cambridge University Press, Cambridge UK.
- \_\_\_\_ 1999, *Sex and Social Justice*, Oxford University Press, New York.
- \_\_\_\_ 1993, 'Non-relative virtues: An Aristotelian approach', in NC Nussbaum & A Sen eds 1993, *The Quality of Life*, Oxford University Press, Oxford.
- Nussbaum, MC & Sen, A eds 1993, *The Quality of Life*, Oxford University Press, Oxford.
- Parsons, T 1964 [1947], 'Introduction', M Weber, *The Theory of Social and Economic Organization*, ed. T Parsons, trans. AM Henderson, The Free Press, New York.
- Pierce CS 1867, *Collected Papers of Charles Sanders Pierce*, C Hartshorne & P Weiss eds 1931-35, vols 1-6, Harvard University Press, Cambridge USA.
- Popper K 1948, 'What can logic do for philosophy?' *Aristotelian Society Proceedings*, supplementary vol. xxii.
- Putnam, H 2002, *The Collapse of the Fact/Value Dichotomy and Other Essays*, Harvard University Press, Cambridge USA.
- \_\_\_\_ 1993, 'Objectivity and the science-ethics distinction', in A Sen & MC Nussbaum eds 1993, *The Quality of Life*, Clarendon Press, Oxford.
- Searle, JR 2001, *Rationality in Action*, Bradford, MIT Press, Cambridge USA.
- \_\_\_\_ 1999, *Mind, Language and Society: Philosophy in the Real World*, Phoenix, Weidenfeld & Nicholson, London.
- \_\_\_\_ 1995, *The Construction of Social Reality*, The Free Press, New York.
- \_\_\_\_ 1967 [1964], 'How to derive "ought" from "is"', in P Foot ed. 1967 [1958-59], *Theories of Ethics*, Oxford Readings in Philosophy, Oxford University Press, Oxford, pp. 101-14 (originally in the *Philosophical Review* (1964, pp. 43-58).
- Sen, A 2002 [1990], 'Positional objectivity', in *Rationality and Freedom*, Harvard University Press, Cambridge USA.
- \_\_\_\_ 1999, *Development as Freedom*, Random House, New York.
- \_\_\_\_ 1993, 'Capability and well-being', in A Sen & MC Nussbaum eds 1993, *The Quality of Life*, Clarendon Press, Oxford.
- \_\_\_\_ 1987, 'Maurice Herbert Dobb', in J Eatwell, M Milgate & P Newman eds, *The New Palgrave: A Dictionary of Economics*, Macmillan, London.
- \_\_\_\_ 1982 [1980], 'Description as choice', in A Sen, *Choice, Welfare and Measurement*, Oxford University Press, Oxford.
- Walsh, V 2000, 'Smith after Sen', *Review of Political Economy*, vol. 12, no. 1, January, pp. 5-25.

# Corporate Governance in State-Controlled Enterprises

Xinting Jia

Victoria University, Australia

---

## Abstract

*This paper is an international comparison of corporate governance in state controlled enterprises, focusing on corporate governance in Telstra in Australia and China Telecom in China. By comparing and contrasting corporate governance in these two companies, this article explored corporate governance practices and mechanisms in partially listed state controlled enterprises under dramatically different socio-economic environments manifested in China and Australia. This article also explored the role of the Australian government and the role of the Chinese government in Telstra and China Telecom respectively and shed some lights on the underlying forces that have, up to date, shaped the governance of partially listed state controlled enterprises in China and Australia..*

## Introduction

A privatisation wave swept through Australia and China in the 1980s for vastly different reasons. In Australia's case, the sale of public assets was mainly influenced by the international privatisation trend in the 1980s (Ranald, 1996: 97); this trend began in 1986 and escalated during the late 1990s (APS Commission, 2003: 128). In China's case, partial privatisation of state-owned enterprises has been the core part of its mega economic and enterprise reform since the "open door" policy was adopted in 1978. Corporate governance in state controlled enterprises becomes more complicated after their partial privatisation. To help us understand the governance of those partially listed state controlled enterprises, this article explored corporate governance in Telstra and China Telecom under the vastly different socio-economic contexts of Australia and China respectively.

## Background

### The Case of Australia

Government Business Enterprises (GBEs) play an important role in the Australian Economy. For example, in the year of 1988-1989, they contributed 10% to the gross domestic product (GDP) and 6% to total employment (Economic Planning Advisory Council, 1990) in Australia. In the 1980s, a privatisation trend swept the world's most developed countries such as the UK, France, Italy and Japan (Clarke, 1994: 1) and in the late 1980s, Australia joined others to pursue privatisation as a way of

Copyright © 2006 Victoria University. This document has been published as part of the Journal of Business Systems, Governance and Ethics in both online and print formats. Educational and non-profit institutions are granted a non-exclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the

improving the financial performance of its public sector (Browne, 1993). Furthermore, in the earlier 1990s, privatisation was proposed as one way to increase competitiveness and productivity in Australia. The government also realised that the conflict of interests for a GBE to be both the regulator as well as a player in the market. The Hilmer Committee (1993: 217) suggested that the key to increased efficiency came from privatisation and that it was therefore necessary to separate the regulatory function from the commercial function of a GBE.

After the privatisation of the Commonwealth Bank, Qantas and Australian National Railways etc. by the Federal government, and the gas and electricity companies such as PowerCor, and CityPower by the state governments in the earlier 1990s (Fairbrother et al., 1997), the privatisation of Telstra was finally on the agenda. In fact, the privatisation of the telecommunications industry was also closely related to deregulation. It was argued that the national competition policy should include reforming the regulations that unjustifiably restricted competition in the telecommunications industry (The Hilmer Committee, 1993: xvii).

As part of the deregulation of the telecom sector in Australia, the regulatory function of Telecom Australia (predecessor of Telstra) was transferred to an independent regulator – Australian Telecommunications Authority (AUSTEL) in 1989 (The Hilmer Committee, 1993). According to the Australian Communications Authority Act 1997, AUSTEL merged with the Spectrum Management Agency (SMA) to become the Australian Communications Authority (ACA) on 1 July 1997. The promulgation of the Australian Communications and Media Authority Act 2005 on 1 July 2005 marked the official merging of ACA and the Australian Broadcasting Authority (ABA) to form the Australian Communications and Media Authority (ACMA).

## **The Case of China**

Since the ‘open door’ policy was adopted in China in 1978, the economy in China has gradually transformed from a socialist economy to the so-called ‘socialist-market economy’. The corporatisation and partial privatisation of the Telecommunications industry in China is part of its mega economic and enterprise reform which has been carried out in China since then.

The telecommunications industry in China was traditionally directly managed under the monopoly of the former Ministry of Postal & Telecommunications (MPT). It has long been perceived as one of the industries with strategic and military importance by the government (Pitt et al., 1996: 350). Perhaps because of this, the economic reform in the telecommunications industry has attracted a lot of controversy.

In the late 1980s and the earlier 1990s, there were often two different voices in the debate about reforming the telecom sector in China. The pro-reform clan argued that opening competition in the telecommunications industry would boost economic development and increase efficiency in China, especially in an information age, when China’s telecommunications industry was developing at an astonishing speed, accompanied by an exponential increase of sales and profit. On the other hand, the con group suggested that more competition would be detrimental to the government’s interest in reigning in the telecommunications industry; less government control could become a strategic disadvantage for the whole country. Not surprisingly, a lot of the resistance against the reform came from within the former MPT, as more competition would result in the loss of its highly lucrative monopoly power (Tan, 1994).

In 1998, MPT was also under reconstruction following the government’s massive plan to reform its ministries and spin off commercial activities associated with them as separate enterprises. This process sought to ensure that spun-off enterprises could eventually seek listing in the stock markets (Chen, 1998). In March 1998, the MPT merged with the Ministry of Electronic Industry (MEI) to become the Ministry of Information Industry (MII) (Zhang, 2000: 10); the management function of the MPT directly relating to the postal management was separated and managed under a newly established government department – State Post Bureau (under the MII).

## **Corporate governance in Telstra vs. China Telecom**

### **The Case of Telstra**

Telstra's history can be traced back to 1901, when the Postmaster-General's Department (PMG) was established to manage all domestic telephone, telegraph and postal services (Senate Environment Recreation Communications and the Arts References Committee, 1996b: 23). During its long history, Telstra was also transformed and renamed several times, including Telecom Australia, the Australian and Overseas Telecommunications Corporation and as Telstra since 1993 (Telstra, 2005). Telstra lost its monopoly power in the market when, in 1991, Optus was introduced into the long distance and mobile phone market (Australia Industry Commission, 1995: 142). In 1993, a third license was awarded to Vodaphone (Australia Industry Commission, 1995: 142). Since then, a few other competitors gained access to the Australian market to operate in data, fixed line and mobile areas. Overall, the Australian telecommunications market has indeed become one of the most open telecommunications market in the world (Barton and Teicher, 2000: 6).

### **Ownership Structure**

The predecessor of Telstra, Telecom Australia, was corporatised as a government owned corporation in 1975 (Australian Public Service Commission, 2003: 212). The corporatisation process involved creating a legal structure for the enterprise in the form of a company with the government being the shareholder (Browne, 1993: 477). After being directly owned and managed by the government for more than 90 years, in 1997 Telstra was partially privatised, with 1/3 of its shares sold to the public. The partial sale was finally achieved after lengthy debate among the public as well as among the major political parties. A further 16.6% of Telstra's shares were sold to the public in 1999, with government controlling 50.1% of its shares (Telstra, 2005). The 50.1% is also the minimum requirement of the government ownership required by law (Australian Government Attorney-General's Department, 2005). Currently, the government shareholder's role is represented jointly by the Minister for Communications, Information Technology and the Arts and the Minister for Finance and Administration (Department of Communications Information Technology and the Arts, 2005).

### **The Role of the Government**

The role of the government in the governance of Telstra changed gradually after it was privatised in 1997. Rather than directly managing Telstra, currently, the government only oversees the proper management of Telstra to insure public interests have been served (Australian Government Attorney-General's Department, 2005). As Telstra is still a partially privatised GBE, its board has the obligation to report to government on various issues as listed in Telstra Corporations Act 1991. For example, the board of Telstra must keep the Minister informed of its financial status, corporation plan and any other significant issues (Australian Government Attorney-General's Department, 2005). The responsible Minister, after consultation with the board may also give directions to Telstra to serve the public interest (Australian Government Attorney-General's Department, 2005).

### **The Board and the Management**

The Telstra Corporation Act 1991 clearly stipulates some general requirements for appointment as a director of Telstra. For example, the chairperson of Telstra's board must be an Australian citizen, a majority of directors must be Australian citizens, and at least 2 directors must have knowledge of, or experience in, the communication needs of regional areas (Australian Government Attorney-General's Department, 2005: 40).

Telstra's annual report 2004 illustrated that apart from Telstra's CEO, who was also a director, its board was composed primarily of non-executive and independent directors. As a majority shareholder, the government did not directly appoint any government officials to the board. In fact, as suggested by Dawkins (1986: 2), most of the boards of government trading enterprises have long been dominated by private businessmen. Technically, the government still remained in control by appointing directors to the

board with its majority shareholding. In regards to the composition of its senior management team, all the nine senior executives were private businessmen with extensive commercial experience.

### **Interests of other Stakeholders**

Apart from the shareholders, the board, the management, and the government, there are also other major stakeholders in Telstra, such as customers, employees, creditors and suppliers. The two most important groups among them are probably customers especially the rural communities and employees, whose interests are also closely related to the governance of Telstra. Clearly one of the main arguments to keep Telstra as a government controlled entity is its responsibility to fulfil Community Service Obligations (CSO), such as providing universal services including to the rural community at affordable prices (Dawkins, 1986: 4). This point has recently been re-emphasised by the former national party leader – Mr John Anderson (Wardill, 2005).

Another group of stakeholders are employees of Telstra, who are concerned that their interests will not be taken care of during the privatisation process. After all, the sale of Telstra is always political as well as sentimental. The job losses of employees has been one of the major public concerns of Telstra's privatisation (Senate Environment Recreation Communications and the Arts References Committee, 1996a: 1579, 1587, 1611). Official data showed that in the period of total two years ending 30 June 1998, staff numbers were reduced by more than 20 thousand (Prior, 1998: 61).

Despite some of the criticism of Telstra's management of stakeholders' interests, according to a global survey conducted by the Governance Metrics International (CCH, 2005), Telstra's governance was actually rated significantly higher than average for Australian companies in terms of criterion such as board accountability, shareholder rights, ownership base etc. This, in a way, indicated that overall, Telstra had a very good corporate governance system. However, with further privatisation of Telstra – sale of the third tranche of shares of Telstra in the near future, the governance structure of Telstra could also change dramatically.

### **The case of China Telecom**

In 1994, perhaps under the influence of privatisation of the telecommunications sector all around the world (Pitt et al., 1996), and also as an effort by the government to reform and invigorate the telecommunications industry, the management of the fixed line telephone network and the mobile network was separated from the administrative function of the MPT and established as a legal enterprise under the MPT – China Telecom (People Daily Online, 2005). The pressure to push forward economic and enterprise reform in the telecom sector has also seen the establishment of the Department of Telecommunications Administration (DTA) within the MPT to oversee the extensive regulatory functions of MPT. However this reform was widely criticised, as a DTA controlled by the MPT was not seen as appropriately independent (Pitt et al., 1996: 360). This problem eventually disappeared in 1998, when the regulatory function of the telecommunications market was transferred to a newly developed Ministry – the Ministry of Information Industry (MII); at the same time, the supervision of the state interest in China Telecom and other telecommunications companies was also transferred to the State Trade and Economic Commission (STEC), the predecessor of the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council.

Back to 1994, while the regulatory functions were reformed within the MPT, in order to further increase competition and to drive efficiency in the telecommunications industry, another telecom operator, China Unicom was introduced into the market. China Unicom was formed under the auspice of the state council, with its capital contributed from the Ministry of Electronic Industry (MEI), the Ministry of Railways (MOR), the Ministry of Electrical Power (MOP) and thirteen other large state-owned enterprises (Pitt et al., 1996: 357). The establishment of China Unicom marked an age of a fundamental 'paradigm shift' in the development of the Chinese telecommunications industry (Pitt et al., 1996: 356), as China's telecommunications sector moved away from the strict monopoly to the so-called 'managed

competition' (Pitt et al., 1996: 348). At this stage, both China Telecom and China Unicom were state-owned enterprises controlled by different government interest groups.

Following the introduction of China Unicom to the market, four other companies have emerged: China Mobile, China Railcom, China Netcom and China Satcom. All these telecom companies were sourced from different government interest groups in China and some of them were formed after breaking up the original monopoly government player – China Telecom. For example, China mobile was separated from the then China Telecom in 1999, to focus on the mobile communications business; China Railcom originated from the Ministry of Railway in 2000; China Netcom incorporated the 10 provincial branches of the former China Telecom and two independent carriers – the China Network Communications Co Ltd and Jitong Communications (China Daily, 2003); China Satcom was set up combining the following corporations: China Telecommunications Broadcast Satellite Corp., China Orient Telecommunications Satellite Company Co, Ltd., China Space Mobile Satellite Telecommunications Co, Ltd., China Posts & Telecommunications Translation Service Corp., China Telecom (Hong Kong ) and Chinasat Corporation (China Satcom, 2005).

The telecommunications companies in China were restructured in such a way that, on the one hand, the dominant government interest in the telecommunications industry was preserved; on the other hand, the 'managed competition' framework favoured by the Chinese government in its transition stage of economic and enterprise reform was reinforced. Given the roots and history of all six major players in the telecommunications market, China Telecom was chosen to serve as a comparison with Telstra.

### **Ownership Structure**

China Telecom is listed both in the Hong Kong Stock Exchange and New York Stock Exchange (traded as American Depositary Shares) (China Telecom, 2004: 2). According to China Telecom's Annual Report 2004 (China Telecom, 2004: 45), as at 31 December 2004, 72.09% of its shares were owned by China Telecommunications Group Corporation. Three legal-persons owned a further 10.76% of China Telecoms' shares. All these shares were classified as 'domestic shares' and were not tradable in the stock markets. The remaining 17.15%, were listed in Hong Kong Stock Exchange (H shares). The share structure in China Telecom is called a split ownership structure and is very typical of state-owned enterprises transformed into listed companies in China.

### **The Role of the Government**

China Telecommunications Group Corporation (the major shareholder of China Telecom) is a state-owned enterprise. In 1998, the supervision of China Telecommunications Group Corporation was transferred to STEC from the former MPT, following a general economic and enterprise reform plan to separate government functions from commercial activities. In 2003, the supervision of China Telecommunications Group Corporation was further transferred to SASAC of the State Council of China. Now SASAC is responsible for managing 172 companies (State-owned Assets Supervision and Administration Commission of the State Council, 2005), most of them were previously under the management of various government ministries.

The controlling interest of 72.09% represented by the government in China Telecom has huge implications. Through its dominant shareholding not only in China Telecom but also in other telecom companies, the government played an important role in reforming the telecommunications industry through its administrative measures. Nearly all six major telecommunications companies mentioned before are listed in the stock markets. However, because of the government's dominant shareholding in all these companies, all six companies are still treated as wholly state-owned enterprises most of the time. A typical example was that on 1 November 2004, the government swapped the top executives of China Telecom, China Mobile and China Unicom without explanation (People's Daily Online, 2005d, c). This episode illustrated that the Chinese government still maintained a very powerful position in managing state-owned enterprises transformed listed companies.

### **The Board and the Management**

According to China Telecom's 2004 annual report (China Telecom, 2004), the management board of China Telecom is composed mainly of executive directors. Among the 15 directors of the company, 11 of them were executive directors, one was categorised as non-executive director, and three of them were categorised as independent directors, although their independence has been often questioned by outside observers. The chairman of the board was also the CEO of the company. Apart from the management board, China Telecom also had a supervisory board. The supervisory board was composed of 5 members. It was worth noting that both the management board and the supervisory board were mainly composed of former government officials, who now have taken up management positions in the government controlled listed company. Most of the executive directors still had their government ranking. This suggested that the current arrangement has only converted the title of previous government officials to directors, or managers, and there was no substantial change in the role each person used to be playing. This was consistent with the fact that the government has taken a 'gradualist approach' in its economic and enterprise reform.

### **The Interest of Other Stakeholders**

Utilising the same governance framework employed in the analysis of Telstra, it could be argued that in the case of China Telecom, the two major stakeholder groups are also customers and employees. Because there are also other players in the telecommunications market in China, there is similar concern (as is the case of Telstra) that the players will 'cream skim' the market, which could leave the interests of the high-cost rural areas unserved (Pitt et al., 1996: 359).

In terms of the interest of employees, historically, state-owned enterprises provided the so-called 'cradle-to-grave' social services, which included providing life long employment, a generous pension, proper medical care and other social securities to its employees (Broadman, 2001). Although these arrangements will be gradually faded out as a proper social security system is established (Jia, 2004), it will take a considerable long time under China's 'gradualist' approach to achieve that.

In the case of China Telecom, after it was listed, there has *not* been any employee redundancy, simply because the job cuts have seldom been considered as an option. The reduction of employees was mainly achieved through natural attrition such as retirement. In terms of pension payment to retirees, the company has moved away from direct payment of pensions to its retirees, which is a normal practice for a state-owned enterprise before the economic and enterprise reform was carried out in China. According to China Telecom's 2004 annual report, the company has made contribution to retirement plans organised by municipal and provincial governments (China Telecom, 2004: 125). This illustrated that the company has gradually moved away from the old practice of direct payment of pensions to employees. Consistent with its old government function of providing social services to employees, the company also contributed 5%-10% of its net profit to a special fund to serve employee interest such as construction of dormitories, canteen and other staff welfare facilities (China Telecom, 2004: 111).

### **The Comparison and Contrast**

Although both were triggered by the international privatisation trend, the partial privatisation of Telstra compared with that of China Telecom illustrated the different privatisation paths of the two companies associated with each company's socio-economic context. In Telstra's case, the privatisation was more or less driven by the efficiency argument, and partial privatisation moved Telstra one step closer to become a general market player. In China's case, apart from the 'market efficiency' argument, the partial privatisation of China Telecom was also closely related to the overall economic and enterprise reform in China which aims to separate government functions from economic management.

In terms of governance arrangements, the government's involvement in Telstra is clearly stipulated in various regulations and government will only give direction to Telstra to serve the public interest. In comparison, the governance of China Telecom demonstrated that the company was still more or less



treated as a wholly state-owned enterprise. The direction in China Telecom and how its reform will be carried out in the future still remains a purely government administrative decision.

## Looking at the Future

With the Australian Government taking control of the senate on 1 July 2005, the full privatisation of Telstra is now back on the agenda,. Latest developments show that the total sell-off of Telstra could be decided by the Australian government as earlier as the end of May 2006 (Sainsbury and Lewis, 2006). At the same time, China has also started to tackle its split share structure problem. In May 2005, a trial of four companies was announced with plans to gradually sell off the non-tradable shares to the market (People's Daily Online, 2005b) and a further 42 companies were to join the trial in June 2005 (People's Daily Online, 2005a). By 2006, more than seven hundred companies listed in the Shanghai and Shenzhen Stock Exchanges announced their split share ownership structure reform plans. If China Telecom is to undertake the split share ownership structure reform in the future, then there could well be changes to its corporate governance practices and the role of the government in its governance arrangements. The likelihood of further developments in Telstra and China Telecom make this comparison case open for future analysis.

## References

- APS Commission 2003, *The Australian experience of public sector reform*, Australian Public Service Commission, Barton, A.C.T.
- Australia Industry Commission 1995, *The growth and revenue implications of Hilmer and related reforms: a report by the industry commission to the Council of Australian Governments*, A.G.P.S., Canberra.
- Australian Government Attorney-General's Department 2005, *Telstra Corporation Act 1991*, [Online]. Available: <http://www.comlaw.gov.au/> Accessed 20 June 2005
- Australian Public Service Commission 2003, *The Australian experience of public sector reform*, Commonwealth of Australia, Canberra.
- Barton, R. and Teicher, J. 2000, "A labor government's different than the current government " *telstra, neo-liberalism and industrial relations*, Monash University, Faculty of Business, Clayton, VIC.
- Broadman, H. G. 2001, *Lessons from corporatization and corporate governance reform in Russia and China*, World Bank, [Online]. Available: [http://www.developmentgateway.com/download/106673/Russia\\_vs\\_China\\_SOEs.pdf](http://www.developmentgateway.com/download/106673/Russia_vs_China_SOEs.pdf) Accessed 2 May 2003
- Browne, A. 1993, 'Privatisation in Australasia' In Ramanadham, V. V. (ed.) *Privatisation: a global perspective*, Routledge, London, pp. 470-490.
- CCH 2005, *Telstra tops US corporate governance test*, [Online]. Available: <http://www.cch.com.au/> Accessed 21 September 2005
- Chen, K. 1998, 'China's revamped ministries expected to create huge new firms for listings', *The Wall Street Journal*, pp.B11B.
- China Daily 2003, *China's Netcom denies business split*, [Online]. Available: [http://english.people.com.cn/200306/09/eng20030609\\_117898.shtml](http://english.people.com.cn/200306/09/eng20030609_117898.shtml) Accessed 3 July 2005
- China Satcom 2005, *Corporate information*, [Online]. Available: <http://www.chinasatcom.com/English/about.htm> Accessed 3 July 2005
- China Telecom 2004, *China Telecom Annual Report 2004*, [Online]. Available: [http://www.chinatelecom-h.com/tzgx\\_e/tzgx\\_e4\\_1.htm](http://www.chinatelecom-h.com/tzgx_e/tzgx_e4_1.htm) Accessed 16 July 2005
- Clarke, T. 1994, 'Introduction: privatising the world?' In Clarke, T. (ed.) *International privatisation: strategies and practices*, Walter de Gruyten, Berlin.
- Dawkins, J. 1986, 'Privatisation and deregulation: myths and practicalities', *Journal of Australian Political Economy*, vol.20, pp.2-17.

- Department of Communications Information Technology and the Arts 2005, *Telstra shareholder role*, [Online]. Available: [http://www.dcita.gov.au/tel/telstra\\_shareholder\\_role](http://www.dcita.gov.au/tel/telstra_shareholder_role) Accessed 20 June 2005
- Economic Planning Advisory Council 1990, *The Size and efficiency of the public sector*, Australian Government Publishing Service, Canberra.
- Fairbrother, P., Svensen, S. and Teicher, J. 1997, 'The withering away of the Australian state: privatisation and its implications for labour', *Labour & Industry*, vol.8, no.2, pp.1-29.
- Jia, X. 2004, 'Corporate governance and corporate social responsibility in China: past, present and future', *Australian Journal of Corporate Law*, vol.17, no.1, pp.136-143.
- People Daily Online 2005, *State Council approved China Telecom's north-south split plan*, [Online]. Available: [http://english.people.com.cn/200112/11/eng20011211\\_86402.shtml](http://english.people.com.cn/200112/11/eng20011211_86402.shtml) Accessed 3 July 2005
- People's Daily Online 2005a, *China launches 2nd round of experiments to tackle major capital market problem*, [Online]. Available: [http://english.peopledaily.com.cn/200506/20/print20050620\\_191139.html](http://english.peopledaily.com.cn/200506/20/print20050620_191139.html) Accessed 25 June 2005
- People's Daily Online 2005b, *China selects firms for experiments to tackle major problem facing sluggish stock markets*, [Online]. Available: [http://english.peopledaily.com.cn/200505/10/print20050510\\_184242.html](http://english.peopledaily.com.cn/200505/10/print20050510_184242.html) Accessed 25 June 2005
- People's Daily Online 2005c, *End of the road for China Unicom?*, [Online]. Available: [http://english.people.com.cn/200501/19/eng20050119\\_171083.html](http://english.people.com.cn/200501/19/eng20050119_171083.html) Accessed 2 July 2005
- People's Daily Online 2005d, *Landmarks of China's telecom industry 2004*, [Online]. Available: [http://english.people.com.cn/200412/17/eng20041217\\_167697.html](http://english.people.com.cn/200412/17/eng20041217_167697.html) Accessed 2 July 2005
- Pitt, D., Levine, N. and Yan, X. 1996, 'Touching stones to cross the river: evolving telecommunication policy priorities in contemporary China', *Journal of Contemporary China*, vol.5, no.13, pp.347-365.
- Prior, N. 1998, 'Blount defends plans to slash jobs at Telstra' *The West Australian*, p.61.
- Ranald, P. 1996, 'Redefinition of the public sector: serving citizens or customers?' In Farrar, A. and Inglis, J. (ed.) *Keeping it together: state and civil society in Australia*, Pluto Press, Leichhardt, N.S.W., pp. 92-113.
- Sainsbury, M. and Lewis, S. 2006, 'Minchin pushes full Telstra sale' *The Australian*, 31 March 2006, p.19.
- Senate Environment Recreation Communications and the Arts References Committee 1996a, *Telstra (Dilution of Public Ownership) Bill 1996: submissions to Senate Environment, Recreation, Communications and the Arts References Committee*, The Committee, Canberra.
- Senate Environment Recreation Communications and the Arts References Committee 1996b, *Telstra: to sell or not to sell?: consideration of the Telstra (Dilution of Public Ownership) Bill 1996*, The Parliament of the Commonwealth of Australia, Canberra.
- State-owned Assets Supervision and Administration Commission of the State Council 2005, *List of corporations controlled by SASAC of the State Council*, [Online]. Available: <http://www.sasac.gov.cn/zyqy/qym/ default.htm> Accessed 16 July 2005
- Tan, Z. 1994, 'Challenges to the MPT's monopoly', *Telecommunications policy*, vol.18, no.3, pp.174-181.
- Telstra 2005, *Telstra's history*, [Online]. Available: <http://www.telstra.com.au/communications/corp/history.cfm> Accessed 19 June 2005
- The Hilmer Committee 1993, *National competition policy: report by the independent committee of inquiry*, Australian Government Publishing Service, Canberra.
- Wardill, S. 2005, 'Nationals draw line on Telstra demands' *The Courier Mail*, 18 June 2005, p.1.
- Zhang, B. 2000, *Promoting liberalization and regulation reforming: the impacts of the WTO on China's Telecom Industry*, [Online]. Available: <http://www.its2000.org.ar/conference/zahng.pdf> Accessed 17 July 2005

# Three Questions To Guide Study and Practice in the Information Systems Field

**JuanQiong Gou**

Beijing Jiaotong University, China

**Arthur Tatnall**

Victoria University, Australia

---

## Abstract

*Gaining an understanding of Information Systems and improving IS education has become a serious issue for the IS discipline. Prior to undertaking Management Information Systems (MIS) in an MBA course, students sometimes cannot clearly explain exactly what information systems are and what they should do in practice. This paper begins by considering the various influences on the MIS curriculum and some of the conventional approaches to curriculum design, selection and organisation of teaching materials. It then offers an alternative approach by presenting a three question framework for understanding and explaining the IS field. From this basis the paper argues that these three questions can be used to guide the study, teaching and practice of MIS.*

## Keywords

*Information and Communication Technologies (ICT), Information Systems (IS), management information systems (MIS), IS discipline, IS curriculum, IS practice.*

## Introduction

As Information Systems (IS) become ever more important in the functioning and development of organisations, society and the economy, one would expect the IS discipline and its graduates to be highly valued, but in some instances this is not always the case. Students of Management Information Systems (MIS) and even some teachers and researchers in IS sometimes cannot clearly explain to students exactly what information systems are and what they should do in practice. In this paper we examine the nature of the IS discipline in an attempt to provide a clear and easy way to depict it, especially to MBA students undertaking an MIS subject.

The Information Systems field grew from computer data processing in the 1950s and, with maturity, the distinct domain of IS reveals itself in the interaction and permanent interplay between Information and Communication Technologies (ICT) and the social/organisational context. Aspects of the design and use of ICT can be found in the disciplines of Computer Science, Computer Systems Engineering and Information Systems, but this paper focuses on those aspects of ICT involving Information Systems. Lee (2001) emphasises this as follows: “research in IS examines more than just the technological system, or just the social system, or even the two side by side ... it investigates the phenomena that emerge when the two interact” (Lee 2001 :iii).

Copyright © 2006 Victoria University. This document has been published as part of the Journal of Business Systems, Governance and Ethics in both online and print formats. Educational and non-profit institutions are granted a nonexclusive licence to utilise this document in whole or in part for personal or classroom use without fee, provided that correct attribution and citation are made and this copyright statement is reproduced. Any other usage is prohibited without the express permission of the publisher.

## The IS Curriculum Development Process

Information systems curricula are under constant pressure to change as is well known to all those involved in their delivery. Many of the studies on curriculum development and change reported in the literature are based on research, development and dissemination models (Havelock 1971). Relying on logical and rational decisions, change models of this type depend on the use of convincing arguments based on programs of research.

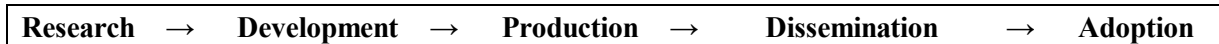


Figure 1: Research-Development-Dissemination Model

Problem solving models (Nordvall 1982) represent another approach to conceptualising curriculum change in which this is seen as due to perceived educational need. Also a quite rational approach they involve searching for alternative solutions, often by looking at what colleagues with similar interests are doing but sometimes by other forms of research, in an attempt to find a solution to the educational problem.

A related approach is to consider that many curriculum statements result from the conscious or unconscious copying of 'authoritative' existing statements, rather than from any new thought (Clements, Grimison and Ellerton 1989). Curriculum documents from groups like IFIP, ACM, IEEE and IRMA have, in many cases, tended to act as 'authoritative' statements in this way (Longenecker, Feinstein, Cougar, Davis and Gorgone 1994; Davis, Gorgone, Cougar, Feinstein and Longenecker 1997).

Writing in relation to Master's level curricula in Management Information Systems in the United States, Sandman (1993) offers seven principal environmental forces which he contends shape this curriculum and trigger its reassessment.

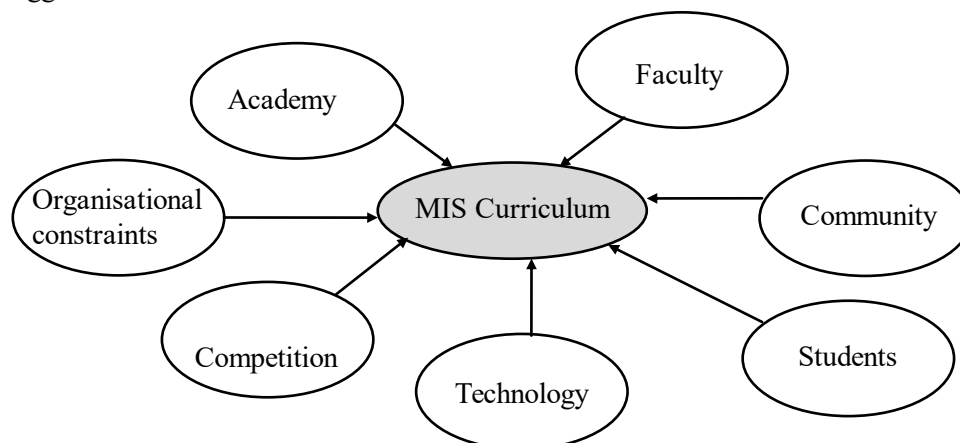


Figure 2: Influences on MIS curriculum (- adapted from Sandman (1993))

The strongest of the seven forces Sandman postulates is that of the 'academy', a term he uses to mean the requisite body of knowledge prescribed by one of the professional associations. For some time professional bodies around the world, such as the Australian Computer Society (ACS), have published documents setting out what they regard as the Body of Knowledge required of a computer professional (ACS 1997). A core Body of Knowledge is expressed in a form intended to assist university computing departments with the development of their curricula.

Obviously the faculty of academics who teach the program has an influence and Sandman considers that the background and experience of these academics can be a limiting factor. IS graduates undertake masters courses primarily in order to get better jobs, he asserts, and so the views of the local industrial community are an important force to take into account in developing a curriculum. Student background is another constraining factor. In common with a number of writers on IS curriculum (Nunamaker 1981; Longenecker, Feinstein et al. 1994; Cougar, Davis, Gorgone, Feinstein and Longenecker 1995),

Sandman argues that this is a technology-driven field and that emergent technologies are an important force in this dynamic area. Competition for students is a force for curriculum change as courses adapt to capture the ever elusive extra student. Finally, organisational constraints are also important forces for change. These range from internal departmental power struggles to shortages of funds and equipment (Sandman 1993).

A reading of a number of other papers on IS curriculum suggests that two issues currently stand out as particularly significant: how courses can be kept up to date, and the balance between technical, managerial and human skills required of students. Each of these issues relates to students later finding jobs in the computer industry. Model curriculum IS'97 (Davis, Gorgone et al. 1997) sees the academic field of Information Systems as encompassing two broad areas:

- An **Information Systems** function consisting of the acquisition, deployment and management of information technology resources and services.
- A **Systems Development** function involving development and evolution of infrastructure and systems for information use in organisational processes.

It seems clear to us that development of information systems curriculum is a much less straightforward and much more complex process than simple research-development-dissemination or problem solving models suggest. Changes in technology certainly play an important part, but as seen in Sandman's (1993) model, so do many other factors. IS curriculum development cannot be thought of as simply technology-driven but really must be considered as a socio-technical process.

### Three Questions to Guide Understanding the IS Field

Another approach to the definition of the IS field and to deciding what an information systems curriculum should contain is based on asking three broad questions. After listening to the questions of students and enterprise managers, and teaching and researching in information systems for many years, we propose these three questions to guide understanding of the IS field, help students understand and study IS, and help managers make best use of IS as they deploy ICT in their organisations. The three questions focus on a combination of IS and management, from different views and levels, to guide thinking about the IS discipline. The questions are:

- Why are information systems so important for organisations today?
- How can you customise ICT to meet challenges to organisations?
- How do you change organisations to get best advantage from ICT?

By continuous refinement, the 3 questions have been proved meaningful when explaining the IS discipline, especially to those who know little of IS, useful when organising IS teaching materials and valuable when guiding practice in the IS field. This paper presents some examples of using the three questions to analyse the IS discipline, organise MIS textbook materials, and analyse some topics in IS practice.

### Using the Three Questions in an Explanation of IS Itself

For many people the term *Management Information Systems* just means some form of software, but it is more useful to consider it as having the following three features:

1. The ability to support management with information
2. It makes use of Information and Communication Technologies (ICT)
3. It is a system.

These three features can then be used to explain IS more clearly. The first feature represents the purpose of information systems, which makes it different to other kinds of software. In the past the main function of an Information System was processing information to support management. This included transactions, daily management, and decision making. Now, with new technologies and new application

areas, information systems are expected to cover all fields in enterprise and society, including E-commerce and related applications. The second feature emphasises the tools of IS. Without information and communication technologies humans are still able to process information and undertake management tasks, but ICT provides such a powerful approach that we should understand and explore its advantages and be able to undertake development to enhance these more and more. The third feature is the core of the socio-technical nature of information systems. No matter how we analyse the components of the system these must include management, organisation and technology, and all components in the system should collaborate.

These features also correspond with the three questions proposed in understanding the IS field. The first feature is just another way of asking the first question as each enterprise has its own situations and aims. The second feature allows the customisation of an MIS as the means to get it to satisfy client needs. The third feature is not only related to the third question it is also a combination of the last two questions.

## **Using the Three Questions as an Explanation of the IS Discipline**

Information Systems is multidisciplinary: it is a combination of management science, computer science, and system science (Khazanchi and Munkvold 2000; Elliot 2002). Students of IS will study a lot in common from these three sciences, each of which is itself multi-faceted. Research and practice in IS will meet with various questions related to the other disciplines, some of which seem to have no relation to each other and which make the IS discipline seem unclear.

Ingwersen (1996) has defined IS as “the study of the effective use of information and the potential impact of software systems and enabling information technologies on the human, organisational, and social world”, he emphasises that “... the principle role of IS is to arrange information technology. We deal with commercial architecture, with system design and analysis, and with managerial and organisational aspects of information technology. Although we do create some software technology, most of what we do is to react to it.”

In the application of IS in business the three questions emphasise the relation between technology and commercial practice. The first question reflects features of IS from a strategic view, that is from an organisational needs and strategic development perspective, not a technological one. Of course the potential impact of technology is something that determines peoples’ requirements. This question seems simple, but it is often neglected by decision makers and ICT curriculum designers. A good answer comes from a thorough understanding of the organisational environment and ICT itself, and is the basis for everything else.

The first question and its answer also reflect and should be improved with the development of the IS discipline, including the evolution of ICT, society and their combination. This implies that many management questions would be solved by the proper use of ICT, and so the importance of IS comes from the ability of ICT to solve management problems, especially some strategic ones. Good solutions come from good combinations of ICT and business requirements. It is this combination, not ICT itself that determines the value of IS. The answer to the first question gives students a general view of ICT in organisations and will guide them to understand what organisations need and what ICT can do for them.

The emphasis of the second question is to customise. This asks of the IS discipline how best to arrange ICT to get a good solution. This needs a good understanding of ICT itself, and of the way ICT is adapted – the same problem in different organisations will need different solutions. On the other hand ICT skills are the basis of customising, which is a long process that needs engineering techniques and related management to ensure quality. All of these are necessary for an IS graduate.

The third question examines IS from a practical business view. As Laudon and Laudon (2001) say: “IS is an organisational and management solution, based on information technology to a challenge posed by the environment.” IS will not only support business operations, but may also change business operations and strategy. The process of ICT application is also a process of business reengineering, a process to

get advantages by the improvement of business and organisation. This question asks researchers to understand society, the economy and the organisation itself. With this knowledge, they can look for problems in current systems and key points to improve organisations by making best use of ICT.

These three questions guide students' understand of IS step by step. The first one shows the real features of IS which serve managers, and belongs to the management field, not to computer science. The last two questions reflect the stages in IS application development and implementation, and the two aspects of IS value in organisations. They show how different people care about different questions and need different knowledge and skills.

## Using the Three Questions to Guide Study

What they should study in university and do after graduation are the first questions students will ask, and the basic questions for the discipline. IS courses are typically designed to include broad business knowledge and skills in ICT so that IS graduates are prepared for the business environment and complex problems of IS development and operation within it. The result is that sometimes students are lost in their study, and in what they should focus on out of so much knowledge. There are not enough ways to help them to integrate what they have learned.

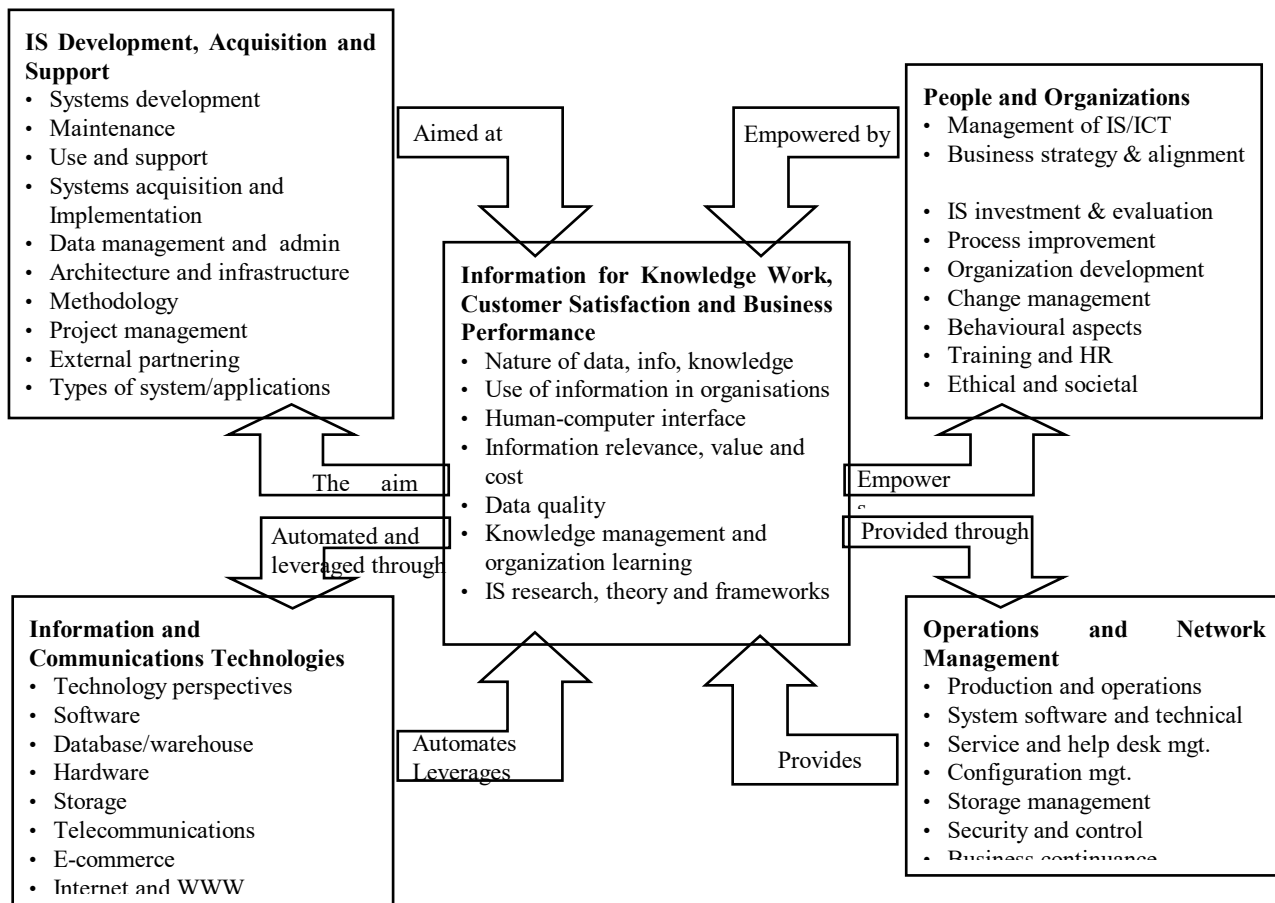
Figure 3 (below) presents a systemic framework (Bacon and Fitzgerald 2001) of the field of IS: its areas of concern and its central theme. It is developed as an integrated framework of five main areas: *IS Development, Acquisition and Support, People and Organisations, Information and Communications Technologies, Operations and Network Management*, and *Information for Knowledge Work, Customer Satisfaction & Business Performance*. The later area is proposed as the central, distinguishing theme for the field.

This framework is comprehensive and has proved meaningful for IS students in understanding what skills they should possess as an IS professional. But it is also too comprehensive to guide students to deal with their study, particularly as different students should have different study aims. Using the three questions we can analyse and summarise the framework, in order to help students to determine their study and development needs.

The central theme of the framework lists several different purposes of information systems, and this is the focus of the first question. IS provides various functions from basic data work to knowledge management, from business performance to customer satisfaction. Every organisation has its own aim. So what the first question means is making sure that an organisation's own aim is at the centre of everything. Information systems thus play a more important role in business life. So IS students should focus on how to combine and merge what they have learned to meet the requirements of business, and become capable of discovering and solving business problems with ICT. At the same time, the importance of the IS discipline also guides students to understand the societal needs and the features of IS.

The second question covers most parts of the figure. *Information and Communications Technology* is the foundation and material for customising. *IS Development, Acquisition and Support* gives the reason for customising: it is the direct way of creating systems that satisfy the central theme. In its original form this area was the core of the IS field in the academic environment. While for organisations *Operations and Network Management* may be the strategic focus, it is a part of customising IS and this area has been relatively neglected. These areas show different aspects of customising and the second question summarises them from a user view. With the help of the second question, the framework assists different people to think about the needs of their own business.

*People and Organisation* is listed as a major area because it is *people* in organisations who determine, specify, develop, exploit, support, are empowered by, and rely upon information and information and communication technologies (Bacon and Fitzgerald 2001). For these reasons it seems that this area is a sub-area of IS development. From these lists, Business Strategy and Alignment, Process improvement, Organisation development, Change management, etc just mean that organisations should be *adjusted*.



**Figure 2:** Systemic framework for the field of Information Systems

The third question clearly describes the essence and aim of change, and this inevitably involves many actors (Latour 1996), comprising both humans and non-human artefacts such as computer hardware and software.

## Using the Three Questions to Organise Teaching Materials

Information systems are important for enterprise managers and so, of course, to MBA and MIS graduate students (Tatnall, Davey, Burgess, Davison and Wenn 2002). Courses should cover most topics in the IS discipline to help business manager understand the IS field and guide their future work in IS. The average manager or executive, however, has difficulty in obtaining an integrated and holistic view of IS and this leads to a lack of alignment between IS and the strategic aims of enterprises. Compared with the whole framework of the IS discipline (see figure 3 above) many MBA courses ignore details of ICT itself. Laudon and Laudon's MIS book (2001) is a widely used and comprehensive one, but after reorganising its materials with the 3 questions, it seems much easier for students to obtain an integrated view of the content and to master the essence of the IS field.

The first question can be used to guide students to realise the information systems needs of enterprises and of society, as well as the power and value of IS. How to customise ICT is a big topic requiring much knowledge. With an explanation of the three questions in the first lesson, and guidance on all materials with them, an MIS course seems more interesting and meaningful for MBA students. During subsequent lessons, the three questions are always mentioned and discussed with some cases, which makes the whole course systematic and much easier to master.



## Using the Three Questions and Framework to Guide IS Practice

After many years of development information systems applications have two distinguishing features: integration and business-intensity. Compared with formerly function-specific systems, organisations need integrated systems to cover all information requirements in the enterprise and more management ideas are involved in development of commercial software. This results in business-intensive applications.

These two features imply that IS has become a big investment, a big value and a big risk. IS investment is a critical decision, and a complicated and difficult task for organisations. Implementation of IS involves every department and every business process in organisations. IS practice involves more business problems and decisions from business managers and executives, all of which need an easy way to classify various problems for explanation to managers and to guide ICT personnel and managers in their work together. The three questions present a common language to guide IS practice.

The following example uses the three questions to guide students in their reading of a book on ERP by Davenport (2000), used it in a subject related to MIS. The book is a comprehensive and general one aimed at business people understanding ERP systems and ICT in business. The first of the three questions suggests that we begin by considering why an ERP system is important to the organisation, and the book handles this in chapters on *What are Enterprise Systems and why do they matter?* and *The promise and perils of Enterprise Systems*. These chapters provide an introduction to ERP and their business benefits and describe the roles of ERP in business life. The second question deals with how to customise ERP systems, and several chapters describe this step by step. For an information system such as an ERP system customisation is not development, but a process of implementation. After a general analysis of ERP the book discusses organisations and implementation conditions for ERP systems both from a strategic and an operational viewpoint.

The third question is related to changes in organisations, and the last three chapters answer this in different ways by looking at process, organisation and strategy. There is also discussion of some possible directions within the context of large-scale changes to the business environment within the next few years.

## Conclusion

It is sometimes the case that Information Systems students cannot describe their own discipline. To address this issue, in this paper we proposed three questions: Why are information systems so important for organisations today? How can you customise ICT to meet challenges to organisations? How do you change organisations to get best advantage from ICT? The three questions can be used to help teachers explain the discipline to students, and also to guide students in their learning and mastery of the essence of IS.

The three questions can also form a useful framework for the study of MIS, both for textbook writers and for curriculum designers. They can also be used to good purpose by students in organising their work. Providing answers to the three questions offers students and graduates the possibility of integrating the broad knowledge learned in IS with various management issues in a social context.

Each of the three questions relates to a range of problems and knowledge. Answers to them will cover most aspects of the Information Systems discipline. The questions will clarify different requirements and suggest different knowledge material. For management students and others with different backgrounds, they could be used to clarify their study needs and guide them in the right direction on the long road to IS practice.

## References

- ACS (1997). The Core Body of Knowledge for Information Technology Professionals. <http://www.acs.org.au/national/postpaper/bokpt1.htm>, September 1997, Australian Computer Society.
- Bacon, C. and Fitzgerald, B. (2001). "A Systematic Framework for the Field of Information Systems." *The DATABASE for Advances in Information systems*. **32**(2).
- Clements, M. A., Grimison, L. A. and Ellerton, N. F. (1989). *Colonialism and School Mathematics in Australia 1788-1988*. School Mathematics conference: The Challenge to Change Geelong, Geelong, Australia, Deakin University.
- Cougar, J. D., Davis, G. B., Gorgone, J. T., Feinstein, D. L. and Longenecker, H. E. (1995). Information Systems IS'95 DRAFT Report. Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems. USA, AIS, ACM, DPMA.
- Davenport, T. (2000). *Mission Critical: Realizing the Promise of Enterprise Systems*. Cambridge, Ma., Harvard Business School Press.
- Davis, G. B., Gorgone, J. T., Cougar, J. D., Feinstein, D. L. and Longnecker, H. E. J. (1997). IS'97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems. USA, Association for Information Technology Professionals.
- Elliot, S. (2002). *IS: A Discipline in Crisis*. Australasian Information Systems Conference (ACIS-2002), Melbourne.
- Havelock, R. (1971). Planning for Innovation Through Dissemination and Utilization of Knowledge. Ann Arbor, Centre for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan.
- Ingwersen, P. (1996). Information and Information Science in Context. *Informing Science: From the Development of Discipline to Social Interaction*. Oliasen, J., Erland, M. P. and Wilson, P. Oslo, Scandnavian University Press: 69-111.
- Khazanchi, D. and Munkvold, B. (2000). "Is Information Systems A Science? An Inquiry into the Nature of the Information Systems Discipline." *The DATABASE for Advances in Information systems*. **31**(3).
- Latour, B. (1996). *Aramis or the Love of Technology*. Cambridge, Ma, Harvard University Press.
- Laudon, K. C. and Laudon, J. P. (2001). *Management Information Systems*. USA, Prentice Hall.
- Lee, A. S. (2001). "Editorial." *MIS Quarterly* **25**(1).
- Longenecker, H. E. J., Feinstein, D. L., Couger, J. D., Davis, G. G. and Gorgone, J. T. (1994). "Information Systems '95: A Summary of the Collaborative IS Curriculum Specification of the Joint DPMA, ACM, AIS Task Force." *Journal of Information Systems Education* **Winter 1994-95**: 174-186.
- Nordvall, R. C. (1982). The process of change in higher education institutions. Washington DC, American Association for Higher Education.
- Nunamaker, J. F. E. (1981). "Educational Programs in Information Systems: a report of the ACM Curriculum Committee on Information Systems." *Communications of the ACM* **24**(3): 124-133.
- Sandman, T. E. (1993). "A Framework for Adapting a MS/MIS Curriculum to a Changing Environment." *Journal of Computer Information Systems* **34**(2): 69-73.
- Tatnall, A., Davey, B., Burgess, S., Davison, A. and Wenn, A. (2002). *Management Information Systems - concepts, issues, tools and applications*. Melbourne, Data Publishing.



