

A study of case studies: 1985-2012

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ABSTRACT: What is termed a *case study* has become a recognised part of teaching some management subjects, and has been described as a description of a multi-variable problem situation which the student is required to analyse, then, make a decision. As a basic management subject is provided to undergraduate engineering students one might expect to find suitable case studies available for use with those students, but none were found when this author was teaching such a management subject. Therefore, through some fifteen years (late 1980s to mid-1990s), this author generated one hundred and ten case studies with distinctly innovative features for those students. Previous papers have outlined how they were started by a need to teach effectively, now the article following this abstract will cover the inspiration and development processes of the cases, with notes on their content, and their further development into the present decade.

INTRODUCTION

There have been several occasions in the past when this author has written about the use of what he's termed *the series of continuing case studies*. The earliest, reviewed the changes which had been made in presenting management to undergraduate engineers and how new cases had been used [1]. The third, at the end of the same year, dealt more fully with the preparation and presentation of, and early results from, them [2]. Several others followed. But at no time has he spelled out how the narrative in the series originated, how the series came to be developed, and how a semester-series of cases has become a novel. Now seems to be a good time to do that, and to show how a work of fiction can be, as this has been, a teaching instrument.

The good news, after what has been a long story through the nineties into the present century, is that a publisher has accepted the novel *A Project in Ammonia*, which grew from one of the series of case studies used in teaching management to engineering students - all of over a decade ago [3]. But how did this start? Was it a slowly-developed idea? Or a sudden inspiration?

The idea did spring into life in an instant, it was an inspiration which hit the author when walking along the footpath under scaffolding around the old Dairy Farmers building which was being demolished, from the main university building to the carpark, after 9.00 pm, having given an evening lecture. That would have been in the mid-to-late 1980s.

The background of this vividly recalled event was an invitation, at the beginning of 1984, to teach management to engineering undergraduates, first assisting a visiting American, who went home in mid-year. The author took over the whole subject for the second semester, more or less following the pattern the visitor had set up. But the results, observed in the class taught by the visitor, and in the later class taught personally, left a dreadfully dissatisfied feeling. The subject's presentation, or content, was not making an impact on the students. Why? Was something missing? If so, what was it?

This dissatisfaction was partly due to having taught thermodynamics for some ten years, in the TAFE system, and because in those classes student interest and enthusiasm was generated quite readily. But those responses were missing in the management classes. There was no *subject-enthusiasm*, not even *subject interest*. Such a lack of response is serious in education. It is all very well for the teacher to know the subject, and to be able to present the relevant information, but for the teaching process to work there must be a sensation, shared by teacher and students, that the material is *getting through*. It was not.

The first step was re-organising the syllabus. In a traditional manner the American colleague had started with the management functions, which made little impression on these numbers-based engineering people. So, the syllabus was

somewhat inverted, opening with familiar items, people and money, then some numerical and pictorial items, the decision tree and the break-even concept; inventory, order quantity and net present value; after all that forecasting; marketing; and the classic management functions - planning, organising, leading and controlling, and finally change.

This sequence definitely suited these undergraduate engineers better than a more traditional system, and led to production of the author's text, which uses the above sequence [8].

Then, thinking back to the MBA programme, he had gone through about fifteen years earlier, realisation of what was missing came: no case studies were being used.

As remarked above, these are a recognised feature of teaching management, and there is a stack of case study texts. So at the beginning of 1985 a few were photocopied and issued to the students (e.g. [4]), as illustrations of management actions and as problems for discussion. This provided some improvement in students' reception but not as much impact as desired. Why?

The answer seemed to be: because they were written for postgraduate *management students* who were working as managers, not for junior, undergraduate, *engineering students* who were working *under* managers.

Sometime, after the above dates this reference describing what should be in a case study was found [5]:

it is a description of an actual situation,
it has a problem and a person or a group are trying to solve that problem,
there is no interpretation,
it includes a number of variables,
it cannot be reduced to one *point, issue or problem*,
there may be a core problem, but usually a number of other problems surround this core,
not all of the facts are available,
and some of the *so-called facts* turn out to be half-facts or opinions.

Is that simple? Or complex? Or much of both? It is the way all the ones in textbooks are written, they are from real-life, recorded, situations, and contain all those other features, but they are very often dull, not quite boring, just close, so they make dull reading, even though they are about real events (e.g. [6][7]), with the utmost respect for the output of those distinguished writers.

That description was found much later, in the 1990s. What became obvious in the mid-1980s was that to interest these numbers-based junior engineering people in working on management problems, they would have to get something of a technical nature, plus something to hold that interest, perhaps also something to amuse them, but what? And how? What format? What style?

So, for the class of the second semester of 1985 a few case studies were written, essentially by weaving engineering material into a few from textbooks. These went down reasonably well, certainly better than the ones taken directly from the books. But there was still something not quite right.

The way textbook cases ended was also a worry, they left a feeling of incompleteness because they just stopped with decisions made and, therefore, problems solved, but this author's memory of being a manager for many years told him that life is not like that, today's decisions can return in a new guise tomorrow. What seemed absolutely tamed yesterday will suddenly rear up and *bite*, today. And tomorrow? Ugh. Wait and see what tomorrow may bring, and learn to worry in anticipation. So, for an experimental semester, probably in 1986, consecutive cases were tried, one following another, serial-style, a later one distorting and disproving, and requiring correction of a decision made earlier.

THE INSPIRATION

Then, walking to the carpark after finishing the 6.00 pm to 9.00 pm lecture, the real inspiration came. For some inexplicable reason the author was pondering on Bert Chandler's series of novels, which used a scenario of colonies out on the rim of our Milky Way, and how he would make them a sort of analogy of Australia, a long way from *civilised* anywhere-else, with a lot of interesting mix of people and events and - and - thoughts came and oozed through - to questioning how a story-line could be developed about engineers in a similar location and be used to teach management?

That was the inspiration. It hit almost physically, with a mental impact. The idea suddenly flowed through: set the case study series in the future, in a way-out location. Why is this a good idea? Because it will intrigue the students, make them think outside their squares, get them interested in the subject.

Why is that scenario legitimate? Because management has always been about the control of people and money, or more correctly, wealth, for centuries in the past, and management in several centuries ahead in time will still be in control of

people and money (or wealth). So, time and location do not matter, controlling people, money, machinery, all the events involving engineer-managers, will follow today's management systems. Well, more or less, maybe some adjustments. But in such a flood of inspiration any maybes will always be ignored. So where next?

THE DEVELOPMENT

The development started with writing of the first case study based on that inspiration, and continued by building up week by week, month by month, and in fact year by year, in a series of series.

The first series was used in Spring 1987 and focussed on a group of people employed in a large company and fighting the company's bureaucracy to get a project approved so they could get out of head office's boring environment. Of course, the proposed series would have to match the syllabus but that proved to be quite simple, it provided an immediate plot outline.

The proposed project was construction of an ammonia-and downstream- products factory, a concept which would bring together technology and management in the cases. The series was bundled together in book form with the title *A Plant for Appropriate Technology* and a few copies were given to students in Autumn 1988 as an introduction to that semester's series.

The *internal chronology* of the eleven series is logical and follows getting approval: building the factory, commissioning it, the first year of operation, the first maintenance shutdown, conflict after they settled down and became bored (two series), accidents (two series) and aftermaths (two series).

However, the *writing chronology* was quite different. After using *A Plant for Appropriate Technology* twice, a new inspiration came from interest in inter-personal conflict, so the series written for Autumn 1988 was set some years ahead in a time when the project had been completed and the dynamic group who had had it approved and had built it were becoming bored with steady-state production. The series was titled *A Conflict in Ammonia*.

The next inspiration came in the later-1980s when the author had become involved in accident investigations, and interest in that topic stimulated use of accidents as a theme for a series in Spring 1988. In each week's case an accident occurred, the early intention being to round it all off at the semester's end, but by half-way through memory (and imagination) had produced so many possible events the semester was ended with no answer to the developing problem. The series was titled *A Mystery in Ammonia*.

The logical follow-on in Autumn 1989, of course, was more accidents, with a conclusion showing that some were *real accidents* and some were caused by a malicious intruder, all solved by someone sent from head office (who arrived in *Mystery*). The series title was *A Murder in Ammonia*, which covered two features: there was a fatality, but the intruder was trying to kill a different person (to be disclosed in that novel). A need-feeling to tidy-up the sequence came as Spring 1989 approached and led to returning for that semester to *A Plant for Appropriate Technology*, rewritten more coherently, thanks to knowing some of what followed in the series after it. (So this author cheats?)

The first attempt at writing about building the ammonia factory occurred in Autumn 1990, with *A Project in Ammonia*, since developed into a full-length novel, and that led into *A Commissioning in Ammonia* for Spring 1990. A delicately unstated aspect of social justice is themed through both, left for the reader to work out.

The decade following had some repetitions and some new developments. Here, briefly, is the full chronology of the cases, by their titles:

1987: Spring, *A Plant for Appropriate Technology*
1988: Autumn, *A Conflict in Ammonia*, Spring, *A Mystery in Ammonia*,
1989: Autumn, *A Murder in Ammonia*, Spring, *A Plant for Appropriate Technology*,
1990: Autumn, *A Project in Ammonia*, Spring, *A Commissioning in Ammonia*,
1991: Autumn, *A Hazard in Ammonia* (rewriting of *Mystery*); Spring, *A Murder in Ammonia*;
1992: Autumn, *A Continuing in Ammonia*; Spring, *A Shutdown in Ammonia*;
1993: Autumn, *A D-Conflict in Ammonia*; Spring, *A C-Conflict in Ammonia*;
1994: Autumn, *A Hazard in Ammonia*; Spring, *A Murder in Ammonia*;
1995: Autumn, *A Farewell from Ammonia*; Spring, *An Engineer in ECL's Old Factory*;
1996: Autumn, *A Project in Ammonia*; Spring, *A Commissioning in Ammonia*;
1997: Autumn, *A Beginning in Ammonia* (originally *Continuing*); Spring, *A Shutdown in Ammonia*;
1998: Autumn, *A Hazard in Ammonia*, Spring, *A Murder in Ammonia*,
1999, Autumn, *A Hazard in Ammonia*; Spring, *A Murder in Ammonia*.

The major new development was in 1993, with the earlier *Conflict* series split into *Destructive Conflict* and *Constructive Conflict*. Further development into 1990 and onward was prevented first, by loss of the subject, then by retirement.

At the end of several semester the series was printed, with an introduction giving preceding events, as a paperback book (A5 size) with a copy to each student in the class. The word of this got around very quickly, and students entering the class in the following semester would ask for a copy of last semester's notes. The reply was: *Sorry, no spare copies, and they wouldn't help you, this semester's problems are different.*

But now an expanded, more complete in detail, version of *A Project in Ammonia* has been accepted by a publisher, and should be in bookshops by the time of your reading this.

THE EDUCATION ASPECTS OF THE SERIES

All that, which in the first instance required writing a short story of some twenty-five hundred words each week for ten weeks, not for one semester but for eleven, with sometimes considerable revision, a total of twenty-five semesters, was an exercise which benefitted the writer personally, but where was the education benefit for the students? That is a good question, and with significant answers.

Every semester's series contained the management features of the above syllabus for the subject, covered in the same sequence in the text used [8], with each case concentrating on some particular aspect of management and presented in a way, which encouraged the students to read the case through, then think about it.

Taking the overall sequence, not as written, but as the series follows through: *A Plant for Appropriate Technology* presents the process for investigating and getting approval for a major project, complicated by in-company and external factors, how a team should work together to achieve a result, and possible (often experienced) management problems.

A Project in Ammonia shows how a team of diverse personalities can overcome obstacles set up by those above them, the use of critical path planning, and how they must function when tragedy occurs. However, a major theme in it is how a principal character displayed poor leadership, then was turned into a good leader. In the longer novel-version an aspect of social justice is featured, and there are also two ethical problems. (These cannot be described here because the novel is now in publication.) *A Commissioning in Ammonia* follows from the above by completing construction and getting the factory operating, behind which there is a problem of working out why there is a leak in costs.

A Beginning in Ammonia covers the first year of production and returns, mainly with accounting problems, to the difficulty of making ends meet before reaching the break-even output. *A Shutdown in Ammonia* contains a broad mix of engineering (the first inspection and overhaul, after a year's operation), management (working out how to do the work in the least possible time), accounting (whether to engage a contractor on hourly rate or fixed cost), and what to do when an important person is hospitalised at a critical time (the two junior engineers were paired into his job by the factory manager).

A D-Conflict in Ammonia and *A C-Conflict in Ammonia* examine, first, how destructive conflict within an organisation can be a serious debilitating problem, then how constructive conflict can be a source of developing enthusiastic co-operation.

A Hazard in Ammonia illustrates how the leaders in an organisation can become so immersed in their everyday activities, the routine which must be done (however boring), that they ignore a series of accidents, going on around them until the situation figuratively screams at them. The accidents were related to industrial hazards, but the management hazard was head office appointing two people as joint managers when the original factory manager was promoted out.

A Murder in Ammonia develops the accident theme further, to some extent becoming a who-done-it story, inviting the students to solve the cause of the accidents (a malicious intruder). (Few did.) The management aspect is very general, following the syllabus and coping with two visitors from head office, one bad, one good.

A Farewell to Ammonia follows by appointing one of the two who were managing jointly as sole manager, and the other was transferred to the *Old Factory* under an autocratic manager Gerald Kahn (known by the nickname of Genghis Khan), which allowed for presenting many management practices which should not be used. *An Engineer in ECL's Old Factory* continues from *Farwell* and leaves the way open for further management-in-engineering adventures.

In all the above there is two junior engineers; these were inserted into the story-line to provide characters similar to the readers, and gave opportunity for these juniors to make mistakes sometimes and be corrected, for them to be inspired to perform *well* occasionally, and most of the time to show they were not dumb undergraduates - all to boost confidence and interest in the student-readers, which apparently worked.

The aim was, of course, to teach management, and one feature adopted quite early was to provide at the end of the first three cases of a semester a vague suggestion, nothing explicit as in an *engineering problem*, of what to consider and what to answer. But this was omitted after that third week, so students would come and point out: *There's no question,*

so what do we do? The regular answer was: *A manager's job is not only to find answers but to pose the questions leading to those answers.* With a rather blank look the student would wander off, spread the word, and finally, the notion: *Work out, yourselves, what would you do if you faced this situation?* came through.

CONCLUSIONS

If one regards the thirteen years as an experiment in education then, one must ask: what was the hypothesis? Well, in retrospect, it was that giving the students a *management story* would improve their acceptance of what, historically, had been a dead subject through which students drifted and came out with little learning to show for it. Perhaps the author holds some bias, but he concludes there was a continuing successful outcome. If one regards the period as only a time of presenting management to undergraduate engineering students, it was extremely successful, it engaged the students in the story events and made them think as managers must in an engineering environment, making decisions.

An incident from one of those years showed how a student's thinking was developed. The lecturer received a complaint from a (non-existent) member of the class who claimed, in an answer to a case early in the semester, to be a Moslem and, therefore, objected to women being presented as managers; this was regarded as serious and was discussed with the deputy head of the school, who could only suggest trying to identify the student. He was tracked down, admitted it was only a spoof, so was told not to play such games because it wastes time. But in retrospect, there is a feeling his imagination must have been stirred by the story-line, admittedly fictitious, but taken as a *good story*, with possible angles into which the author did not venture.

One may argue engineers of the ordinary hardware persuasion do not need to develop their imagination. But against that, remember that many inventions have been made by engineers, and that requires imagination. At a more mundane level, engineers in ordinary jobs have to solve problems, and unless they have some imaginative ability they will find answers linearly, without considering side issues and pros and cons. So, by encouraging thinking, the thirteen years are also remembered as successful.

A final reflection: the author enjoyed teaching this subject more than others he also covered. The students also enjoyed the subject, by engaging in arguments about character personalities, decisions made by characters, and events in the plots. (As an illustration, a few students complained, answering *Hazard* cases, that the factory managers were not paying attention to a series of minor accidents, and one student said openly: *If someone doesn't do something, someone's going to get killed!* Right!).

This *enjoyment factor* presents something of a problem: is it legitimate, proper, normal (or whatever word might come) for a subject to be *enjoyed*, as well as providing learning? Should there be more of this quality, enjoyment, in teaching? This author believes enjoyment boosts the learning, so let there be more, please!

A full list of references on features of management and on case studies, which contributed to developing the *ammonia factory* series of series of cases would fill many more pages than available for this whole article; therefore, only some old items, used in the 80s-90's, from the personal library are given below. Lecture notes from the Macquarie University MBA programme are also acknowledged. This author's case series are identified in the above text.

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