

# Recreating established systems

Anastássios Perdicoulis

Assistant Professor, ECT, UTAD (<http://www.tasso.utad.pt>)  
 Affiliate Researcher, CITTA, FEUP (<http://www.fe.up.pt/~tasso>)

## Abstract

Mental models of non-documented human-made systems, such as the economy, are hypotheses valuable for their effort to conceive and communicate system structure and function. This document illustrates an example from the article-publishing industry with reverse blueprints (RBP).

## 1 Introduction

Contrary to engineering, where formal plans are typically created before the outcome is produced, ‘established’ human-made systems, such as the economy, are made and function with no formal records. In such cases, researchers try to construct *a posteriori* mental models of these systems, all of which are hypotheses. Due to their hypothetical nature, all such models are ‘wrong’, but some may be useful (Sterman, 2002).

Such hypothetical system recreations can be valuable when they stimulate thought and debate, and especially when transmitted in succinct and easily communicable forms — for instance, by using one of many modelling techniques (Perdicoulis, 2010). Let us illustrate this by taking as a working example the case of a niche sector of economics that is familiar to many academics: namely, the ‘article-publishing industry’.

Article-publishing makes science progress at a relatively faster pace, comparing to other publications, and the support industry makes this possible through various functions. Let us start with a process view of the case: Figure 1 gives a concise, easy, and comprehensible process view of the article-publishing industry, showing in general ‘what happens’ — that is, identifies the main objects, the main actors, and their main functions.

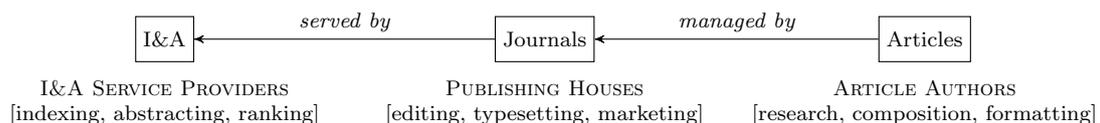


FIGURE 1 The process, the main actors, and their respective functions

## 2 Analysis

The process view of Figure 1 could be elaborated into a more detailed process diagram, but that would defeat the purpose of the ‘concise process diagrams’, or CPDs (Perdicoulis, 2010, 2011). Therefore, to see how the system works, we would have to recreate it with reverse blueprints, or RBPs (Perdicoulis, 2010, 2011).

RBPs discover and display the system elements and their interactions, through research or first-hand knowledge of the system. Even so, the construction of the RBP is done iteratively, by putting down a working hypothesis regarding elements and interactions, and then checking to see if it really represents the system as it is. Even when complete, RBPs are still tentative mental models, which can be discussed and debated.

Table 1 presents a list of key elements of the system, organised in categories similar to the Kaplan–Norton perspectives (Perdicoulis, 2012), chosen in this case because many people are familiar with this kind of organisation.

| CATEGORY              | SYSTEM ELEMENTS   |
|-----------------------|---|
| Functions/ services   | research, writing, formatting, editing, publishing, abstracting, indexing, journal ranking                    |
| Kudos/ attractions    | article quality, author popularity, journal popularity, article popularity, citations                         |
| Financial incentives  | institutional funding (authors), sales revenue (publishers), service revenue (I&A), global pricing (journals) |
| Stocks/ accumulations | author pool, article pool, journal pool   |

TABLE 1 System elements organised in categories

Having pondered about the elements of the system, we can now proceed to link these elements to each other according to their own particular relationships. In the conventions of RBPs, these relationships must be labelled arrows bearing ‘plus’ or ‘minus’ signs near the arrowheads (Perdicoulis, 2011). Discovering and examining these relationships is a task with many iterations — hence, requiring much time, attention, clear reasoning, and knowledge of the system.

A systems view such as Figure 2 shows the key elements of the system plus interactions among them. Thus, it is possible to identify a number of interesting pathways, some of which form feedback loops. Table 2 contains a number of these pathways, together with their type — for instance, reinforcing or balancing loops — as well as the respective drivers or inhibitors.

## 3 Discussion

The recreation of the system as a mental model with some formality provides an entity that can be observed, criticised, and explored from different points of view. The following sections present some sample observations made on the system model, which can in turn lead to much thinking and many discussions.



| PATH NAME                | SEQUENCE OF SYSTEM ELEMENTS  | PATH TYPE          | DRIVER/ INHIBITOR        |
|--------------------------|--|--------------------|--------------------------|
| Research loop            | author pool, research, writing, formatting, editing, publishing, article pool, citations, research | reinforcing loop   | research                 |
| Author branch            | citations, author popularity, author pool, research  | enhancing branch   | author popularity        |
| Quality branch           | editing, article quality, citations  | enhancing branch   | article quality          |
| Pricing branch           | publishing, global pricing, research   | inhibiting branch  | global pricing           |
| Funding branch           | author popularity, institutional funding, research   | enhancing branch   | institutional funding    |
| Journal branch           | article pool, journal pool, journal ranking, journal popularity, citations                         | reinforcing branch | journal popularity       |
| Indexing branch          | article pool, abstracting and indexing, research   | enhancing branch   | abstracting and indexing |
| Ranking loop             | citations, journal ranking, journal popularity, citations  | reinforcing loop   | journal popularity       |
| Publishing business loop | publishing, global pricing, sales revenue, publishing  | reinforcing loop   | sales revenue            |
| I&A business loop 1      | journal ranking, service revenue, journal ranking  | reinforcing loop   | service revenue          |
| I&A business loop 2      | abstracting and indexing, service revenue, abstracting and indexing                                | reinforcing loop   | service revenue          |
| Article popularity loop  | citations, article popularity, citations   | reinforcing loop   | article popularity       |

TABLE 2 Main pathways are loops, while branches either enhance or inhibit their functions

is highly linked, or ‘popular’ — that is, it participates in many activities. There are genuine reasons for citations to represent value: for instance, citations are proportional to ‘article quality’. However, there are also actor interests for citations to be artificially augmented: for instance, citations can be perceived as proportional to ‘author popularity’, which can be cashed in for sponsorships. Quite interestingly, what this centrepiece really represents seems to be close to the concept of ‘currency’.

### 3.2 Actors/ stakeholders

Contrary to what may appear to the novice author, the ‘top actor’ of the article-publishing industry is not the publishing houses, but the ‘I&A service providers’, as in Figure 1. Publishers are concerned with their ‘image’, which includes various bibliometry statistics and — most importantly — journal ranking, so the holder of that image can be respected. This may resemble the role of the rating agencies in the wider world of economics, which ‘rank’ not only commercial institutions, but also authorities or ‘sovereign’ states such as municipalities or countries.

Paradoxically, the ‘I&A service providers’ themselves are also differentiated in the public view — or, at least, they are not all equally important to universities and/ or national scientific councils. While these providers — which are commercial operations of public good — are not formally rated, they appear to be given preferences or importance in subtle but recognisable ways, similar to ‘clubs’ where academics may belong.

### 3.3 Natural versus artificial selection

The stimulated mass production of articles is likely to operate on the ‘natural selection’ premise, similar to that of Nature — for instance, something like ‘readers will discover the value of the good articles, and these will become popular’. On the contrary, though, some I&A service providers function as a force of ‘artificial selection’ — that is, they select journals on the basis of quality of their articles, admit them into an ‘elite’ league, and thus promote them as ‘models’ or ‘targets’. This could very well introduce some interest-driven bias towards certain journals. While this function of the I&A service providers cannot be reprimanded, it should make academics think about ‘artificial selection’ — for instance: is this our best bet for quality articles?

## 4 Conclusion

Mental models of non-documented human-made systems contribute to our understanding of how these systems are structured and function. An example from the article-publishing industry, featuring reverse blueprints (RBP), helped identify important pathways such as feedback loops, auxiliary branches, and drivers or inhibitors in each case. Recreating the system also revealed intriguing views regarding the interests of the actors/ stakeholders, and raised questions regarding some of their functions.

## References

- Perdicoulis, A. (2012) The semantic content of strategy maps. *Systems Planner*, **5**.
- Perdicoulis, A. (2011) Application manual for the ‘Systems Thinking’ book. *Systems Planner*, **2**.
- Perdicoulis, A. (2010) *Systems Thinking and Decision Making in Urban and Environmental Planning*. Cheltenham: Edward Elgar.
- Sterman, J.D. (2002) All models are wrong: reflections on becoming a systems scientist. *System Dynamics Review*, **18**:501–531.

