

Chapter 1

Grey Publishing and the Information Market: A New Look at Value Chains and Business Models

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Justification

The article “The Information Market for Research and Higher Education”¹ was written on the occasion of the Fifth International Conference on Grey Literature held December 4-5, 2003 in Amsterdam.

Since then, the author has been involved in a number of publications (Roosendaal et al., 2005²; Roosendaal et al., 2008³; Roosendaal et al., 2009⁴) further developing the subject of the article albeit not strictly focusing on grey literature. In particular, the last two publications, a book chapter and a comprehensive book are recent and report new developments.

In this article, the author has chosen to make use of the 2003 article in combination with Roosendaal et al., (2009) with a focus on aspects of grey literature. As main source, Roosendaal et al., (2009) will be briefly but comprehensively quoted without mentioning this explicitly. For further details on the discussed issues, the reader is advised to consult Roosendaal et al. (2008, 2009).

The parts of the article that are copied from the 2003 article are taken over verbatim and are recognisable as printed in *italics*.

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- 1 Roosendaal H.E., (2004) “The Information Market for Research and Higher Education, *How to integrate all relevant information in a network of repositories?*” Publishing Research Quarterly, 20 (1), p. 42-53.
 - 2 Roosendaal H.E., P.A.Th.M, Hilf E.R, (2005) ‘Pertinent Strategy Issues in Scientific Information and Communication in 2004’, Invited review in *Library Science- quo vadis?*, edited by Petra Hauke, Institute of Library Science at the Humboldt University Berlin, Berlin, K.G. Saur Verlag, München, pp: 217- 238.
 - 3 Roosendaal H.E., Kurek K., Geurts P.A.Th.M. (2008). ‘Modèles économiques de l’édition scientifique et processus de recherche’ in J. Schöpfel, *La publication scientifique. Analyses et perspectives*. Hermes Science, Lavoisier.
 - 4 Roosendaal H.E., Zalewska-Kurek K., Geurts P.A.Th.M. Hilf E.E. (2009) *Scientific Publishing, from Vanity to Strategy*. Chandos, Oxford.

1.1 Introduction

“Authors want to publish more, readers want to read less.” This statement paraphrases the fact that wide exposure is paramount to the author and (pre)selection to the reader of research information, including grey information. Any force in the market like the use of Information and Communication Technology (ICT) by the actors involved (authors, readers, libraries, scientific publishers etc.) that allows better fulfilling this statement is an engine for change in the value chain, prompting changes in the roles of the stakeholders in scientific communication.⁵

The above statement means that, for the author, visibility is crucial whilst, for the reader, retrievability is. In this context it is important to bear in mind that readers, when searching for information, will in most cases not be able to specify in detail what they are looking for. Combining these various factors can only lead to the conclusion that wide availability of information is the foremost requirement in this market. Arguing along the familiar business criteria of volume and margin we see that wide availability takes the role of high volume and restricted availability that of low volume. In the research and higher education (HE) information market volume is thus the potential volume of readers, rather than the actual volume of reading. The fact that readers want to read less but everything that is relevant to them at the right time illustrates this point of view. This means that the elasticity in the market is determined by the degree of availability, and this is compatible with the requirements for an open system.

This discussion illustrates that the statement at the head of this introduction determines to a large extent the dynamics of the market, and is independent of the carrier of the information, be this paper or a digital carrier. In other words, the value chain of the research and HE information market is largely determined by it. In this value chain the author and the reader, jointly the user, are the generic stakeholders while other stakeholders are institutional stakeholders.

The main driving force in the market is thus seen to be the desire of researchers to share information with the research community and the wider societal community. E-science can be seen as a further step towards the ideal of universal sharing of scientific results and making research information an ever more integral part of the research process. E-science is an integrative concept: it comprises not only the changes in the process of sharing information but also and above all new opportunities in the research process itself.

The gist is that e-science is a further step in making research information the integral raw material in the research process as it should be. In e-science, it will be possible to share primary data much more efficiently with other researchers allowing for new schemes of division of labour e.g. in splitting up collecting data in an

5 Roosendaal H.E., Geurts P.A.Th.M., van der Vet P.E. (2001) Developments in scientific communication: Considerations on the value chain. *Information Services & Use*, vol. 21, p. 13-32.

advanced way from analysing these same data and so on, as is daily practice in e.g. high energy physics.

E-science thus leads to new research strategies and research communication strategies with the goal to improve the production of new knowledge. Researchers will have to develop clear strategies for doing research and how to collaborate in the research environment with their colleagues as well as with the society at large. Scientific information strategies should support and therefore facilitate these researchers' strategies.

In this vein, a proper starting point is to first discuss research using the concept of the business model as guidance to analyse the research environment, competition in research and drivers in research for making research results public and for acquiring these results by other researchers. This allows discussing criteria for business models in the information market and developing scenarios for scientific information and their consequences for all stakeholders, researchers, publishers, librarians alike. It allows speculating on the consequences for the business model of research and HE institutions as e-science opens up new possibilities for collaborations in projects across such institutions. In particular, it will create new challenges for the smaller and medium institutions to participate in such collaborations.

1.2 From value chains to business models

Changes in the value chain are triggered by engines of change.⁶ For this market these engines for change are the potential that ICT offers to empower the author and reader and the recent developments in research and HE, also to a large extent but not exclusively enabled by the potential offered by ICT. ICT provides a huge potential to empower the author and the reader and allows a change from a user-oriented system towards a more availability-oriented system at the same time allowing a new balance between centralised systems and distributed or federated systems. ICT raises for the stakeholders the strategic choice between empowerment of the user, or alternatively applying a hostage strategy directed at the user in particular.⁷

With respect to some broader developments in research it may suffice to mention that research has generally become more subject to market conditions, even when carried out in the environment of a research institution. Market conditions mean that intellectual capital and scarcity of resources, both financial and human, play a more and more important role. As a result, research information is being intensively used for planning and evaluating of entire research programmes em-

6 Roosendaal H.E. (2004) Driving Change in the Research and HE Information Market. *Learned Publishing*, vol. 17, no. 1., p. (...)

7 Freeman E., Liedtka J. (1997) Stakeholder Capitalism and the Value Chain. *European Management Journal*, vol. 15, no. 3, p. 286-296.

phasising the formal publication side system rather than the communication side. This means to say that the balance between real communication between researchers as opposed to formal publication of research information is even more changing to formal publication.

In education, the introduction of the bachelor/master structure at the European universities will spur the development of web-based and blended learning when students are becoming more mobile and will hop from one university to another. This mobility is expected to show up in particular for master students and will lead to the introduction of international masters. Wider applications of distance learning and life-long learning will spur these developments.

For our discussion it is interesting to note that the information requirements - in terms of publishing and archiving - for research and for educational materials are very similar indeed. For educational information the volume required for each HE institution is at least an order of magnitude larger than the research information it requires. This makes it attractive from an institutional point of view to have research information financially piggy-backing on educational information. HE institutions have to develop their information infrastructure for the production and registration, i.e. publishing and archiving of educational material anyway and can use that infrastructure for the production and registration, i.e. publishing and archiving of research information as well. In both cases this includes the production and registration, i.e. publishing and archiving of grey information.

Nevertheless, rather than focusing on engines for change and the value chain a more comprehensive argument based on the business model for the scientific information should be used.⁸

Any business model should serve the following conditions:

- It should create value in its environment⁹ in the process at hand, i.e. the production and sharing of knowledge.
- It should create a sustainable process.
- It should create value for commerce.

A business model is thus viewed as the organisation of property and of the exchange of property, the property being the knowledge produced by the researcher and in particular the intellectual property of this researcher, as well as the added value of all other stakeholders.

Following Chesbrough & Rosenbloom¹⁰, a business model

- articulates the value proposition;
- clearly defines the market segment;
- reflects the strategic position of the researcher;

⁸ See Roosendaal et al. (2009), op.cit.

⁹ Kurek K., Geurts P.A.Th.M., Roosendaal H.E. (2006). The split between availability and selection. Business models for scientific information, and the scientific process? *Information Services & Use*, vol. 26, no. 4, p. 217- 282.

¹⁰ Chesbrough H., Rosenbloom R.S. (2002) The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-offs companies. *Industrial and Corporate Change* vol. 11, no. 3, p. 529-555.

- identifies the value chain in the market of scientific information;
- reflects researchers' competitive strategy;
- identifies revenues and costs structure and profit potential.

A major boundary condition is that business models for the scientific information market should be commensurate with the research environment in order to serve research. Under this condition, the main parameters of a business model for the scientific information market have been shown to be the availability of scientific information and the power of selection of the researcher.

Relevant for the discussion on engines of change is the notion that making research results public is an important tool for researchers to position themselves in their environment, the research environment and the wider societal environment. It is for this reason that a brief discussion of the concept of strategic positioning is given here, as this positioning is relevant for establishing a strategic relation resulting in the production of knowledge to be made public.¹¹

Researchers establish such a strategic relation with their environment with the goal to create added value. Partners decide to collaborate because in a situation in which they would not have access to resources of other researchers they would not be able to create added value and to achieve their goals. Establishing this strategic relation is essentially a process of acquisition of resources and negotiation between these two partners on sharing heterogeneously distributed strategic resources and on governing the directions of research. Researchers decide to give up governing research to a certain degree and accept sharing resources to a certain degree.

From the literature, a number of modes of strategic positioning is known. In "mode1", researchers set research directions driven by scientific curiosity. Results of research are not necessarily meant to be of societal relevance. Therefore, researchers can restrict the communication and collaboration to their research environment. In this case, researchers do not need to influence this environment. This type of positioning is well-known as 'ivory tower' or 'free research'.¹²

In the so-called "mode2", the societal environment directs researchers. It influences research directions and ipso facto influences the scientific products they deliver. This means that researchers match their own research problems to existing research programmes based on the demand of the societal environment. They are "context-sensitive",¹³ listen to the environment and fulfil societal needs.

11 A more extended discussion can be found in Kurek K., Geurts P.A.Th.M., Roosendaal H.E. (2007). The research entrepreneur: strategic positioning of the researcher in his societal environment. *Science and Public Policy*, vol. 34, no. 7, p. 501-513.

12 Ziman J. (1994) *Prometheus bound. Science in a dynamic steady state*. University Press, Cambridge.

13 Novotny H., Scott P., Gibbons M., (2003) Introduction: 'Mode2' revisited: The New Production of Knowledge. *Minerva* vol. 41, p. 179-194. See also Gibbons M., Limoges C., Novotny H., Schwartzman S., Scott P., Trow M., (1994) *The new production of knowledge. The dynamics of science and research in contemporary societies*. SAGE Publications, Stockholm.

The “mode3” position introduced by Kurek et al. (2007)¹⁴ means that researchers share resources with the environment like “mode2” researchers. But contrary to “mode2” researchers, “mode3” researchers or “research entrepreneurs” have the opportunity to be autonomous in determining the directions of research. They retain their own responsibilities for directing a project. Research entrepreneurs, like business entrepreneurs, influence the societal environment by creating demand for their scientific products. “Mode3” is seen to be compatible with e-science in the sense that e-science facilitates “mode3”.

One aspect of scientific information, such as information for any business organisation, is to create competitive advantage for the research enterprise. Competitive advantage based on scientific information enhances the influence of researchers not only in their research environment but also leads to a better strategic position in the societal environment. For this very reason, it is important to deal in a succinct way with this aspect of competition as an engine of change, in particular how it relates to making research results public and in acquiring scientific information. This is particularly relevant when competition is changing due to a change in researchers’ modes as facilitated by e-science.¹⁵

1.3 Functions in scientific information

As stated above, the driving force for the market of scientific information is that “authors want to publish more” and have their product widely available, while “readers want to read less”, but want to be informed of all that is relevant for their research at hand. Readers want this information available just in time. They want to be guaranteed that they can and will be informed of all that is relevant to them.

This market thus consists of researchers as producers of knowledge (authors) and as users (such as readers) of knowledge, the overall goal of researchers being to produce knowledge. Moreover, in the process of production of knowledge they acquire and make use of scientific information produced by others. Therefore, discussing the market means discussing the combination of the production of knowledge and the acquisition of scientific information.

Next to researchers and other stakeholders such as libraries, digital networks, publishers, and agents etc. the market consists of the product of scientific information, as the objective of researchers is to share scientific information. As we know, researchers are not only producers but also heavy users of scientific information produced by others. The condition here is that scientific information must have been made public.

14 Kurek K. et al. (2007) op. cit.

15 A more extended discussion can be found in Kasia Zalewska-Kurek, Peter A.T.M. Geurts, Hans E. Roosendaal,(2008). ‘The role of business models for scientific publishing in the research environment’, chapter4 in Kasia Zalewska-Kurek *Strategies in the production and dissemination of knowledge*. PhD dissertation. University of Twente.

Forces that can be observed in this market are therefore related to researchers and scientific information itself. The driving force for researchers in producing scientific knowledge is recognition. Important motives to publish research results have been seen to be recognition and visibility.

Recognition leads to reputation and researchers report produced knowledge as an instrument in the acquisition of resources. The goal is to be recognised and competition is the organisation of actions and efforts of researchers to attain this goal of recognition. Recognition and competition are attributes of the researchers and availability and selection are attributes of the product. Researchers in the market of scientific information require knowledge that can be easily acquired. It has to be available and easy to select. Only in this way researchers gain a competitive advantage in competing with other researchers. The forces are complementary and should be properly balanced with regard to the researchers and their positioning in the environment.

Following these arguments, one can deduce that the driving forces in the scientific information market are recognition, competition, availability and selection. The main functions of scientific information are then registration, awareness, certification and archiving (Figure 1.1).

These functions are defined as strategic functions from a science point of view.¹⁶ The external functions registration and archiving are seen to be outsourced out of science to the publisher and the library respectively.

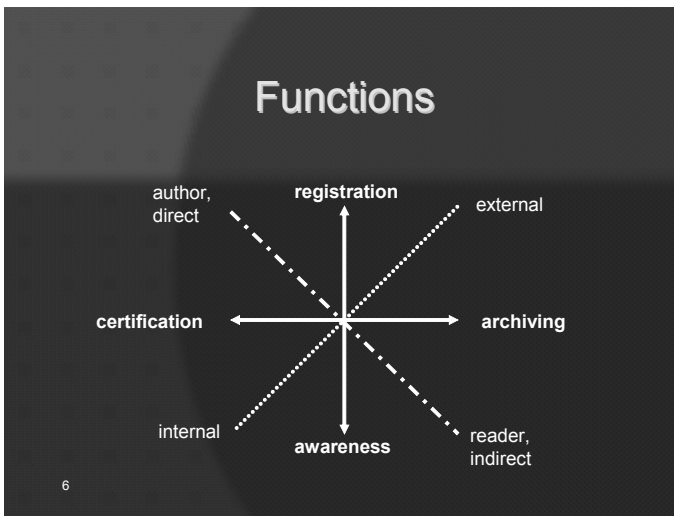


Figure 1.1 Strategic functions of scientific information

The four functions in scientific information need always be performed independently of the technological environment, albeit that the balance between the func-

16 See Roosendaal et al. (2001), op.cit.

tions may well change under changing technological conditions. We will use the four function scheme for scientific information as analytical tool in our analysis of changes in the value chain arising from the engines of change as discussed above. They provide amongst others a powerful check on the comprehensiveness of these scenarios and the consequences for the stakeholders.

Sharing information is the main value proposition that any business model should account for: it should allow researchers making research results public and acquiring scientific information. As the intellectual property is the main property in scientific information, any business model can only serve researchers in producing knowledge if it serves the author in claiming intellectual property next to serving the reader in acquiring scientific information. This can only be achieved by guaranteeing adequate availability of scientific information. In addition, the ability to acquire scientific information depends necessarily on the availability of such information next to the ability of selecting this information by the researchers. This means that the information should in principle be universally accessible.

In the above, we have implicitly defined the market segment as the research environment worldwide. In the narrower sense, this implies that the reader will want to acquire information and to use this information to do further research to produce future research results. This seems the main use of scientific information, but scientific information is also used in areas of application outside the original research area. Such areas of application can be other research areas, interdisciplinary areas or even application outside research, e.g. in societal applications, such as in industry, services or the public at large. This means that the market segment is clearly broader than the research environment. Nonetheless, the main objective remains to share information and it is therefore the receiving end that determines how to make use of this information for their goals and purposes. A main observation to add then is that the value proposition is therefore in principle determined by the demand side.

1.4 Value chain options

As stated above, ICT in particular allows a variety of value chains. The value chain is defined being linear in terms of steps of added value and is not a process chain. The corresponding process chain is in essence a rather complex network of process steps.

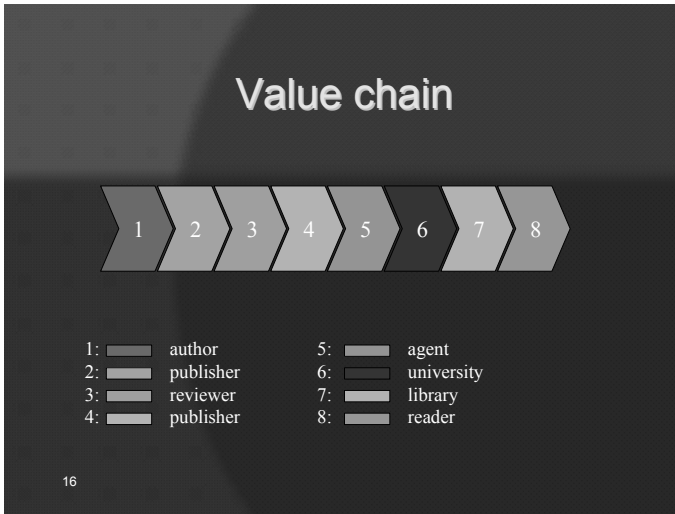


Figure 1.2 Traditional value chain

Figure 1.2 shows the traditional value chain, as we know it from the paper-based environment. In this figure we show the value chain with the stakeholders responsible for the added value per link. Thus the author creates the work, sends it to the editor, the publisher will produce the work and send it to the university. Administrative assistance is mostly given by an agent. Finally the paper arrives at the reader.

1.4.1 Alternative options

In Figure 1.3 we show a shortened value chain of author and reader only, i.e. full empowerment for the author and the reader. This means no quality filter or branding. This value chain can well work for information that the reader is very familiar with, but takes an extraordinary effort on the part of the reader with information less familiar thereby violating the statement: ‘Authors want to publish more, readers want to read less.’ This value chain is totally availability-based meaning that the author or the institution does not only have to bear the financial risk but as there is no refereeing there is also for the author the full risk as scientific entrepreneur.



Figure 1.3 Value chain with full empowerment for author and reader

Another possible value chain is the one in Figure 1.4 where publishers are delivering information directly to the reader. Weak point in this value chain is the responsibility for the archive that in this case should rest with the publisher, not a very realistic proposition. This value chain is totally reading use based and costs will have to be picked up by the reader.

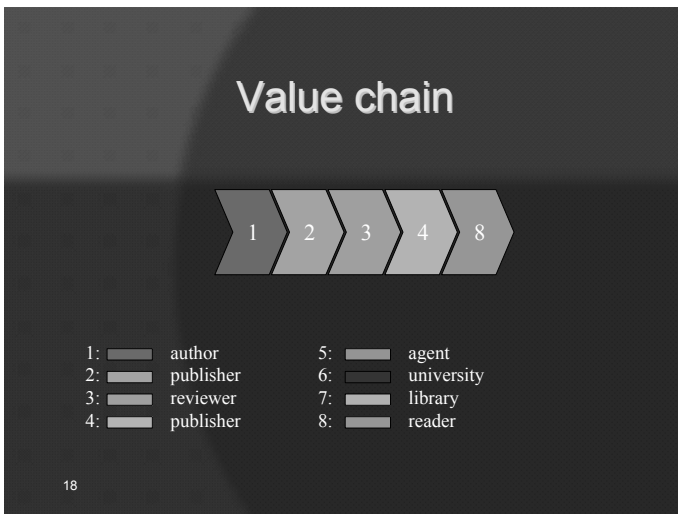


Figure 1.4 Value chain without universities

Alternatively, we could swap the publishers for the HE institutions taking over the publishing function (Figure 1.5). In the case of research information the weak point then is the certification of the material. This cannot be managed by the home institution of the author. A way out could well be the creation of alliances of institutions, leading finally to the establishment of new publishers. However, for learning material this value chain is highly feasible as in this case the 'buying' institution can exercise the certification power.

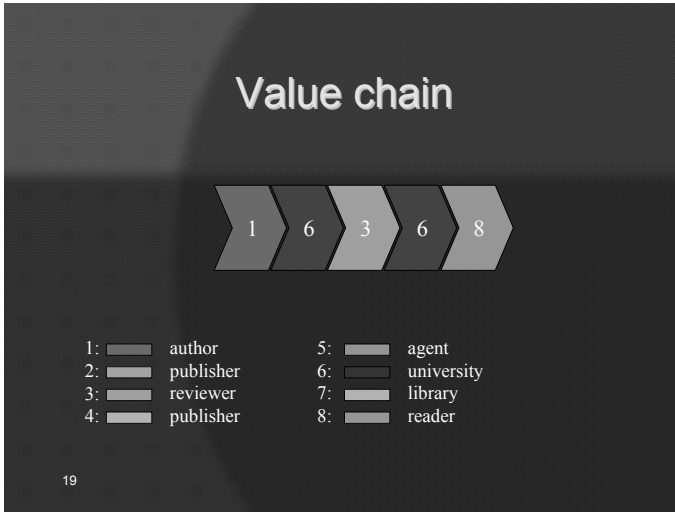


Figure 1.5 Value chain without publishers

In the last figure we see a value chain that looks rather similar to the traditional value chain, but with totally new roles for the stakeholders. The institutions are now responsible that the work (author) can be sustainably archived ('perpetual' archiving) and is properly disseminated to the reader. The institutions are in this chain responsible for the registration and the archiving functions (Figure 1.6). The publisher is responsible for the distribution and branding and in providing logistical assistance for the editor in the certification process.

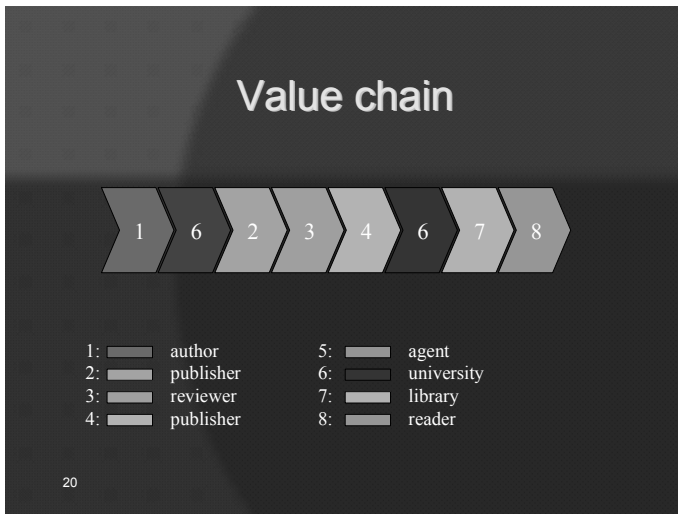


Figure 1.6 Value chain with new roles for institutions and publishers

This chain has a number of consequences:

1. *The fixed first copy costs have not to be born twice, i.e. by the institution and the publisher, but will be born by the institution only.*
2. *The author can transfer copyright, i. e. the overall exploitation rights, to the institution where the work was performed. The institution can then transfer specifically designated rights to the publisher.*

In this last value chain the costs for production and dissemination will be born by the institution. The different options of the value chain allow different options for scenarios in the research and HE information market. The different options represent also differences in the balance between availability on the one-hand side and reading use on the other hand. This is relevant for the different business models emerging from these options.

1.4.2 Business models

As we have seen before, the value chain of all stakeholders involved in the entire process should be a part of the business model. A major consideration then is that if serving researchers is the main value proposition, any business model should account for the conditions determining how researchers are conducting research. This means that this model should account for the different modes of strategic positioning in which different types of scientific information is being required, acquired and produced. This then results in requirements for the value chain.

The business model should account for competition within the research environment that, as argued, affects the researchers' choices, requirements, and the necessary conditions for scientific information. Part of the competition is in claiming intellectual property which evidently creates a competitive advantage for the owner of that property. But there is also a competitive element in the acquisition of information.

Full availability of information can be argued to be of particular relevance to smaller research institutes as they are necessarily more limited in their networks and generate less knowledge than larger institutes. Medium and smaller research institutes may therefore be more vulnerable for limited availability of information as this may hamper them in producing new knowledge. Effective acquisition of scientific information also depends on the power of selection by researchers. This power of selection, possibly enhanced by various services, gives researchers additional competitive advantage in terms of improved access to relevant and up to date information acquired at the right time.

As we have noted above, a business model should provide a proper balance between availability of scientific information and selection of this information by researchers. A proper balance influences the researchers' ability to acquire and select relevant scientific information and therefore, impacts on their competitive advantage. Grey literature can provide an important service in this respect.

The revenues and costs structure and profit potential in the business model is shown to be dependent on the organisation of the two main dimensions that we have noted before: availability and selection, or rather the balance between these two dimensions.

Another condition is that the business model should be sustainable, where sustainability is defined as the characteristic of a process, system or state that can be maintained at a commensurate level, and in 'perpetuity'. This boundary condition is seen to be particularly relevant in scientific information in its service to the production of knowledge with its strong demand for legacy. The boundary condition of sustainability means that scientific information should be available and accessible in perpetuity at the same time requiring a revenue, costs and profit structure that can ensure this demand. It may be noted that a subsidised and therefore political system, would not possibly only render the scientific information system very vulnerable, but could also endanger independent certification of the research results, in this way endangering the research process itself. Sustainability and its consequences are issues that also grey literature should account for.

Another issue that grey literature should deal with is peer review. Peer review certifies the researchers' contribution to scientific knowledge and 'brands' it. In the process of peer review the research environment decides if the claim to the property by the author can be made, if the claim is of commensurate scientific value. Being essential for claiming the property, peer review is therefore core to any business model for scientific information.

Any business model is based on a combination of the two parameters of availability and selection. Neither the subscription model nor the open access model does entirely fulfil the necessary conditions for general availability and power of

selection at the discretion of researchers. Each of these models focuses too much on one parameter.

The business model for grey literature represents a family of variations of the optional business model, a characteristic being that the registration and archiving functions are combined in the author's institution.¹⁷

Another conclusion is that the dominant business model, the subscription model, is heavily supply oriented while providing bounded or limited availability and in doing so is in principle a publisher centred model while at the same time focusing on the author as the primary stakeholder for consideration. The open access model in all its variations as coming up in the market is in essence also a supply oriented model. It is furthermore like the subscription model primarily a publisher centred model, in particular in its forms of open access mandates for publishing on the institution's repository followed by subsequent publication in a journal.

This means that both known business models, the dominant subscription model and the open access model both in their different manifestations in the market are essentially supply oriented and publisher centred, whereas convergence of the scientific information market towards e-science can only result in a business model that should be demand oriented and above all research centred.

Demand oriented means that the business model should fulfil the demand of authors for full availability and the demand of readers to decide on their own needs for selection depending on the information they want to acquire. Research centred means that the business model should allow for the different strategies researchers want to develop in strategic positioning themselves in the relevant environments and for competing in these environments. Any business model, grey or not, should comply with the prime demand of research of sharing scientific information for the benefit of research, i.e. sharing information in a very dynamic environment demanding that information must be made public and can be fully acquired.

1.4.3 High-level strategy

Creating a network of repositories of information relating to research and education requires a basic conception of a high level strategy shared between the different stakeholders having different business philosophies. Such a strategy can only be successful if it fulfils in the best possible way the major interests of the stakeholders. This requirement means that such a strategy can only have one focus: the user as the primary beneficiary of the network. This is the only possible strategy leading to value creation, the alternative being value capture by one of the stakeholders and taking the other stakeholders, in particular the users, as hostages. The user is the learners, teachers, researchers and students in knowledge institutions and organisations, in their capacities as author and/or reader. This means

17 See Roosendaal et al. (2009), op.cit.

that a comprehensive approach to user behaviour and to the consequences of such behaviour for the value chain of information is indispensable.

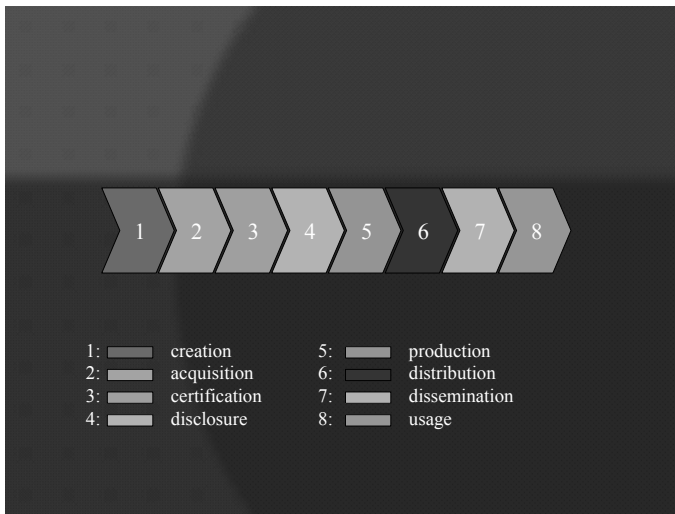


Figure 1.7 Strategic tasks of the network as represented in the value chain

The institutional stakeholders in the research and HE information market and beyond, will as enablers be the secondary beneficiaries. As stated before, the foremost goal for every stakeholder is to develop an individually tailored strategy to comply with the high level strategy in this way positioning this stakeholder at the forefront of developments in on-line information management. Only then the stakeholder will be able to make an invaluable contribution to a network for worldwide information provision in research and education. A key aim of this strategy is making universities and other knowledge institutions, scientific publishers, non-commercial or commercial, professional by helping to make use of this network and ensuring that the architecture will best serve all stakeholders' needs. The network should be able to support the user in the strategic tasks as embedded in the value chain in Figure 1.7.

As a consequence of such a high level strategy the corresponding technology strategy should focus on developing an architecture for federating existing and future repositories and libraries for the familiar strategic reasons for making use of an architecture:

- to reduce complexity;*
- to allow a proper balance between central and decentral aspects of the development;*
- to be able to manage change properly;*
- to facilitate experimentation and competition;*
- to ensure that many different systems can develop together gracefully.*

A main goal for this architecture is the development of a shared architecture for e-documents, e-learning and e-science and this requires integration and resources syndication. A foremost strategic goal is that the authentic copy of a work of whatever type, should remain located at the home repository, being the repository of the affiliation of the creator of this work. This would constitute an important step towards empowerment of the user.

The relation between the research environment and the information environment, i.e. research and HE institutions, repositories, publishers and other intermediaries, requires a sort of virtual organisation comprising of these two environments as to ensure steady progress in the development towards e-science. In fact, it calls for a sort of organisation like we know well from the development of the World Wide Web: the WWW consortium. In this way, a worldwide scientific information network as described in the vision could be realised with a dispersed spectrum of stakeholders ensuring a diversified and differentiated network that is optimally integrated in research and teaching.

1.5 Concluding remarks

In further analysing the consequences for stakeholders including researchers and research and HE institutions in a way consistent with the above discussion, we again have to look at the production of scientific information as an alliance or as a sort of integration of the main stakeholders with the research environment. This seems valid as it is evident that research centred and demand oriented business models require some degree of integration between the stakeholders. Here, a grey business model could possibly be advantageous as this business model is per definition more integrated.

We conclude our chapter with some summarizing remarks.¹⁸

- Researchers demand a research centred and demand oriented family of business models for scientific information as only such models ensure that scientific information serves the production of knowledge, results from the side of the. These business models ensure further integration of scientific information into the research and teaching enterprise in its development towards e-science.
- As for research and HE institutions it is evident that high value information provision is a strategic core activity of every institution and becomes even more relevant in the development towards e-science. Institution management has to be aware of this responsibility for the provision of adequate information services.
- The research and HE institutions are the natural candidates to initiate the development of new business models and structures. This is foremost an organisational and not a technical challenge. A major organisational chal-

18 See Roosendaal et al. (2009), op.cit.

lenge will be to absorb the library consequently into the research organisation. The goal of this absorption is to change the relation between the institution's primary processes and the information provision for these processes. It has been seen necessary that this information provision will have to integrate more closely with the primary processes to deliver the services they need.

- The developments in the market of scientific information, in particular the convergence towards e-science provide great opportunities for professional, commercial or non-commercial service providers. To grasp these opportunities it is important that these service providers will develop a more integrated relation with the research environment.
- Other service providers will have opportunities to assume tasks to support the functioning of the overall network. Tasks can be in the areas of technical and administrative support. There is a special task in controlling the logistics of the network.

Any business model should comply with the prime demand of research of sharing scientific information for the benefit of research, i.e. sharing information in a very dynamic environment demanding that information must be made public and can be fully acquired. Such a business model leads to a network comprising the research environment as the pivotal stakeholders together with the other stakeholders. Such a network requires careful strategic positioning of these other stakeholders with respect to the research environment. As stated above, a grey business model is a family of variations of the optional business model.

The technical and organisational development bears important consequences for the strategic development and use of grey information. Rather than seeing grey literature as type of product or a set of types of products it may well be tempting to consider grey literature as a specific type of value chain(business model) or a set of specific types of value chains (business models) in the entire family of value chains (business models) possible in information related to science.

Indeed, in grey literature the registration and archiving function have always been combined at the author's institution, being this an individual author or the institution itself. Grey information that is published on the institutional repository will then enjoy wide availability as opposed to limited distribution as used to be the case and this will make grey information straight away the most abundantly available scientific information.

The challenge for grey literature is then to find ways to integrate fully into the further and continuing convergence towards e-science.

Acknowledgement

The author should like to thank Dominic J. Farace and Joachim Schöpfel for inviting him to write this article. The author should like to thank Joachim Schöpfel for his encouragements and invaluable help to write this article in this particular form.

